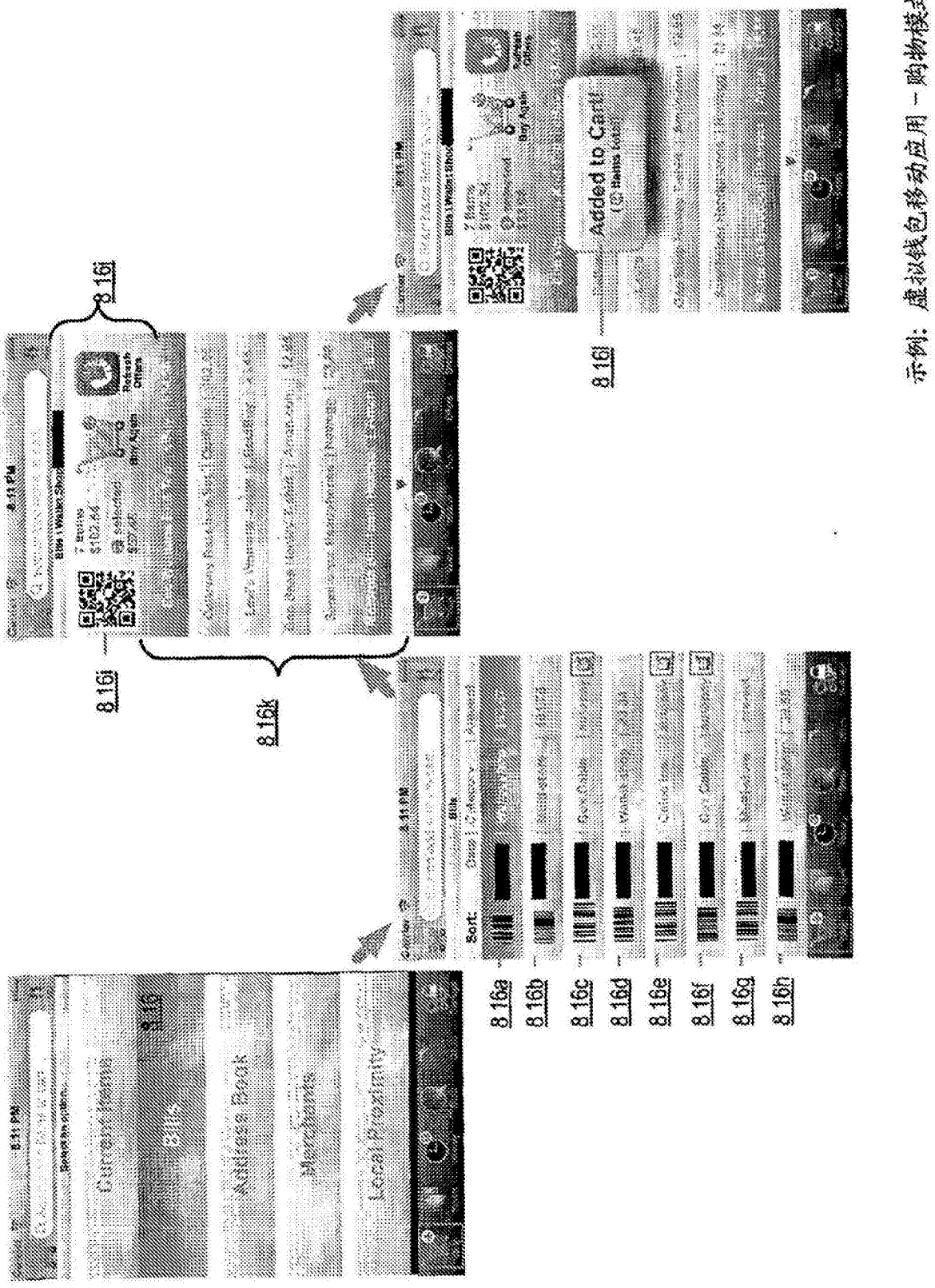

图8B

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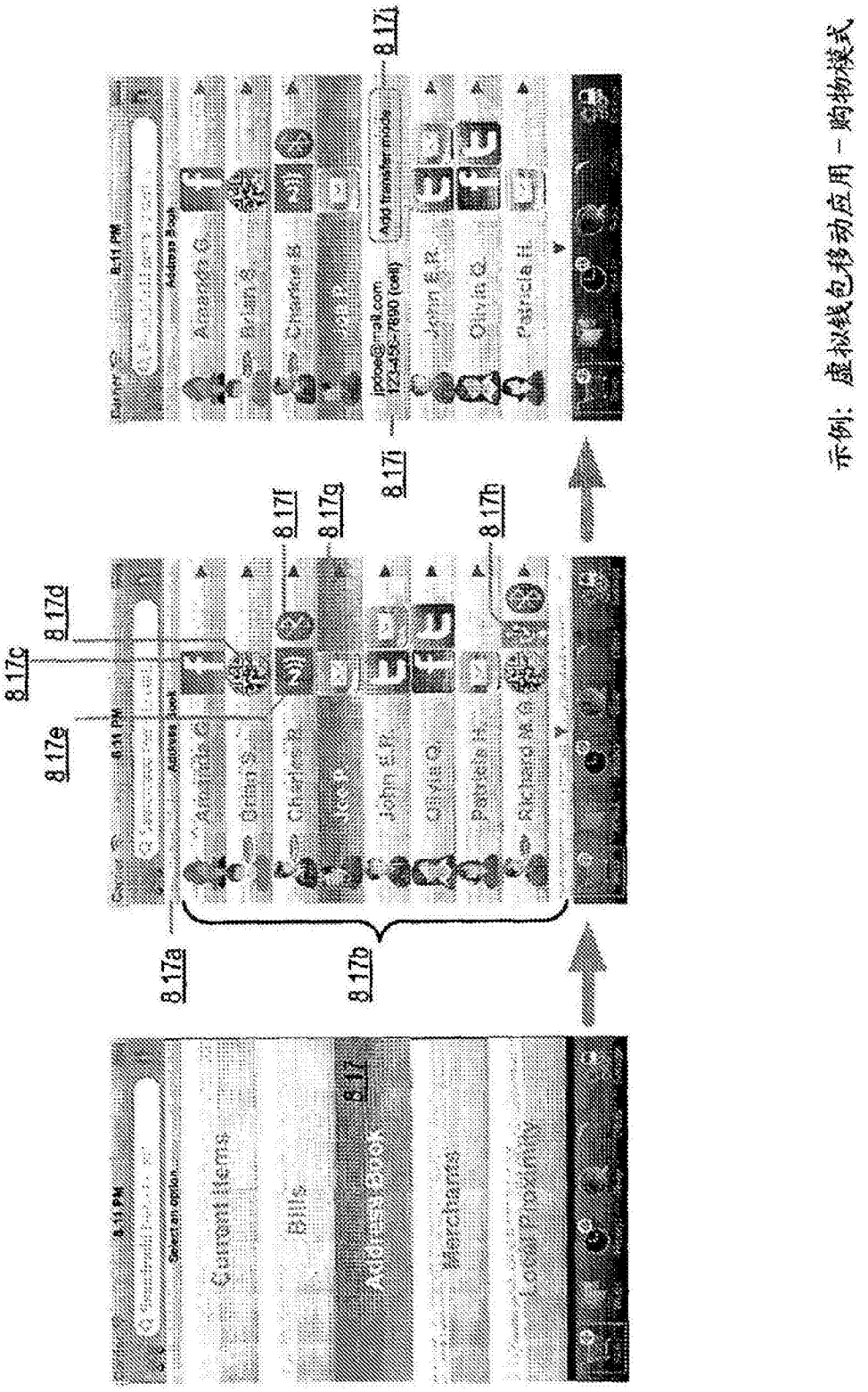

示例：虚拟钱包移动应用－购物模式

图8C

Petitioner Exhibit 1002-0354

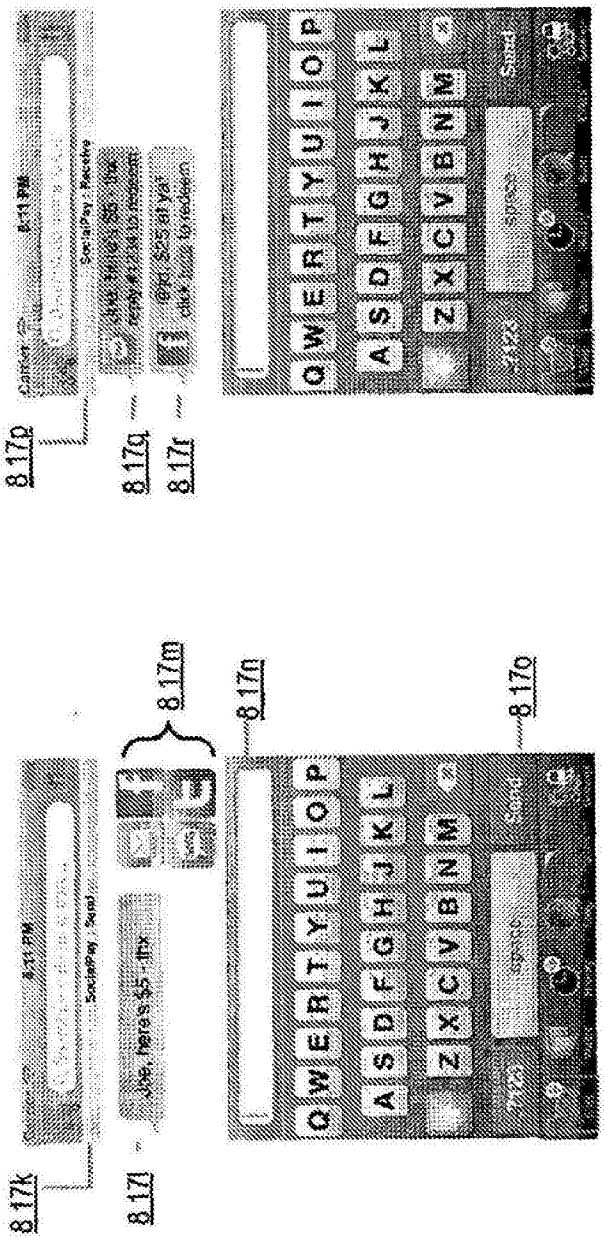

图8D

示例：虚拟钱包移动应用－社交支付模式

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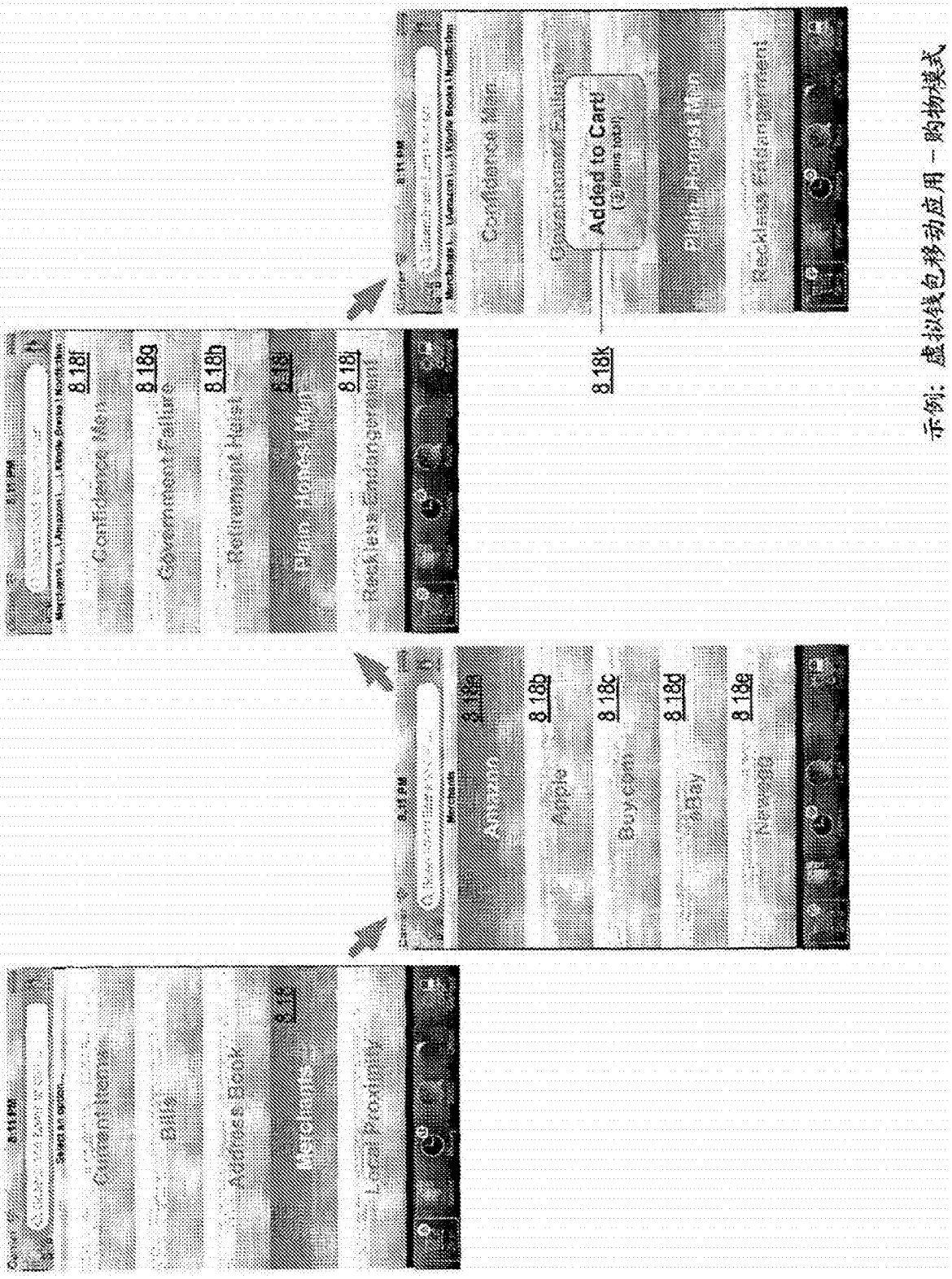


图8E

Petitioner Exhibit 1002-0356

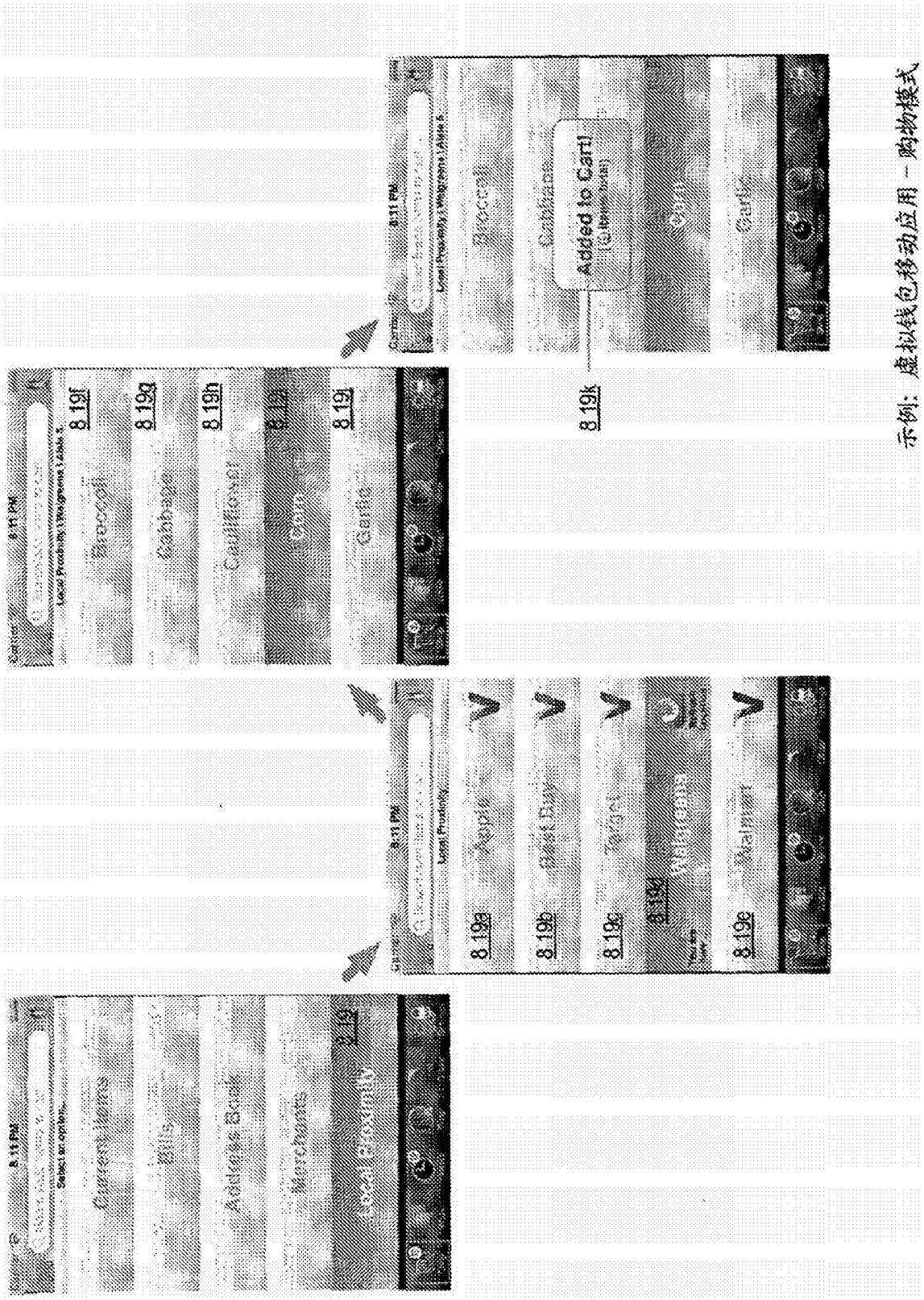
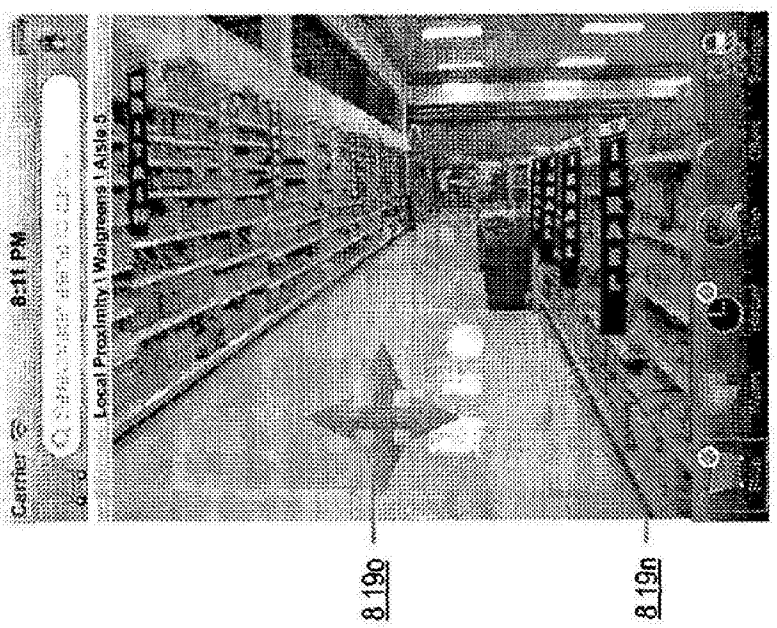


图8F

Petitioner Exhibit 1002-0357



示例：虚拟钱包移动应用－购物模式

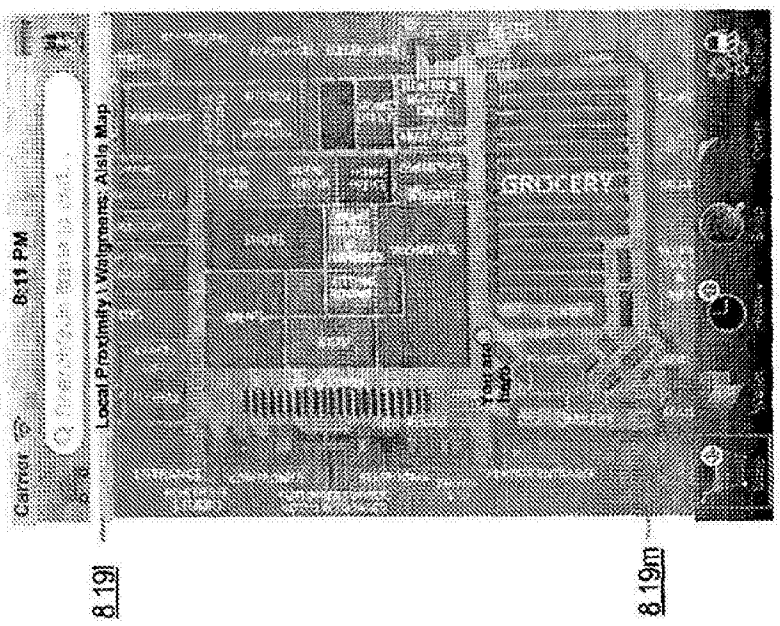


图8G

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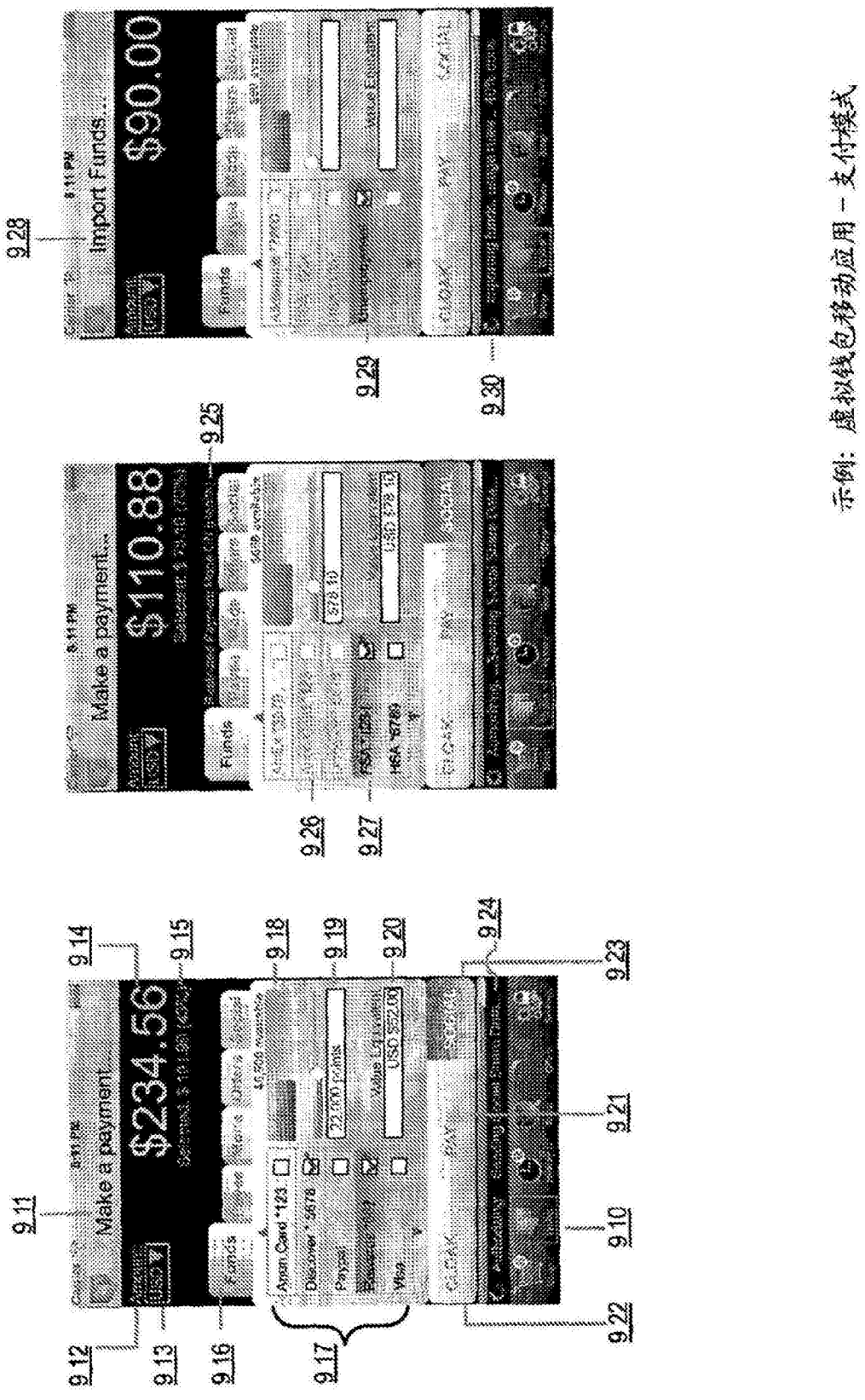

图9A

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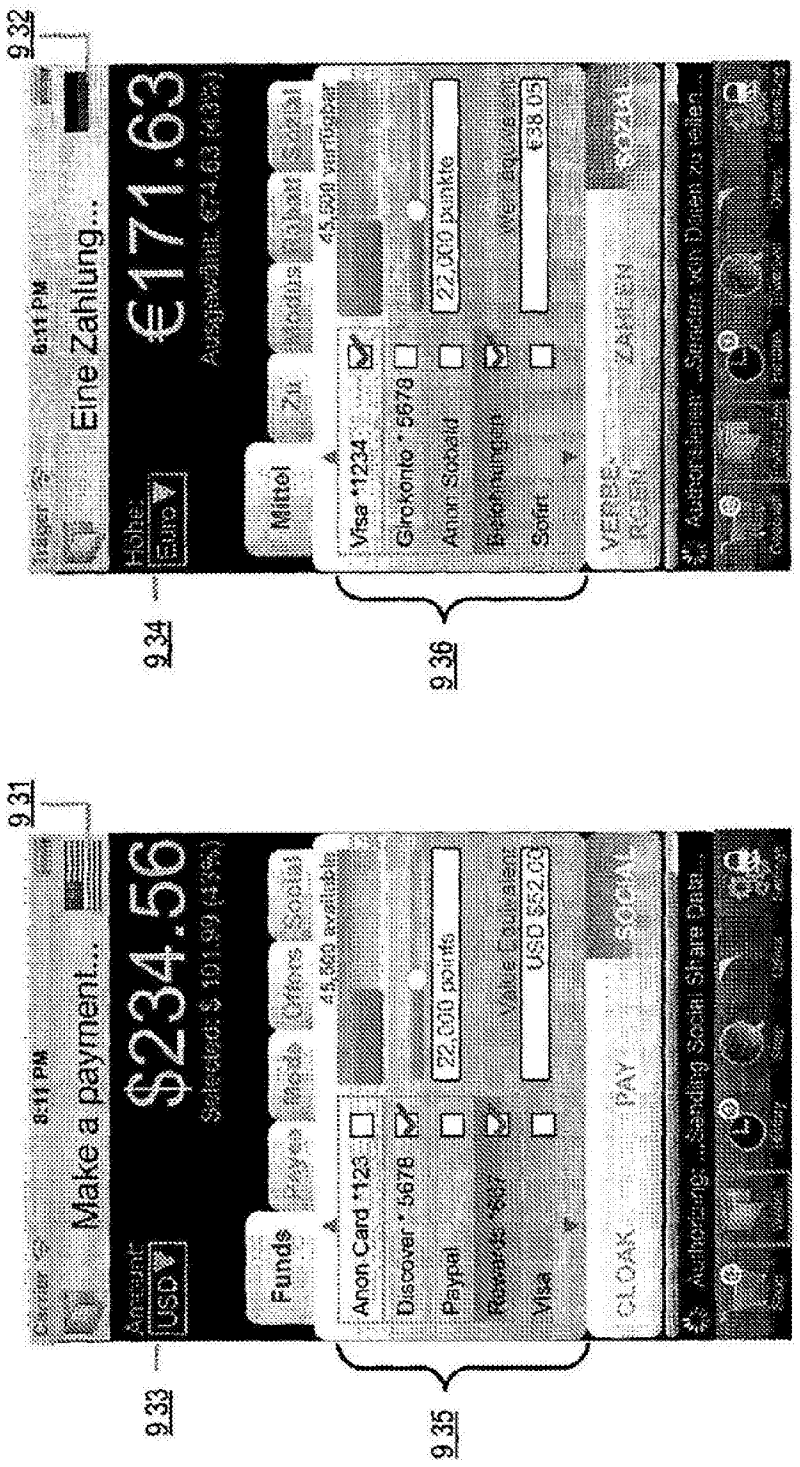
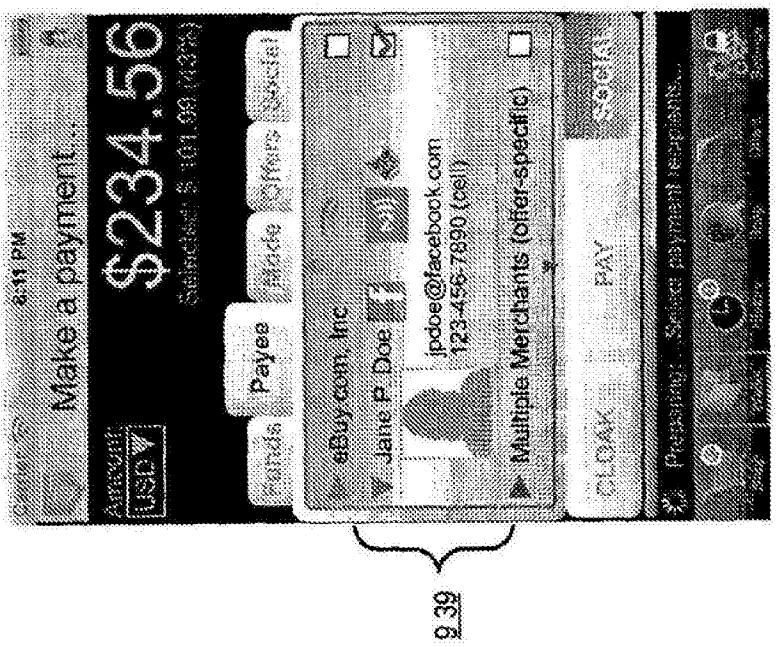


示例：虚拟钱包移动应用－动态支付优化

图9B

Petitioner Exhibit 1002-0360



示例：虚拟钱包移动应用

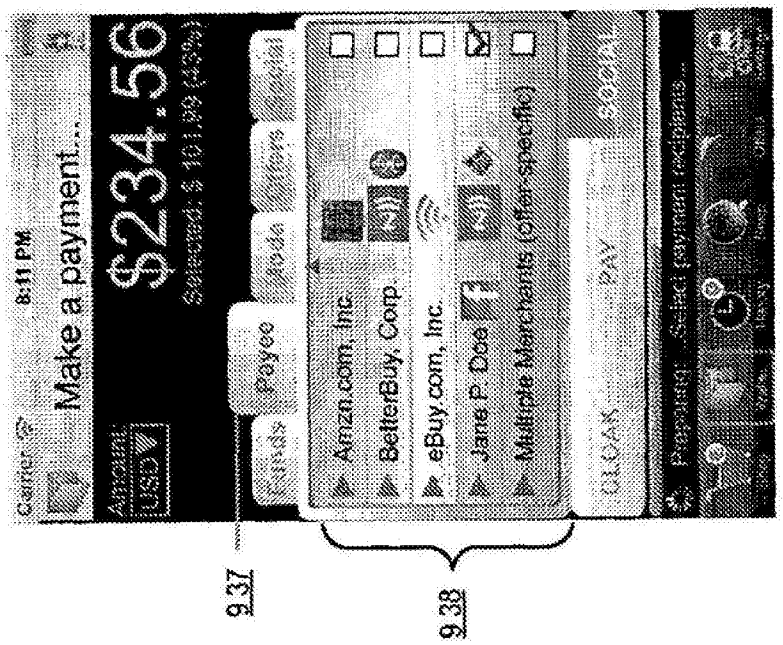


图9C

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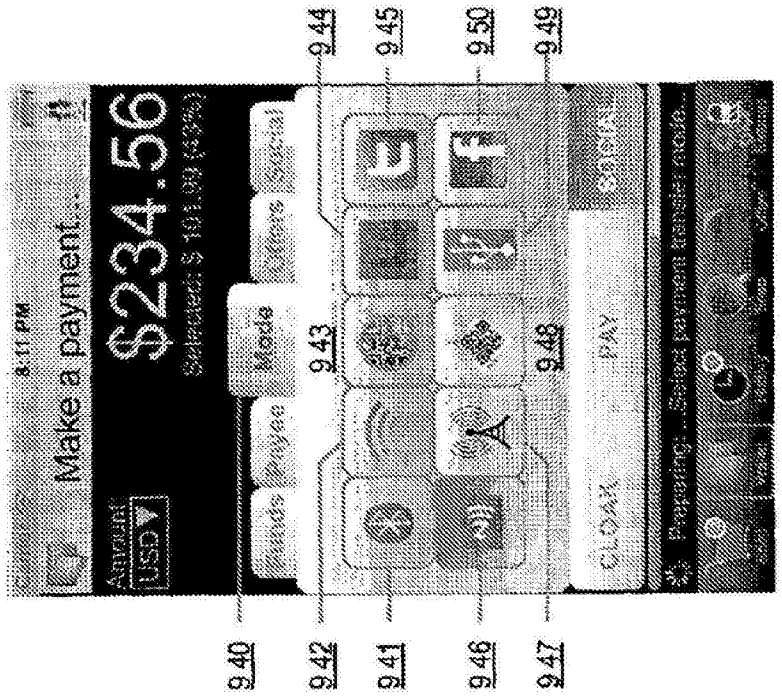

示例：虚拟钱包移动应用

图9D

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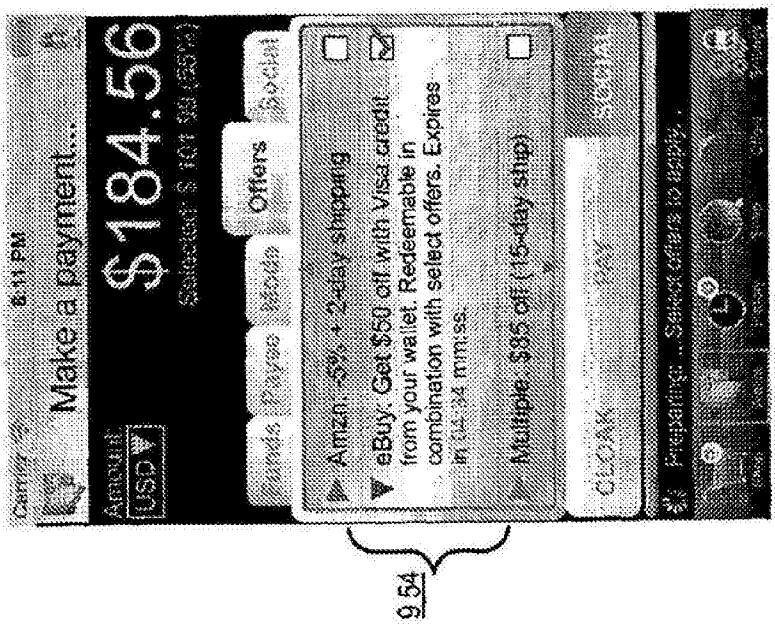


示例：虚拟钱包移动应用

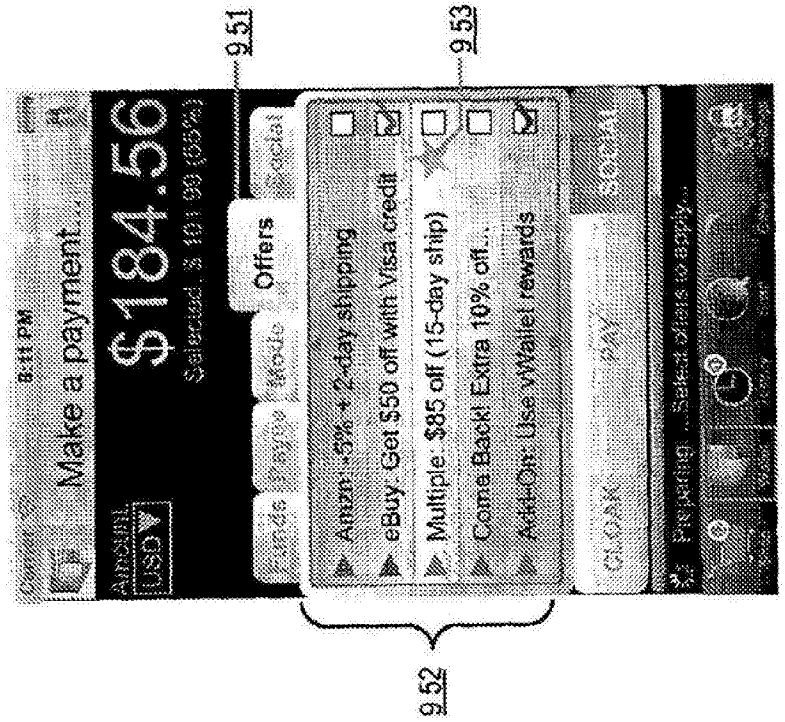
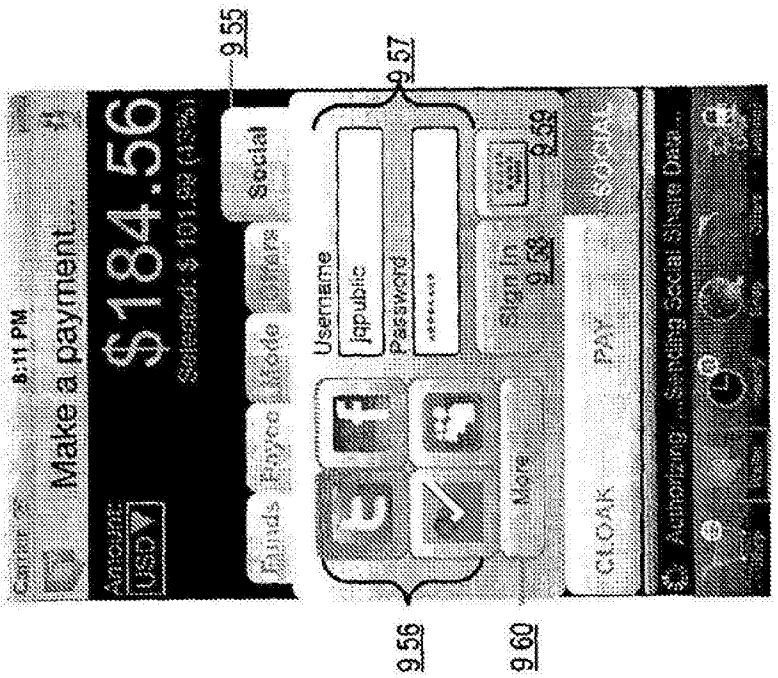


图9E

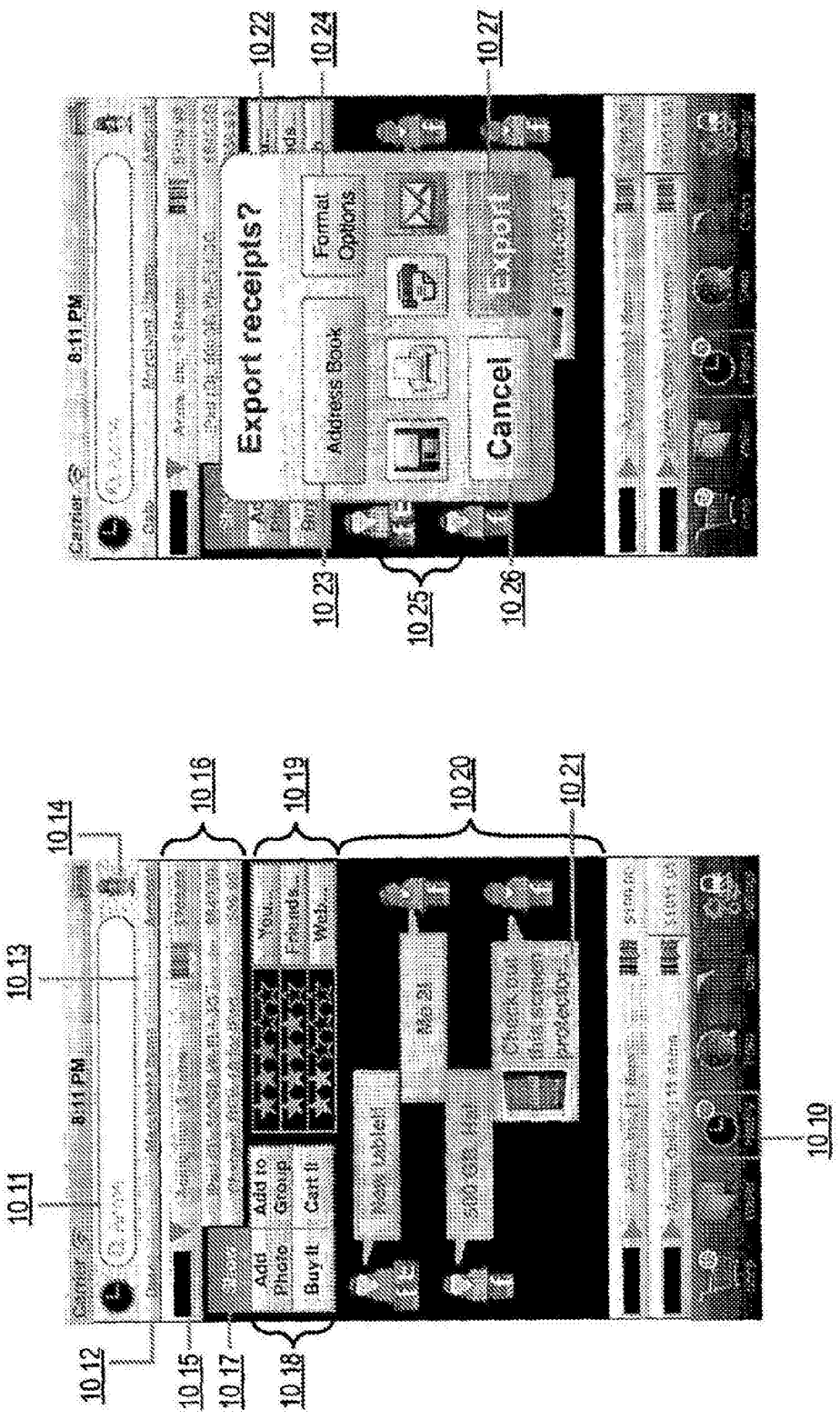
Petitioner Exhibit 1002-0363



示例：虚拟钱包移动应用

图9F

Petitioner Exhibit 1002-0364



示例：虚拟钱包移动应用－历史

图10

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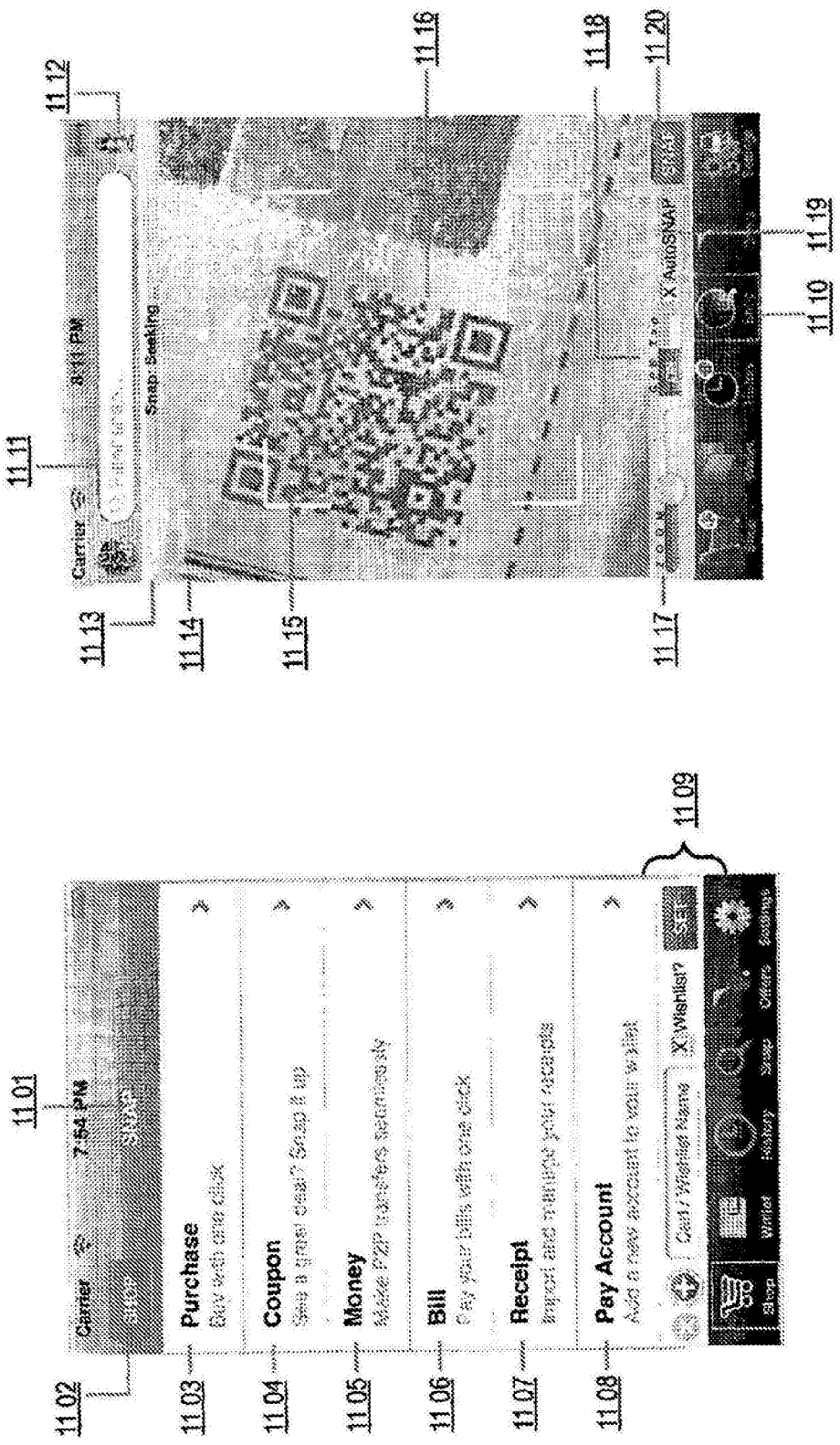

图11A

示例：虚拟钱包移动应用－快拍模式

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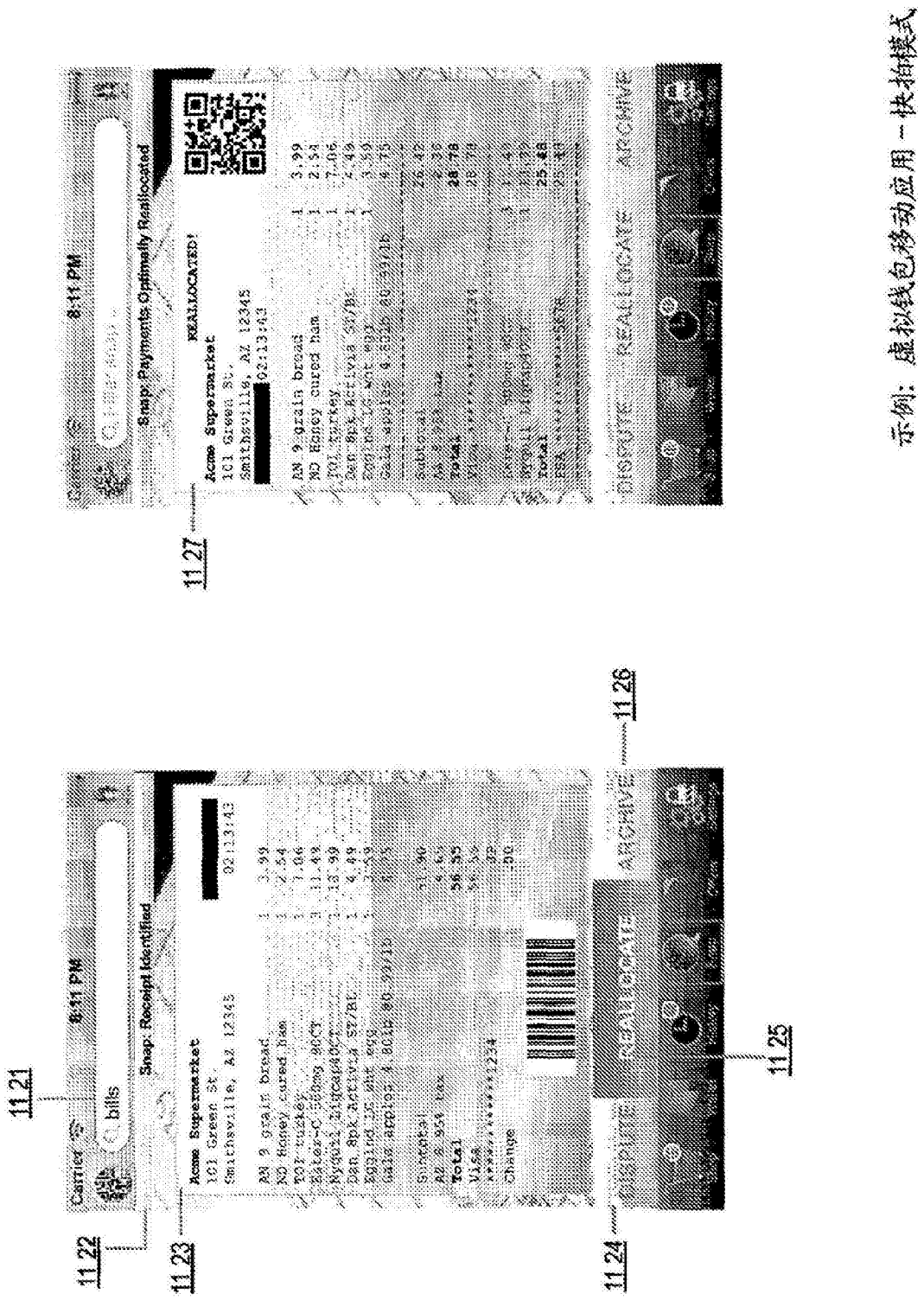

图11B

示例：虚拟钱包移动应用－快拍模式

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示例：虚拟钱包移动应用－快拍模式

图11C

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图11D

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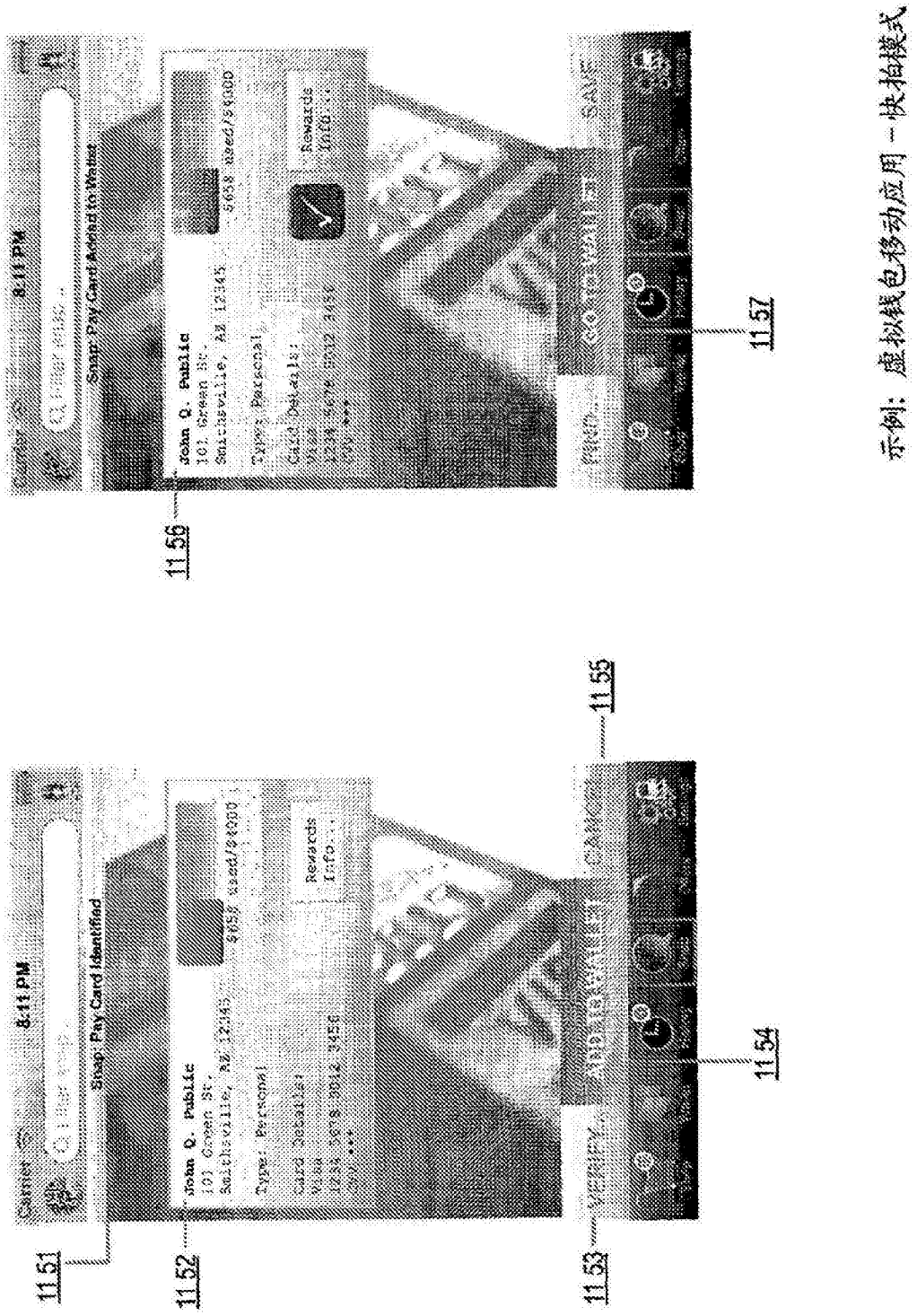

示例：虚拟钱包移动应用－快拍模式

图11E

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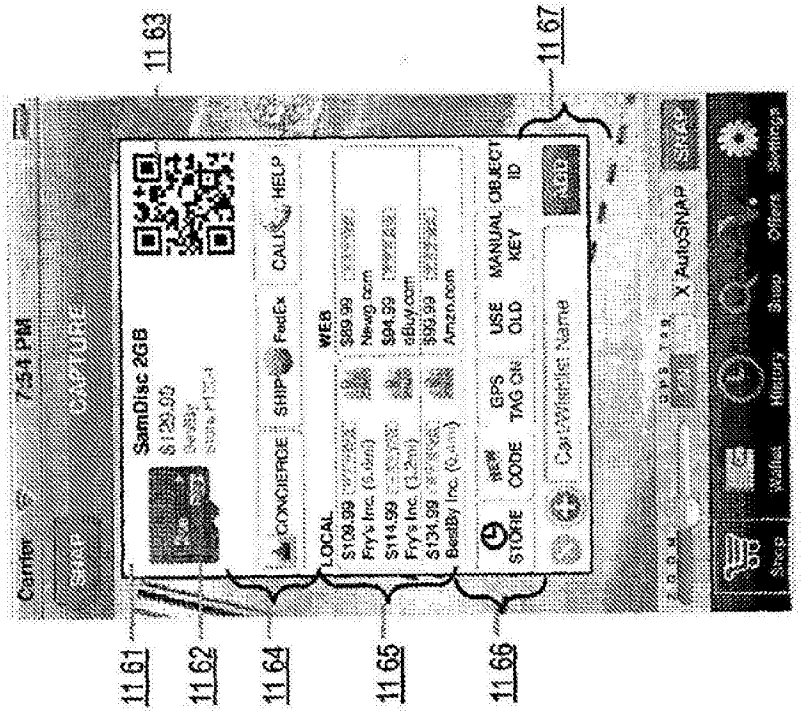

图11F

示例：虚拟钱包移动应用－快拍模式

Petitioner Exhibit 1002-0371

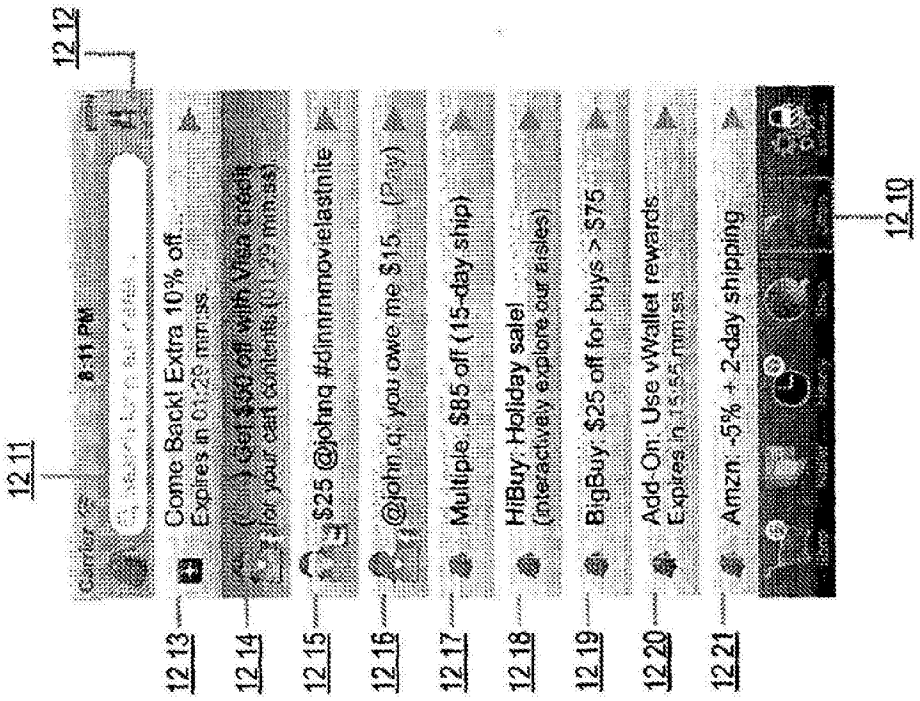

图12

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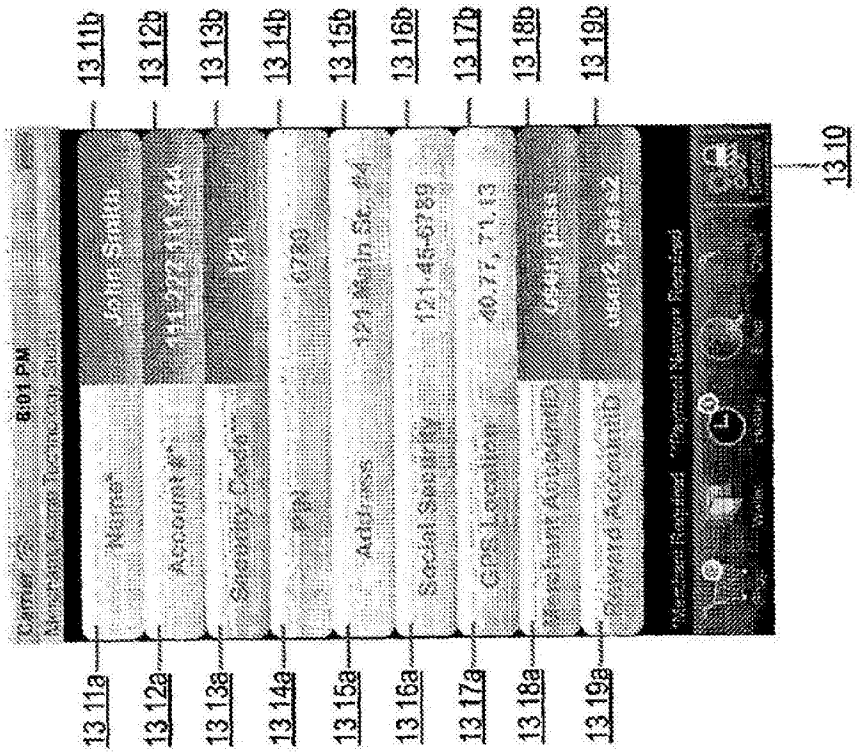
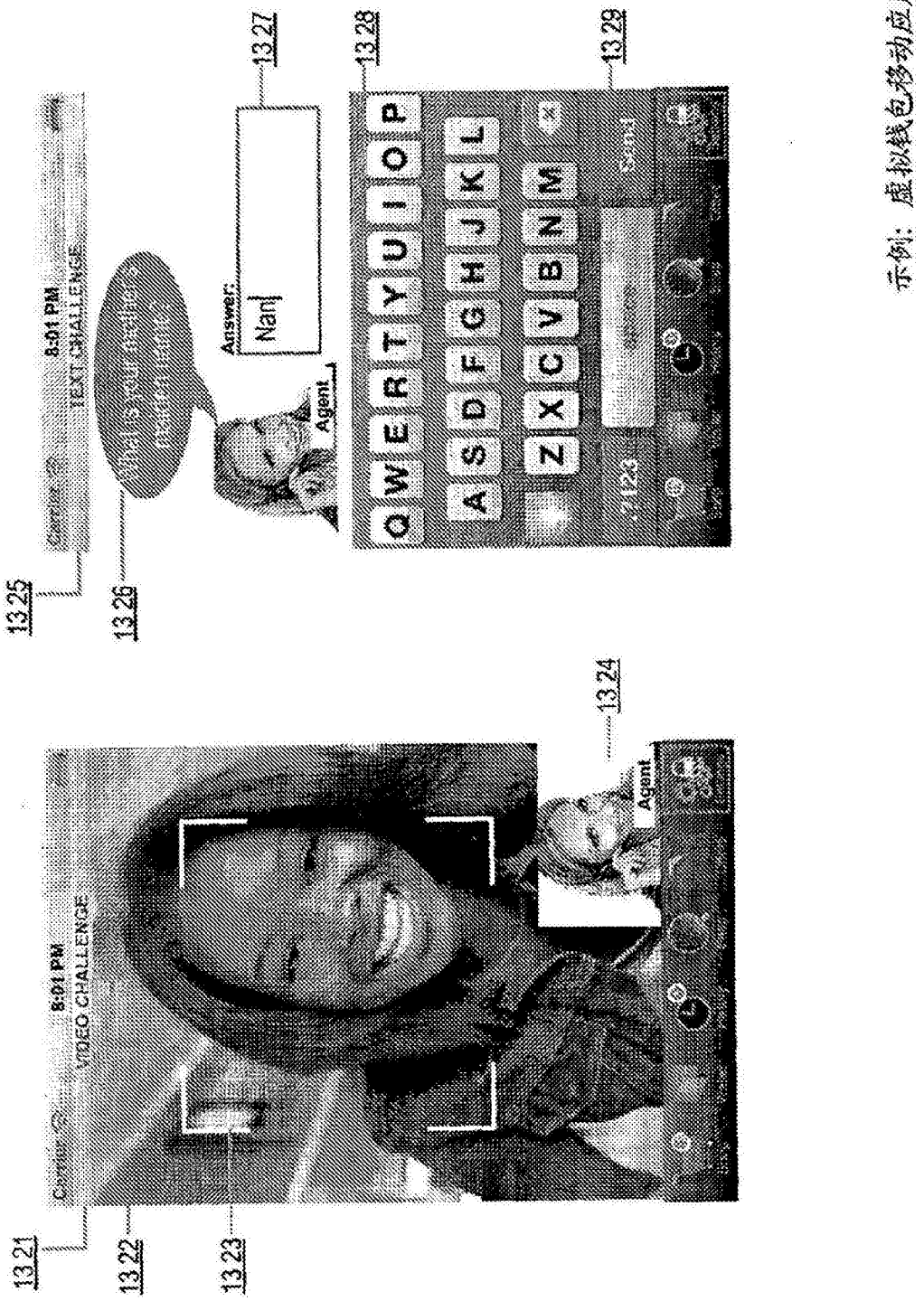


图13A

Petitioner Exhibit 1002-0373



示例：虚拟钱包移动应用

图13B

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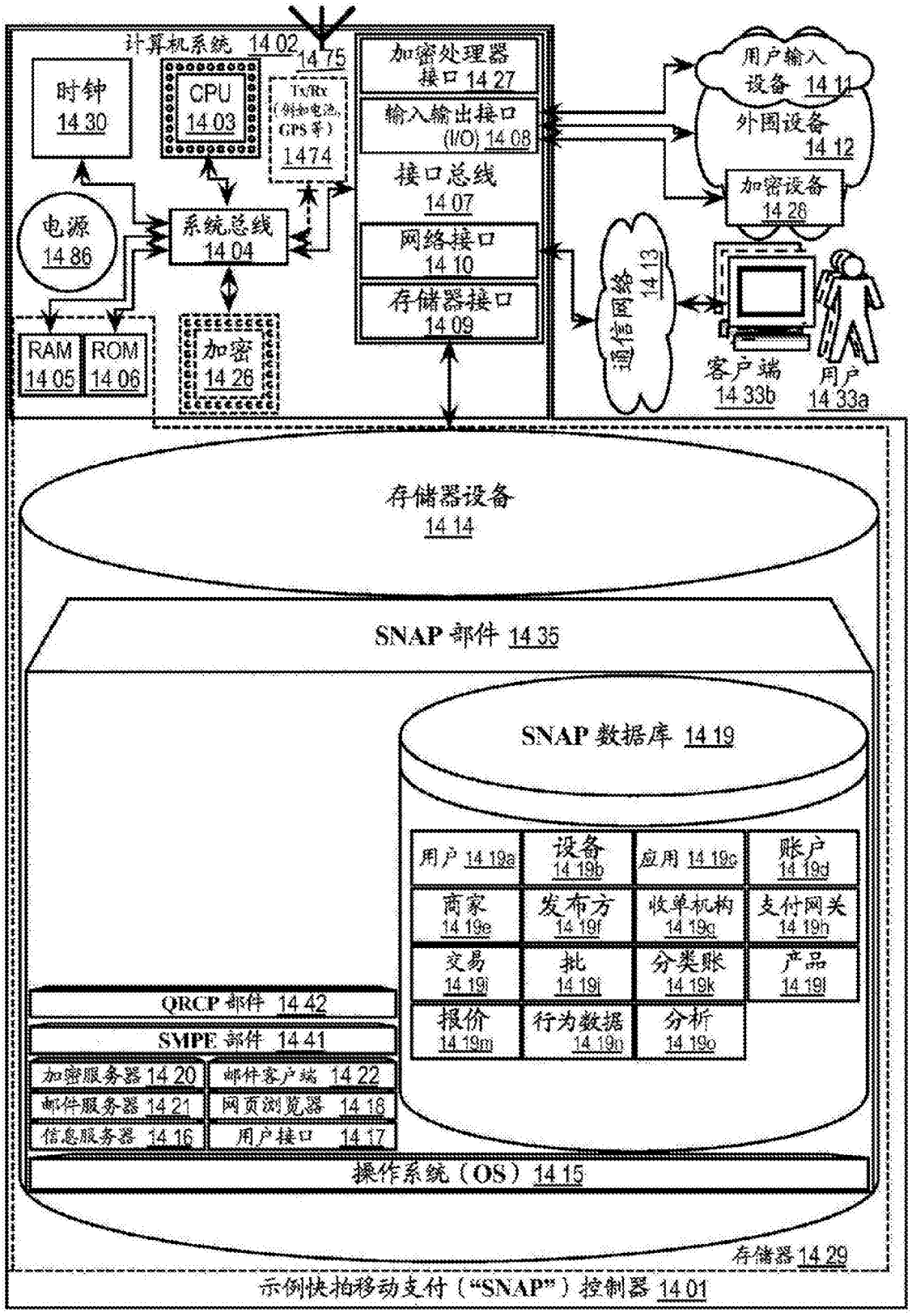

图14

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(71) Applicant *(for all designated States except US)*: **WALKER DIGITAL, LLC** [US/US]; 1177 High Ridge Road, Stamford, CT 06905 (US).

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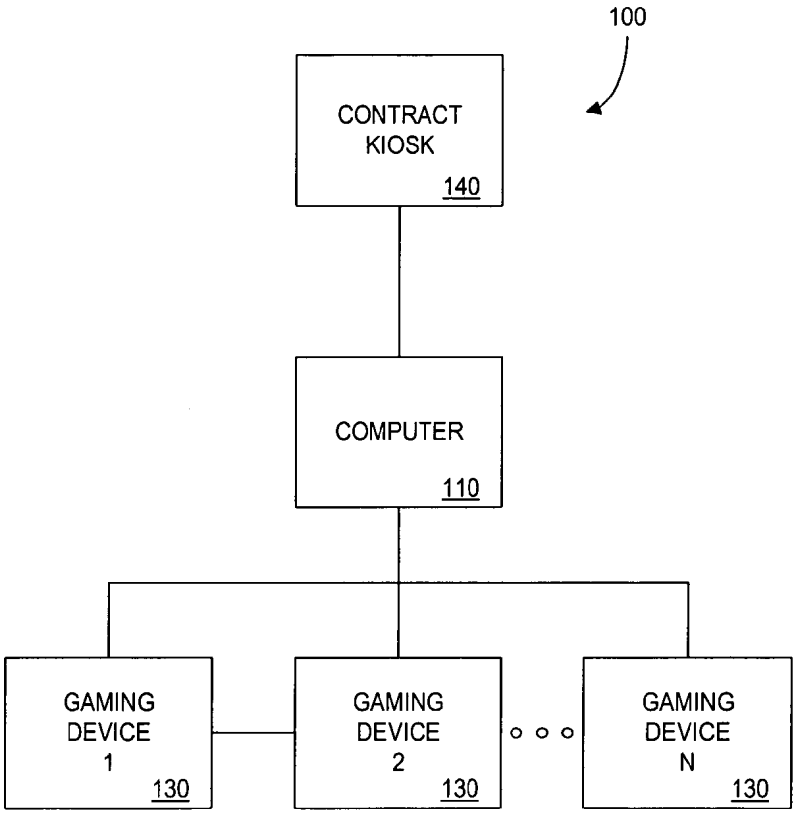
(74) Agents: **FINCHAM, Magdalena, M.** et al.; Walker Digital Management, LLC, Five High Ridge Park, Stamford, CT 06905 (US).

(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI,

[Continued on next page]

(54) Title: SYSTEMS, METHODS AND APPARATUS FOR FACILITATING PLAY OF A GAMING DEVICE IN ACCORDANCE WITH A CONTRACT



(57) Abstract: In accordance with one or more embodiments, a contract is established with a player. The contract may define, for example, a period of time, a contract fee, and a benefit that a player may earn or otherwise qualify for by participating in, for example, game play of a gaming device or a table game. The play or other activity of the player may be monitored (e.g., by a casino server) to determine whether the player is complying with the terms defined by the contract and / or whether the player has earned or otherwise qualified for the benefit.

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GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SM, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

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SYSTEMS, METHODS AND APPARATUS FOR FACILITATING PLAY OF A GAMING DEVICE IN ACCORDANCE WITH A CONTRACT

Claim of Priority

The present application claims the benefit of (i) Provisional Application Serial No. 60/600,211, filed August 10, 2004 in the name of Walker et al. and entitled SYSTEMS, METHODS AND APPARATUS FOR ADMINISTERING GAMING CONTRACTS, and (ii) Provisional Application Serial No. 60/600,646, filed August 11, 2004 in the name of Walker et al. and entitled SYSTEMS, METHODS AND APPARATUS FOR MONITORING GAMING CONTRACTS. The entirety of each of these applications is incorporated by reference herein for all purposes.

Related Applications

The present application is related to the following commonly-owned patents and patent applications:

(i) U.S. Application Serial No. 08/804,060, entitled SYSTEM AND METHOD FOR GENERATING AND EXECUTING INSURANCE POLICIES FOR GAMBLING LOSSES, which was filed on February 21, 1997 in the name of Walker et al. and which issued as US Patent No. 6,113,493 on September 05, 2000;

(ii) U.S. Application Serial No. 08/880,838, entitled GAMING DEVICE FOR A FLAT RATE PLAY SESSION AND A METHOD OF OPERATING SAME, which was filed on June 23, 1997 in the name of Walker et al. and which issued as US Patent No. 6,077,163 on June 20, 2000;

(iii) U.S. Application Serial No. 10/001,089, entitled GAMING DEVICE FOR A FLAT RATE PLAY SESSION AND A METHOD OF OPERATING SAME, which was filed on November 02, 2001 in the name of Walker et al. and which is currently pending;

(iv) U.S. Application Serial No. 10/636,520, entitled SYSTEM AND METHOD FOR COMMUNICATING GAME SESSION INFORMATION, which was filed on August 07, 2003 in the name Walker et al. and which is currently pending;

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(v) U.S. Application Serial No. 10/420,066, entitled METHOD AND APPARATUS FOR EMPLOYING FLAT RATE PLAY, which was filed on April 21, 2003 in the name Walker et al. and which is currently pending; and

(vi) U.S. Application Serial No. 10/365,154, entitled METHOD AND APPARATUS FOR PROVIDING INSURANCE POLICIES FOR GAMBLING LOSSES, which was filed on February 11, 2003 in the name of Walker et al. and which issued as US patent no. 6,869,362 on March 22, 2005.

BRIEF DESCRIPTION OF THE FIGURES

Various embodiments of the present invention are described herein with reference to the accompanying drawings. In the drawings, like reference numerals indicate identical or functionally similar elements. The leftmost digit(s) of a reference numeral typically identifies the figure in which the reference numeral first appears. As will be understood by those skilled in the art, the drawings and accompanying descriptions presented herein indicate some exemplary arrangements for stored representations of information. A number of other arrangements may be employed besides the tables shown. Similarly, the illustrated entries represent exemplary information, but those skilled in the art will understand that the number and content of the entries can be different from those illustrated herein. A brief description of the drawings follows:

FIG. 1 is a block diagram of an example system, according to one or more embodiments of the present invention.

FIG. 2 is a block diagram of a server operable to communicate with one or more gaming devices, according to one or more embodiments of the present invention.

FIG. 3 is a block diagram of an example gaming device, according to one or more embodiments of the present invention.

FIGS. 4A and 4B are a table illustrating an example player database, in accordance with one or more embodiments of the present invention.

FIG. 5 is a table illustrating an example player eligibility rules database, in accordance with one or more embodiments of the present invention.

FIGS. 6A and 6B are a table illustrating an example gaming device database, in accordance with one or more embodiments of the present invention.

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FIG. 7 is a table illustrating an example gaming device eligibility rules database, in accordance with one or more embodiments of the present invention.

FIG. 8 is a table illustrating an example gaming device status database, in accordance with one or more embodiments of the present invention.

FIG. 9 is a table illustrating an example contract customization rules database, in accordance with one or more embodiments of the present invention.

FIG. 10 is a table illustrating an example available contracts database, in accordance with one or more embodiments of the present invention.

FIG. 11 is a table illustrating an example purchased contracts database, in accordance with one or more embodiments of the present invention.

FIG. 12 is a table illustrating example contract cards, in accordance with one or more embodiments of the present invention.

FIG. 13 is an example contract receipt, in accordance with one or more embodiments of the present invention.

FIG. 14 is a flowchart illustrating an example process, in accordance with one or more embodiments of the present invention.

FIG. 15 is a flowchart illustrating an example process, in accordance with one or more embodiments of the present invention.

FIG. 16 is a flowchart illustrating an example process, in accordance with one or more embodiments of the present invention.

DETAILED DESCRIPTION OF EMBODIMENTS

Numerous embodiments are described in this patent application, and are presented for illustrative purposes only. The described embodiments are not intended to be limiting in any sense. The invention is widely applicable to numerous embodiments, as is readily apparent from the disclosure herein. These embodiments are described in sufficient detail to enable those skilled in the art to practice the invention, and it is to be understood that other embodiments may be utilized and that structural, logical, software, electrical and other changes may be made without departing from the scope of the present invention. Accordingly, those skilled in the art will recognize that the

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present invention may be practiced with various modifications and alterations. Although particular features of the present invention may be described with reference to one or more particular embodiments or figures that form a part of the present disclosure, and in which are shown, by way of illustration, specific embodiments of the invention, it should be understood that such features are not limited to usage in the one or more particular embodiments or figures with reference to which they are described. The present disclosure is thus neither a literal description of all embodiments of the invention nor a listing of features of the invention that must be present in all embodiments.

The terms "an embodiment", "embodiment", "embodiments", "the embodiment", "the embodiments", "an embodiment", "some embodiments", "an example embodiment", "at least one embodiment", "one or more embodiments" and "one embodiment" mean "one or more (but not necessarily all) embodiments of the present invention(s)" unless expressly specified otherwise.

The terms "including", "comprising" and variations thereof mean "including but not limited to", unless expressly specified otherwise.

The term "consisting of" and variations thereof mean "including and limited to", unless expressly specified otherwise.

The enumerated listing of items does not imply that any or all of the items are mutually exclusive. The enumerated listing of items does not imply that any or all of the items are collectively exhaustive of anything, unless expressly specified otherwise. The enumerated listing of items does not imply that the items are ordered in any manner according to the order in which they are enumerated.

The terms "a", "an" and "the" mean "one or more", unless expressly specified otherwise.

The term "based on" means "based at least on", unless expressly specified otherwise.

The methods described herein (regardless of whether they are referred to as methods, processes, algorithms, calculations, and the like) inherently include one or more steps. Therefore, all references to a "step" or "steps" of such a method have antecedent basis in the mere recitation of the term 'method' or a like term. Accordingly, any reference in a claim to a 'step' or 'steps' of a method is deemed to have sufficient antecedent basis.

Headings of sections provided in this patent application and the title of this patent application are for convenience only, and are not to be taken as limiting the disclosure in any way.

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Devices that are in communication with each other need not be in continuous communication with each other, unless expressly specified otherwise. In addition, devices that are in communication with each other may communicate directly or indirectly through one or more intermediaries.

A description of an embodiment with several components in communication with each other does not imply that all such components are required. On the contrary a variety of optional components are described to illustrate the wide variety of possible embodiments of the present invention.

Further, although process steps, method steps, algorithms or the like may be described in a sequential order, such processes, methods and algorithms may be configured to work in alternate orders. In other words, any sequence or order of steps that may be described in this patent application does not, in and of itself, indicate a requirement that the steps be performed in that order. The steps of processes described herein may be performed in any order practical. Further, some steps may be performed simultaneously despite being described or implied as occurring non-simultaneously (e.g., because one step is described after the other step). Moreover, the illustration of a process by its depiction in a drawing does not imply that the illustrated process is exclusive of other variations and modifications thereto, does not imply that the illustrated process or any of its steps are necessary to the invention, and does not imply that the illustrated process is preferred.

It will be readily apparent that the various methods and algorithms described herein may be implemented by, e.g., appropriately programmed general purpose computers and computing devices. Typically a processor (e.g., a microprocessor) will receive instructions from a memory or like device, and execute those instructions, thereby performing a process defined by those instructions. Further, programs that implement such methods and algorithms may be stored and transmitted using a variety of known media.

When a single device or article is described herein, it will be readily apparent that more than one device / article (whether or not they cooperate) may be used in place of a single device / article. Similarly, where more than one device or article is described herein (whether or not they cooperate), it will be readily apparent that a single device / article may be used in place of the more than one device or article.

The functionality and / or the features of a device may be alternatively embodied by one or more other devices which are not explicitly described as having such functionality / features. Thus, other embodiments of the present invention need not include the device itself.

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The term "computer-readable medium" as used herein refers to any medium that participates in providing data (e.g., instructions) that may be read by a computer, a processor or a like device. Such a medium may take many forms, including but not limited to, non-volatile media, volatile media, and transmission media. Non-volatile media include, for example, optical or magnetic disks and other persistent memory. Volatile media include dynamic random access memory (DRAM), which typically constitutes the main memory. Transmission media include coaxial cables, copper wire and fiber optics, including the wires that comprise a system bus coupled to the processor. Transmission media may include or convey acoustic waves, light waves and electromagnetic emissions, such as those generated during radio frequency (RF) and infrared (IR) data communications. Common forms of computer-readable media include, for example, a floppy disk, a flexible disk, hard disk, magnetic tape, any other magnetic medium, a CD-ROM, DVD, any other optical medium, punch cards, paper tape, any other physical medium with patterns of holes, a RAM, a PROM, an EPROM, a FLASH-EEPROM, any other memory chip or cartridge, a carrier wave as described hereinafter, or any other medium from which a computer can read.

Various forms of computer readable media may be involved in carrying sequences of instructions to a processor. For example, sequences of instruction (i) may be delivered from RAM to a processor, (ii) may be carried over a wireless transmission medium, and / or (iii) may be formatted according to numerous formats, standards or protocols, such as Bluetooth, TDMA, CDMA, and 3G.

Where databases are described, it will be understood by one of ordinary skill in the art that (i) alternative database structures to those described may be readily employed, (ii) other memory structures besides databases may be readily employed. Any schematic illustrations and accompanying descriptions of any sample databases presented herein are illustrative arrangements for stored representations of information. Any number of other arrangements may be employed besides those suggested by the tables shown. Similarly, any illustrated entries of the databases represent exemplary information only; those skilled in the art will understand that the number and content of the entries can be different from those illustrated herein. Further, despite any depiction of the databases as tables, other formats (including relational databases, object-based models and / or distributed databases) could be used to store and manipulate the data types described herein. Likewise, object methods or behaviors of a database can be used to implement the processes of the present invention. In addition, the databases may, in a known manner, be stored locally or remotely from a device that accesses data in such a database.

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In accordance with one embodiment, a method provides for determining that play of a gaming device qualifies for coverage under a contract previously purchased, monitoring the play, and reconciling the contract based on the monitored play.

In one or more embodiments, the determination that play of a gaming device qualifies for coverage under a contract previously purchased may be based on receiving, from a gaming device, an indication that an identifier that is associated with the contract has been inserted into or otherwise received by the gaming device. The determination may further comprise determining terms of the contract, and determining that play of the gaming device satisfies the terms.

In one or more embodiments, reconciling the contract may comprise determining whether the contract has been complied with and providing a benefit to a player who purchased the contract only if the contract has been complied with. The benefit may comprise, for example, a refund of at least a portion of losses incurred by the player during a period of time defined by the contract, a refund of at least a portion of wagers posted by the player during a period of time defined by the contract, and / or allowing a player to continue playing a gaming device once a credit meter balance of the gaming device has been depleted.

In one or more embodiments, determining that a contract has been complied with may comprise determining that an amount of play defined by the contract has been completed in a satisfactory manner. This may comprise, for example, one or more of: (i) determining that the amount of play is not less than a minimum amount of play; (ii) determining that the amount of play is not more than a maximum amount of play; (iii) determining that the amount of play equals a specified amount of play; (iv) determining that the play was conducted on a gaming device approved for play under the contract; (v) determining that the play was conducted within a period of time defined by the contract; (vi) determining that the play required a minimum sum of wagers; (vii) determining that the play was conducted at a minimum required rate; and (viii) determining that a minimum wager amount was posted for at least one game play encompassed by the play.

In accordance with one or more embodiments, a method provides for receiving a contract initiation signal from a gaming device; storing data associated with game play of the gaming device until one of a contract play termination signal is received and / or an end of a contract period is determined; and providing a benefit defined by the contract based on whether the data indicates a compliance with terms of the contract.

In one embodiment, the benefit may comprise a refund of at least a portion of losses incurred by a player associated with the contract during a period of time defined by the contract.

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In another embodiment, the benefit may comprise a refund of at least a portion of wagers posted by a player associated with the contract during a period of time defined by the contract.

In yet another embodiment, the benefit may comprise authorizing the gaming device to allow play of the gaming device once a credit meter balance of the gaming device has been depleted below a predefined level. The level may be zero, a number of credits insufficient to post a wager for a game play at the gaming device, a number of credits insufficient to post a maximum allowable wager for a game play at the gaming device, and / or a number of credits defined by a casino, a player, a gaming device manufacturer or another entity. In one embodiment, authorizing the gaming device to allow play of the gaming device comprises authorizing the gaming device to allow the credit meter balance to be a negative number. In another embodiment, authorizing the gaming device to allow play of the gaming device comprises authorizing the gaming device to add credits to the credit meter balance without requiring payment therefore from a player playing the gaming device.

In one or more embodiments, a system is provided. The system comprises a computing device operable to communicate with a plurality of gaming devices (e.g., a server of a casino), each of the gaming devices operable to facilitate a wagering game. The computing device is further operable to: (i) determine an initiation of a game play at one of the gaming devices; (ii) determine an identifier of a contract associated with the game play, wherein the contract has been entered into by a player prior to the initiation of the game play, and wherein the contract defines a contract period and a benefit to which the player is entitled if the terms of the contract have been satisfied; (iii) determine data associated with the game play; and (iv) determine whether the player is entitled to the benefit based on the data and the terms.

In one embodiment, the system further comprises the plurality of gaming devices.

In one embodiment, the contract comprises a contract in exchange for which the player provided payment.

In one embodiment, the computing device is further operable to store the data in association with data from at least one other game play, thereby storing data indicative of a plurality of game plays; and determine whether the player is entitled to the benefit based on the data indicative of the plurality of game plays.

In one embodiment, the computing device is further operable to determine whether the game play qualifies as a game play that is covered under the terms of a contract.

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In one embodiment, the computing device is further operable to store the data associated with the game play in association with the identifier only if the game play qualifies as a game play that is covered under the terms of a contract.

In one embodiment, the computing device is further operable to identify the contract based on an identifier provided by the player to the gaming device. The identifier may comprise, for example, an identifier that uniquely identifies the player and / or an identifier that uniquely identifies the contract.

In one embodiment, the computing device may further be operable to provide the benefit to the player. Providing the benefit may comprise, for example, causing a gaming device of the plurality of gaming devices to output the benefit to the player and / or authorizing a casino employee to provide the benefit to the player. The benefit may comprise a monetary payment (e.g., a refund of at least a portion of losses incurred by the player during the contract period).

In one embodiment, the computing device may further be operable to receive a request from the player for the benefit and determine, in response to the request, whether the player is entitled to the benefit based on the data and the terms.

In one embodiment, the computing device is further operable to determine the benefit based on the data and the terms of the contract. For example, the computing device may be operable to determine a value of the benefit based on the data and the terms of the contract.

In one embodiment, the computing device may further be operable to authorize a sale of the contract to the player. For example, in some embodiments only certain players (e.g., players associated with a specified status or other characteristic such as being a hotel guest, players associated with one or more specified gambling history characteristics, players associated with a specified history of previous contract purchases and / or contract compliance, etc) may be eligible to purchase any contract and / or to purchase a particular contract. In another embodiment, a certain contract may only be available if specified conditions are satisfied (e.g., a level of gaming device business on the casino floor is satisfactory, a general level of business of the casino is satisfactory, if the contract is flagged as available in a database of available contracts, etc.).

In one embodiment, the benefit is provided to a player at an end of a period defined by the contract, provided the player has complied with the terms of the contract. For example, a refund of at least a portion of player losses incurred during the period of time may be provided at the end of the period of time. In another embodiment, the benefit is provided to a player during a period of time

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defined by the contract, provided the player is currently complying with the terms of the contract. For example, a player may be allowed to continue playing a gaming device even if the credit meter balance has been depleted below a predefined level if the player is complying with the terms of the contract (e.g., the player is playing at a specified minimum rate of play, the player is playing an eligible gaming device, the player is playing during an eligible time of day, etc.).

In accordance with one aspect of the invention(s) described herein, disclosed herein are apparatus, systems and methods for administering a gaming contract (e.g., an agreement between a player and a casino establishment relating to game play within the casino). In one or more embodiments, a computer of the present invention (e.g., a "player tracking" and / or "slot accounting" controller in communication with one or more gaming devices) may be configured to (i) provide a gaming contract associated with a contract identifier (e.g., activate a gaming contract and provide a player a "contract card," which may be similar in appearance to such an object as a player tracking card), (ii) receive a contract initiation signal (e.g., detect the insertion of the contract card into an eligible gaming device), (iii) track game play data associated with the contract identifier (e.g., track an amount wagered and / or an amount lost by the gaming device player), and (iv) reconcile the contract based at least on the game play data (e.g., reimburse the player for an amount wagered and / or an amount lost). Such a system may be advantageous in that gaming contracts may be administered without requiring substantial gaming device reconfigurations (e.g., a slot machine and / or various components thereof need not be programmed or otherwise configured to administer contracts, track game play, etc.).

Systems, apparatus and computer program products are provided for carrying out the above-described embodiments and numerous other embodiments of the present invention. Each computer program product described herein may be carried by a medium readable by a computer (e.g., a carrier wave signal, a floppy disk, a hard drive, a random access memory, etc.).

Thus, in accordance with one aspect of the present invention, play of a gaming device may be made more beneficial and / or convenient to a player with the aid of a contract that a player may purchase. Many different types of contracts are described herein and in the related applications listed herein. Any and all of these contracts may be implemented via the systems and apparatus described herein. Further, in accordance with another aspect of the present invention, play of one or more gaming devices may be monitored by a computing device (e.g., a server of a casino) to determine whether a player who purchased a contract has or is complying with the terms of the contract and is thus entitled to a benefit defined by the contract. In this manner, the benefits of a

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contract may be realized by players without necessarily requiring any or substantial reconfiguration of existing gaming device, as explained herein.

With these and other advantages and features of the invention that will become hereinafter apparent, the nature of the invention may be more clearly understood by reference to the following detailed description of the invention, to the appended claims and to the several drawings attached herein.

Many other advantageous features may be provided in accordance with a contract executable via a gaming device, as described below. At least some of the novel methods and apparatus for facilitating execution of a contract via a gaming device provided herein overcome one or more drawbacks of the prior art.

RELEVANT TERMINOLOGY

The terms "controller" "computing device" and "central controller" are used interchangeably herein and refer, unless specified otherwise, to an electronic device (e.g., a computer) that communicates with one or more peripheral devices (e.g., a card reader affixed to a gaming device), kiosks (e.g., a "contract kiosk" as described further herein), gaming devices, and / or any other devices described herein (e.g., computer devices operated by casino personnel). For example a controller may comprise a casino server operable to communicate with a plurality of gaming devices and / or its peripheral devices. In some embodiments, a controller may perform a variety of "player tracking" and / or "slot accounting" functions. Thus, a controller in communication with a gaming device may be configured to, among other things, (i) identify players (e.g., by detecting the insertion of a player tracking card), (ii) detect gaming contract initiation signals (e.g., by detecting the insertion of a "contract card"), and / or (iii) monitor and / or record game play data associated with players or gaming contracts (e.g., by measuring statistics such as wager amounts, payout amounts, win/loss amounts, and so on). Thus, the controller may contain or otherwise be configured to read data from and / or write data to one or more databases or other memory mechanisms regarding data associated with a particular player, gaming contract and / or gaming session. In some embodiments, a controller may function to, for example, (i) control the activities of a gaming device and / or its peripheral device, (ii) authorize an activity and / or event at a gaming device, (iii) direct a gaming device and / or its peripheral device to perform a function, (iv) monitor activity at a gaming device and / or its peripheral device, and / or (v) interrogate a gaming device and / or its peripheral device for information.

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The term "game" means, unless specified otherwise, a wagering activity whereby a player posts consideration, usually monetary in form, in exchange for a chance at winning a payout. The definition is intended to include basic games and bonus games.

The terms "gaming device", "gaming device", "gambling device" and / or "gaming machine" are used interchangeably herein and refer, unless specified otherwise, to any electrical, mechanical or electro-mechanical device that, in a manner well known in the art, accepts a wager, determines an outcome and determines winnings based on the outcome. The outcome may be randomly generated, may be generated through a combination of randomness and player skill, or may be generated entirely through player skill. Gaming devices may include slot machines (both video and mechanical reels), video poker machines, video blackjack machines, video roulette machines, video keno machines, video bingo machines, pachinko machines, video lottery terminals, handheld gaming devices, and the like. In one or more embodiments, a gaming device may comprise and may also include a computer, personal digital assistant, or cell phone that is communication with an on-line casino (e.g., a gaming website). In one embodiment, a gaming device comprises a handheld gaming device, which may communicate with one or more other devices in a wireless manner.

The terms "game play", "play", "handle pull" and "spin", when used as a noun, are used interchangeably herein and refer, unless specified otherwise, to a single play of a game at a gaming device that generates a singular, corresponding outcome (e.g., a player pulls the handle of a slot machine and the reels resolve to "bar-lemon-plum"). In some embodiments, a game play may comprise a bonus round. It should be noted that, in some instances, the term "game play" may refer to any number of game plays. In one embodiment, a game play includes a sequence of events in which (i) a wager is initiated or made (either by a player or automatically by a gaming device), (ii) an outcome is provided (e.g., a random number and / or a set of reel indicia or other indicia is provided) and (iii) the wager is disposed of and / or a payout is provided in accordance with the outcome (the payout may be made, for example, by applying a credit to a credit balance).

As used herein, a "winning game play" is a game play in which a winning outcome is produced (e.g., a payout or other prize is provided to a player as a result of the outcome).

As used herein, a "losing game play" is a game play in which a winning outcome is not produced (e.g., a payout or other prize is not provided to a player as a result of the outcome and a player loses the wager posted for the game play).

The term "game play data" means, unless specified otherwise, to data and / or information associated with one or more game plays. In some embodiments, a game play data may be

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associated with (i) a player (e.g., as uniquely identifier by a player identifier, such as P-000001), and / or (ii) a gaming contract (e.g., as uniquely identified by a gaming contract identifier, such as GC-000001). Game play data may comprise various statistics related to game play, including but not limited to (i) wager data (e.g., a monetary amount wagered by a player in association with one or more game plays), (ii) payout data (e.g., a monetary amount won by a player in association with one or more game plays), (iii) win/loss data (e.g., a monetary result of one or more game plays, which may be determined by subtracting a wager amount from a payout amount), (iv) payline data (e.g., a number of slot machine paylines activated by a player in association with one or more game plays), (v) time data (e.g., an amount of time elapsed between and / or during one or more game plays), and so on. Game play data may also comprise an indication of a number of game plays initiated in association with a particular player and / or gaming contract (e.g., player P-000001 has played 1,238 handle pulls).

The terms "game session", "gaming session", "session", and "play session" are used interchangeably herein and refer, unless specified otherwise, to a gambling event with a beginning and end that typically encompasses a plurality of game plays. The end of the session may be determined voluntarily (in which the player elects to stop play) or involuntarily (in which the gaming device and / or controller terminates play). In some embodiments, a session may begin when a player provides an identifier (e.g., a player identifier and / or a contract identifier), and end upon an occurrence of a session ending event. A session ending event may comprise, for example, (i) an occurrence of an end of a period of time defined by a contract, (ii) a signal or indication from a player (e.g., the player's removal of a player tracking card and / or a contract card from a gaming device), (iii) a completion of terms of a contract, and / or a reconciliation of a contract. In some embodiments, a player may pay (e.g., pre-pay prior to initiating the game session) a fixed price for a game session. The payment may be in exchange for, for example, (i) a predetermined number of game plays, or (ii) a period of time during which an indeterminate number of game plays may ensue. Apparatus and methods which, among other things, permit and enable various ways of providing gaming contracts and game sessions such as prepaid or flat-rate play sessions, and which are appropriate for use in accordance with the present invention are disclosed in U.S. Patent No. 6,077,163, filed June 23, 1997, entitled "GAMING DEVICE FOR A FLAT RATE PLAY SESSION AND METHOD OF OPERATING SAME," as well as pending U.S. Patent Application No. 10/001,089, filed November 2, 2001, entitled "GAME MACHINE FOR A FLAT RATE PLAY SESSION AND METHOD OF OPERATING SAME"; the entirety of each are incorporated herein by reference for all purposes.

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The terms "gaming contract" and "contract" are used interchangeably herein and refer, unless specified otherwise, to an agreement between a player and another entity (e.g., a casino or other gaming establishment) relating to game play that may be conducted at one or more gaming devices and / or table games. In one embodiment, a contract has an associated price for which the player may purchase the contract and defines a benefit to be provided to the player. The contract may further define one or more terms with which the player must comply in order to be provided with the defined benefit. As explained in more detail below, the benefit may be provided at the end of a period of time defined by the contract. For example, a benefit may comprise a monetary amount that is a refund of at least a portion of losses incurred by the player during the period of time. In another embodiment, the benefit may be provided during a period of time defined by the contract (e.g., once, a plurality of times, continuously, periodically, in response to a triggering condition, or on another basis). For example, a benefit may comprise access to a feature of a gaming device and / or an ability to continue playing the gaming device even though a credit meter balance of the gaming device has been depleted below a predetermined level. In some embodiments, a contract period may comprise (i) a predetermined number of game plays, or (ii) an indeterminate number of game plays to be initiated within a predetermined period of time (e.g., one hour). Further, in some embodiments, a gaming contract may be provided only if a player (i) pays or agrees to pay a premium, fee or surcharge, which may be associated with one or more game plays and / or wager amounts (e.g., an incremental 1¢ fee is assessed for every 25¢ wagered by the player; the player pays a flat $30 premium for two hours of insured play), and / or (ii) agrees to a predetermined contract period (e.g., 12 hours of slot play; 6,000 handle pulls, 25,000 lines played, etc.). One example of a contract is an insurance contract. An insurance contract is described in more detail below.

The terms "gaming contract data" and "contract data" are used interchangeably herein and refer, unless specified otherwise, to information or data associated with or pertaining to a gaming contract, including but not limited to (i) game play data associated with the contract, (ii) a refund rate associated with the contract, (iii) contract fees associated with the contract, (iv) a period of time associated with the contract, and so on.

The terms "gaming contract play" and "contract play" are used interchangeably herein and refer, unless specified otherwise, to one or more game plays which result from a contract, are covered under the terms of a contract, qualify for inclusion under a contract, or are otherwise associated with a contract (e.g., all game plays initiated by a player during a period of time defined by a contract).

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The term "player tracking card" refers, unless specified otherwise, to an instrument issued by a casino and useful in uniquely identifying a player and / or tracking gambling or other activity of the player. Most casinos issue plastic cards (resembling frequent shopper cards) to players as a way of identifying the player at a slot machine or table game. As is well known in the art, such cards typically have encoded thereon (in machine-readable and / or human readable form) a player identifier (e.g., a six digit number) which uniquely identifies the player (e.g., because the number is associated with a record in a player database that includes corresponding player information). The player inserts the card into a reader device affixed to a gaming device (e.g., which may be an example of a peripheral device), and the player identifier is read from the card, most often magnetically or optically. From the player identifier, the corresponding player information may in turn be read from a database, typically via a network connection between the reader device and a device hosting the database (e.g., a controller).

As described in more detail below, in some embodiments a player establishing a gaming contract may receive a "contract card". In some embodiments, a contract card may have a substantially similar function and appearance as to that of a player tracking card, though a contract card may alternately or additionally be associated with a unique contract identifier (e.g., such that data may be read from and / or written to a database regarding the contract and / or game play data associated therewith). In some embodiments a player tracking card may comprise a contract card once a player established a contract.

The term "rate of play" as used herein, unless specified otherwise, refers to the number of game plays performed per unit of time. For example, a rate of 20 game plays performed in five minutes is slower than a rate of 25 game plays performed in five minutes.

The term "depletion of a credit meter balance" as used herein, unless specified otherwise, refers to a reduction of a credit meter balance below a predetermined threshold. For example, depletion of a credit meter balance may refer to the credit meter balance reaching (i) zero credits, (ii) a negative amount of credits (i.e., an amount less than zero), (iii) an amount of credits that is less than a wager amount that is applicable per game play; (iv) an amount of credits that is less than a maximum allowable wager amount per game play; and / or (v) another amount. "Depletion of a credit meter balance" may also include reduction of the credit balance to or below a predetermined level that may have been set by the player, by the gaming device, by the casino, or by the controller.

As used herein, unless specified otherwise, the term "player" includes one person or a group of persons who place wagers on the operation of a gaming device. Such wagers may be made in connection with a contract.

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As used herein, unless specified otherwise, the term "payout" includes an amount greater than zero that is credited to a credit balance of a gaming device in response to a winning game play and / or a prize provided to a player as a result of a game play.

As used herein, unless specified otherwise, the term "inputting" includes any manner of providing an input, a signal, a stimulus, an indication, data or information to a device, and includes actuating an actuatable portion of the device and / or transmitting a signal to the device from another device.

A gaming machine should be understood to "receive" (as that term is used herein and in the appended claims) an input, a signal, data or information upon actuation of an actuatable portion of the gaming machine (e.g., a push button, a keypad, a keyboard, a region of a touch screen) and / or upon receipt of a signal generated by a device exterior to the gaming machine.

EXEMPLARY EMBODIMENTS OF THE INVENTIVE SYSTEM

Referring now to FIG. 1, an example embodiment 100 of a system in accordance with one or more embodiments is depicted in block diagram form. Embodiment 100 is referred to as system 100 herein. The present invention can be configured to work as a system 100 in a network environment including a computer 110 (*e.g.*, a slot server of a casino) that is in communication, via a communications network, with one or more gaming devices 130 (*e.g.*, slot machines, video poker machines, etc.) and with one or more contract kiosks 140. A kiosk 140 may comprise, for example, a stand-alone kiosk or computing device located at a casino-staffed personnel counter via which a player may view available contracts, purchase a contract, and / or receive a benefit for a contract previously entered into. The computer 110 may communicate with any and all of the gaming devices 130 and any and all of the contract kiosks 140 directly or indirectly, via a wired or wireless medium such as the Internet, LAN, WAN or Ethernet, Token Ring, or via any appropriate communications means or combination of communications means. Each of the gaming devices 130 may comprise computers, such as those based on the Intel® Pentium® processor, that are adapted to communicate with the computer 110. Any number and type of devices 130 may be in communication with the computer 110. Similarly, any number and type of contract kiosks 140 may be in communication with the computer 110.

In some embodiments, a contract kiosk 140 may be configured to execute or assist in the execution of various processes described herein, or portions thereof. In some embodiments, a kiosk may comprise a processor and a memory as described. A kiosk may also comprise various input devices (e.g., a keypad, a keyboard, a mouse, buttons, a port that receives player tracking cards, an optical scanner for reading barcodes or other indicia, a CCD camera, etc.), output devices (e.g., a display screen, audio

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speakers, etc.), benefit output devices (e.g., a coin tray or printer for printing cashless gaming tickets), combinations thereof (e.g., a "ticket-in/ticket-out" device, a touch-sensitive display screen, etc.), communications ports, and so on. Thus, a kiosk may comprise many of the features and components of a gaming device, though the kiosk itself may not necessarily be configured to enable gambling activity as a primary function. A kiosk may communicate with any or all of (i) a controller operable to communicate with one or more gaming devices, (ii) a gaming device, (iii) an inventory/reservation system of a casino-maintained property (e.g., a hotel), (iv) casino personnel devices, (v) merchant POS terminals, and so on. A number of contract kiosks 140 may be stationed within casino premises (e.g., at various locations on a slot floor, in a casino hotel lobby, near a swimming pool operated by a casino, etc.). In various embodiments, kiosks may execute or assist in the execution of (i) determining and outputting a player status or other types of data described herein (e.g., a kiosk receives a player tracking card, and outputs a number of accumulated reward which a player may be entitled to redeem), (ii) outputting payments to players (e.g., upon receipt of cashless gaming tickets, player tracking cards, contract cards, smart cards, etc.), (iii) outputting a menu of available contracts and detailed information of each available contract, (iv) determining a player's eligibility to purchase a contract, (v) facilitating a player's purchase of a contract (e.g., including receiving payment therefore), (vi) receiving data indicative of whether a player has complied with, or is complying with, terms of a contract previously purchased by the player (e.g., the data may be received from a gaming device, from computer 110, from a player device, from a contract card and / or player tracking card comprising a memory (e.g., a "smart card"), and / or from a contract server), and / or (vii) any other process described herein, or portion thereof. In some embodiments, a contract kiosk 140 may be configured to, among other things, (i) provide a gaming contract associated with a gaming contract identifier, (ii) reconcile contracts based on contract data (e.g., provide refunds), and / or (iii) output contract data (e.g., provide contract status information). A contract kiosk 140 may be operable to read from and / or write to one or more databases described herein. The memory of a contract kiosk 140 may store a program for executing such processes, or portions thereof.

It should be noted that, in accordance with one embodiment, one or more of the contract kiosks 140 may be in communication with a server or controller different from computer 110. For example, a contract server may be operable to store information about available and / or purchased contracts, authorize a contract kiosk 140 to sell a contract to a player, authorize a contract kiosk 140 to provide a benefit to a player, receive data from a casino employee regarding a contract, etc. In such an embodiment, computer 110 may communicate with contract kiosks 140 via the contract server. Of course, in other embodiments that include a contract kiosk, computer 110 may still communicate with contract kiosks 140 directly (e.g., in addition to, or in lieu of, communicating with the contract server).

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Communication between the devices 130, 140 and the computer 110, among the devices 130, and among the devices 140 may be direct or indirect, such as over the Internet through a Web site maintained by computer on a remote server or over an on-line data network including commercial on-line service providers, bulletin board systems and the like. In yet other embodiments, the gaming devices 130 and / or the contract kiosks 140 may communicate with one another and / or the computer 110 over RF, cable TV, satellite links and the like.

Some, but not all, possible communication networks that may comprise the network or be otherwise part of the system 100 include: a local area network (LAN), a wide area network (WAN), the Internet, a telephone line, a cable line, a radio channel, an optical communications line, and a satellite communications link. Possible communications protocols that may be part of the system include: Ethernet (or IEEE 802.3), SAP, ATP, Bluetooth™, and TCP/IP. Communication may be encrypted to ensure privacy and prevent fraud in any of a variety of ways well known in the art.

A variety of communications protocols may be part of the system 100 or another system operable to facilitate the embodiments described herein, including but not limited to: Ethernet (or IEEE 802.3), SAP, SAS™, SuperSAS™, ATP, Bluetooth™, and TCP/IP. Further, in some embodiments, various communications protocols endorsed by the Gaming Standards Association of Fremont, CA, may be utilized, such as (i) the Gaming Device Standard (GDS), which may facilitate communication between a gaming device and various component devices and / or peripheral devices (e.g., printers, bill acceptors, etc.), (ii) the Best of Breed (BOB) standard, which may facilitate communication between a gaming device and various servers related to play of one or more gaming devices (e.g., servers that assist in providing accounting, player tracking, ticket-in/ticket-out and progressive jackpot functionality), and / or (iii) the System-to-System (S2S) standard, which may facilitate communication between game-related servers and / or casino property management servers (e.g., a hotel server comprising one or more databases that store information about booking and reservations). Communication may be encrypted to ensure privacy and prevent fraud in any of a variety of ways well known in the art.

In some embodiments, a computer 110 may not be necessary and / or preferred. For example, one or more embodiments may be practiced on a stand-alone gaming device 130, a gaming device 130 in communication only with one or more other gaming devices 130, and / or a gaming device 130 in communication with one or more contract kiosks 140 (*i.e.* without a computer 110A). In such embodiments, any functions described as performed by the computer 110 or data described as stored on the computer 110 may instead be performed by or stored on one or more gaming devices 130 and / or by one or more contract kiosks 140.

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In some embodiments, the contract kiosks 140 may not be necessary and / or preferred. For example, one or more embodiments may be practiced on a stand-alone gaming device 130, a gaming device 130 in communication only with one or more other gaming devices 130, and / or a gaming device 130 in communication with computer 110 (*i.e.* without any contract kiosk 140). In such embodiments, any functions described as performed by a kiosk 140 or data described as stored on a kiosk 140 may instead be performed by or stored on one or more gaming devices 130 and / or by computer 110.

In one or more embodiments, system 100 may include additional devices, such as one or more casino personnel devices, one or more additional servers (e.g., a contract server, as described above, a hotel reservation server, and / or an inventory management server). One or more point-of-sale terminals associated with one or more merchants may also be included in system 100.

In some embodiments, various casino employees may be equipped with or otherwise utilize one or more casino personnel devices, such as personal digital assistants (PDAs) or other computing devices (e.g., personal computer terminals). A casino personnel device may comprise various input devices (e.g., a keypad, a touch-sensitive display screen, a card reader, an infrared bar code scanner, etc.), various output devices (e.g., an LCD screen), a processor, a memory and / or a communications port, as described herein with respect to other devices. In some embodiments, a casino personnel device may communicate with a gaming device, server, kiosk, peripheral device, and / or an inventory/reservation system of a casino-maintained property (e.g., a hotel). Thus, a casino personnel device may be configurable to, among other things, (i) read from and / or write to one or more databases of the present invention, (ii) assist in payments made to players (e.g., a representative "scans" a cashless gaming receipt and determines a value associated with the receipt, and if the receipt is valid, provides payment equal to the value; a representative "swipes" a contract card to determine whether or not a player is due a benefit), and / or (iii) execute or assist in the execution of various other processes described herein. For example, a casino employee may utilize a casino personnel device to (i) obtain, display and / or view information about available contracts, (ii) sell a contract to a player, (iii) determine a player's eligibility for a contract, (iv) determine a player's compliance with a previously purchased contract, and / or (v) provide, or authorize the provision of, a benefit defined by a contract to a player associated with the contract. In one or more embodiments, a casino personnel device may be operable to read data from and / or write data to one or more of the databases described herein. A memory of a casino personnel device may store a program for executing processes described herein, or portions thereof.

In some embodiments, various merchants (e.g., shops, restaurants, etc.) may utilize point-of-sale (POS) computer terminals to facilitate various processes of the present invention. For example, in some

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embodiments, a player may receive a benefit defined by a contract in the form of a cashless gaming ticket or other ticket, voucher or instrument redeemable for an amount of currency. However, the ticket may alternately or additionally be redeemable for an amount of credit at a particular merchant location. Thus, in some embodiments, merchants may utilize POS terminals to redeem such vouchers. In some embodiments, such devices may be configured to read from and / or write to one or more databases of the present invention. Such POS terminals may thus comprise various hardware and software described herein with respect to other devices, and may communicate with (i) a casino server, (ii) a gaming device, (iii) an inventory/reservation system (e.g., a computer terminal at a theatre communicates with an inventory database to determine a number of unsold seats for a certain event), (iv) a contract kiosk, and so on.

In some embodiments of the present invention, various component devices (e.g., any or all of the benefit output devices, output devices, input devices and / or input output devices described herein) may be embodied as peripheral devices. For example, such devices may not necessarily be components of a gaming device, though they may be configured in such a manner so as to communicate with one or more gaming device processors or any other devices described herein. For example, a peripheral device such as a large display device may be associated with a plurality of gaming devices, and thus may not necessarily be considered a component of any one gaming device. Further, in some embodiments, certain peripheral devices such as card readers may be interchangeable between gaming devices, and thus may be considered a component of a first gaming device while connected thereto, removed from the first gaming device, connected to a second gaming device, and so on. In other embodiments, various peripheral devices may never be considered a component of a particular gaming device. For example, in some embodiments, a peripheral device such as a USB-based portable memory device may store (i) one or more databases described herein, and / or (ii) a program for executing one or more process steps described herein. Such a peripheral device may then be utilized by casino personnel for upgrading/retrofitting existing gaming devices as described herein.

EXEMPLARY EMBODIMENTS OF A CONTROLLER

Referring now to FIG. 2, illustrated therein is an embodiment 200 of a controller operable to communicate with at least one gaming device (e.g., computer 110). Embodiment 200 is referred to as computer 200 herein. The computer 200 may be implemented as a system controller, a dedicated hardware circuit, an appropriately programmed general-purpose computer, or any other equivalent electronic, mechanical or electro-mechanical device. The computer 200 may comprise, for example, a server computer operable to communicate with one or more client devices, such as one or more gaming devices, one or more kiosks, one or more peripheral devices, and / or one or

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more casino personnel devices. The computer 200 may be operative to manage the system 100 execute some or all of the methods described herein.

In operation, the computer 200 may function under the control of a casino, another merchant, or other entity that may also control use of the gaming devices 130 and / or contract kiosks 140. For example, the computer 200 may be a slot server in a casino. In some embodiments, the computer 200 and a slot server may be different devices. In some embodiments, the computer 200 may comprise a plurality of computers operating together. In some embodiments, the computer 200 and a contract server may be the same device.

The computer 200 comprises a processor 205, such as one or more Intel® Pentium® processors. The processor 205 is in communication with a memory 210 and a communications port 215 (*e.g.*, for communicating with one or more other devices). The memory 210 may comprise an appropriate combination of magnetic, optical and / or semiconductor memory, and may include, for example, Random Access Memory (RAM), Read-Only Memory (ROM), a compact disc and / or a hard disk. The processor 205 and the memory 210 may each be, for example: (i) located entirely within a single computer or other device; or (ii) connected to each other by a remote communication medium, such as a serial port cable, telephone line or radio frequency transceiver. In one embodiment, the computer 200 may comprise one or more devices that are connected to a remote server computer for maintaining databases.

The memory 210 stores a program 220 for controlling the processor 205. The processor 205 performs instructions of the program 220, and thereby operates in accordance with the present invention, and particularly in accordance with the methods described in detail herein. The program 220 may be stored in a compressed, uncompiled and / or encrypted format. The program 220 furthermore includes program elements that may be necessary, such as an operating system, a database management system and "device drivers" for allowing the processor 205 to interface with computer peripheral devices. Appropriate program elements are known to those skilled in the art, and need not be described in detail herein. The program 220 may include computer program code that allows the computer 200 to employ the communications port 215 to communicate with a gaming device (e.g., gaming device 300, described below) in order to, for example:

1. track gambling activity performed at the gaming device;

2. track gaming activities of individual players;

3. track gaming session activities at the gaming device;

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4. determine whether an identifier identifying a contract has been provided to the gaming device;

5. determine whether current play of the gaming device is covered under a contract;

6. determine whether the gaming device is eligible for contract play;

7. instruct the gaming device to perform one or more functions (e.g., output a message and / or provide a benefit to a player);

8. determine whether play of the gaming device complies with terms of a contract; and / or

9. manage a contract play mode of the gaming device.

According to an embodiment of the present invention, the instructions of the program 220 may be read into a main memory from another computer-readable medium, such from a ROM to RAM. Execution of sequences of the instructions in program 220 causes processor 205 to perform the process steps described herein. In alternate embodiments, hard-wired circuitry may be used in place of, or in combination with, software instructions for implementation of the processes of the present invention. Thus, embodiments of the present invention are not limited to any specific combination of hardware and software.

The memory 210 also stores (i) a player database 225; (ii) a player eligibility rules database 230; (iii) a gaming device database 235; (iv) a gaming device eligibility rules database 240; (v) a gaming device status database 245; (vi) a contract customization rules database 250; (vii) an available contracts database 255; and (viii) a purchased contracts database 260. Each of the databases 225 through 260 are described in more detail below.

Although the databases 225 through 260 are described as being stored in a memory of computer 200, in other embodiments some or all of these databases may be partially or wholly stored, in lieu of or in addition to being stored in a memory of computer 200, in a memory of one or more other devices. Such one or more other devices may comprise, for example, one or more peripheral devices, one or more contract kiosks 140, a contract server, one or more gaming devices, a slot server (if different from the computer 200), another device, or a combination thereof. Further, some or all of the data described as being stored in the memory 210 may be partially or wholly stored (in addition to or in lieu of being stored in the memory 210) in a memory of one or more other devices. Such one or more other devices may comprise, for example, one or more peripheral

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devices, one or more gaming devices, one or more contract kiosks 140, a contract server, a slot server (if different from computer 200), another device, or a combination thereof. In one or more embodiments, memory 210 may store databases in addition to those described herein.

EXEMPLARY EMBODIMENTS OF A GAMING DEVICE

Referring now to Fig. 3, illustrated therein is a block diagram of an example embodiment 300 of a gaming device (e.g., a gaming device 130) that may be used in accordance with one or more embodiments. Embodiment 300 is referred to herein as gaming device 300.

The gaming device 300 may be implemented as a system controller, a dedicated hardware circuit, an appropriately programmed general-purpose computer, or any other equivalent electronic, mechanical or electro-mechanical device. The gaming device 300 may comprise, for example, a slot machine, a video poker terminal, a video blackjack terminal, a video keno terminal, a video lottery terminal, a pachinko machine or a table-top game (e.g., a mechanical or electro-mechanical device may be associated with a table game and be operable by a player and / or a dealer).

In some embodiments, a gaming device 300 may comprise, for example, a personal computer (*e.g.*, which may communicate with an online casino Web site), a telephone (*e.g.*, to communicate with an automated sports book that provides gaming services), and / or a portable handheld gaming device (*e.g.*, a personal digital assistant, Nintendo GameBoy or Sony PSP, a dedicated personal hand-held gaming device provided by a casino, or any combination thereof). In some embodiments, a user device such as a PDA or cell phone may be used in place of, or in addition to, some or all of the gaming device 300 components depicted in Fig. 3. Further, a gaming device 300 may comprise a personal computer or other device operable to communicate with an online casino and facilitate game play at the online casino. In one or more embodiments, the gaming device 300 may comprise a computing device operable to execute software that simulates play of, for example, a reeled (mechanical or video) slot machine game, video poker game, video blackjack game, video keno game, video roulette game, or lottery game. In another embodiment, a gaming device 300 may comprise a hand-held device operable to display the results of a table game, slot machine game, keno game or other game being executed on a casino floor.

It should be noted that not all of the components described herein as being components of gaming device 300 may be necessary and / or preferred for a gaming device operable to implement embodiments described herein. For example, in embodiments in which a gaming device comprises a personal computer operable to access an online casino, a random number generator may not be a component of the gaming device but may rather be a component of a server administering the

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online casino. In another example, a gaming device that comprises a personal computer may not necessarily include a benefit output device and / or a player-tracking device.

The gaming device 300 comprises a processor 305, such as one or more Intel® Pentium® processors. The processor 305 is in communication with a memory 310 and a communications port 315 (*e.g.*, for communicating with one or more other devices). The memory 310 may comprise an appropriate combination of magnetic, optical and / or semiconductor memory, and may include, for example, Random Access Memory (RAM), Read-Only Memory (ROM), a compact disc and / or a hard disk. The memory 310 may comprise or include any type of computer-readable medium. The processor 305 and the memory 310 may each be, for example: (i) located entirely within a single computer or other device; or (ii) connected to each other by a remote communication medium, such as a serial port cable, telephone line or radio frequency transceiver. In one embodiment, the gaming device 300 may comprise one or more devices that are connected to a remote server computer for maintaining databases.

The memory 310 stores a program 320 for controlling the processor 305. The processor 305 performs instructions of the program 320, and thereby operates in accordance with embodiments of the present invention, and particularly in accordance with the methods described in detail herein. The program 320 may be stored in a compressed, uncompiled and / or encrypted format. The program 320 may furthermore includes program elements that may be necessary, such as an operating system, a database management system and "device drivers" for allowing the processor 305 to interface with computer peripheral devices. Appropriate program elements are known to those skilled in the art, and need not be described in detail herein.

According to an embodiment described herein, the instructions of the program 320 may be read into a main memory from another computer-readable medium, such as from a ROM to RAM. Execution of sequences of the instructions in program 320 causes processor 305 to perform the process steps described herein. In some embodiments, hard-wired circuitry may be used in place of, or in combination with, software instructions for implementation of the processes of the present invention. Thus, embodiments described herein are not limited to any specific combination of hardware and software.

The memory 310 also stores a plurality of databases, including a probability database 325 and a payout database 330. A probability database may be stored in the memory 310 in tabular form, or any other appropriate database form, as is well known in the art. The data stored therein may include a number of exemplary records or entries, each defining a random number. Those skilled in the art will understand that the probability database may include any number of entries.

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The tabular representation may also define fields for each of the entries or records. The fields may specify: (i) a random number (or range of random numbers) that may be generated by the random number generator; and (ii) an outcome that indicates the one or more indicia comprising the outcome that corresponds to the random number of a particular record. A gaming device may utilize a probability database to determine, for example, what outcome corresponds to a random number generated by a random number generator and to display the determined outcome. The outcomes may comprise the three symbols to be displayed along the payline of a three-reel slot machine. Other arrangements of probability databases are possible. For example, the book "Winning At Slot Machines" by Jim Regan (Carol Publishing Group Edition, 1997) illustrates examples of payout and probability tables and how they may be derived. The entirety of this book is incorporated by reference herein for all purposes.

A payout database may be stored in the data storage device in tabular form, or any other appropriate database form, as is well known in the art. The data stored therein includes a number of example records or entries, each defining an outcome that may be obtained on a gaming device that corresponds to a payout. Those skilled in the art will understand that the payout database may include any number of entries. The tabular representation also defines fields for each of the entries or records. The fields specify: (i) an outcome, which indicates the one or more indicia comprising a given outcome; and (ii) a payout that corresponds to each respective outcome. The outcomes may be those obtained on a three-reel slot machine.

A gaming device may utilize the payout database to determine whether a payout should be output to a player as a result of an outcome obtained for a game. For example, after determining the outcome to output on the gaming device, the gaming device may access the payout database to determine whether the outcome for output is one of the outcomes stored as corresponding to a payout. If it is, the gaming device may provide the corresponding payout to the player via a benefit output device described herein. Other arrangements of payout databases are possible. For example, the book "Winning At Slot Machines" by Jim Regan (Carol Publishing Group Edition, 1997) illustrates many examples of payout and probability tables and how they may be derived.

Additionally, the memory 310 may store (e.g., while a game play covered under a contract is being executed or while a session covered under a contract is being executed), information associated with the contract (e.g., an indication that a current game play is covered under a contract, an indication of compliance with the terms of a contract, an indication of a status of a contract, etc.), via, for example, a memory caching or disk caching mechanism.

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Although databases 325 and 330 are described as being stored in a gaming device 300, in other embodiments of the present invention some or all of these databases may be partially or wholly stored (in addition to or in lieu of being stored in gaming device 300) in one or more other devices. Such one or more other devices may comprise, for example, (i) one or more peripheral devices, (ii) a peripheral device server, (iii) computer 110, (iv) a kiosk 140 (v) another device, or (vi) a combination thereof. Further, some or all of the data described as being stored in the databases 325 and / or 330 may be partially or wholly stored (in addition to or in lieu of being stored in the gaming device 300) in a memory of one or more other devices. Such one or more other devices may comprise, for example, (i) one or more peripheral devices, (ii) a peripheral device server, (iii) computer 110, (iv) a kiosk 140, (v) another device, or (vi) a combination thereof.

In one or more embodiments, as described below, data may be stored in a memory of another device (e.g., a database of computer 110 or a database of a kiosk 140). In one or more embodiments, gaming device 300 may be operable to access the data thereof or have information associated with the data stored therein downloaded to the gaming device as necessary and / or appropriate. For example, gaming device 300 may access a memory of another device to determine terms of a contract to determine whether a current game play is covered under the terms of the contract.

The processor 305 is also operable to communicate with a random number generator 345, which may be a component of gaming device 300. The random number generator 345, in accordance with at least one embodiment of the present invention, may generate data representing random or pseudo-random values (referred to as "random numbers" herein). The random number generator may generate a random number every predetermined unit of time (*e.g.*, every second) and / or in response to an event such as an initiation of a game play on the gaming device or receipt of a signal from another device. In the former embodiment, the generated random numbers may be used as they are generated (*e.g.*, the random number generated at substantially the time of game play initiation is used for that game play) and / or stored for future use. A random number generated by the random number generator may be used by the processor 305 to determine, for example, an outcome for a game play, a payout associated with an outcome, and / or which of a plurality of payouts to provide as the result of an outcome.

A random number generator, as used herein, may be embodied as a processor separate from but working in cooperation with processor 305. Alternatively, a random number generator may be embodied as an algorithm, program component, or software stored in the memory of gaming device 300 and used to generate a random number.

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Note that, although the generation or obtainment of a random number is described herein as involving a random number generator of a gaming device, other methods of determining a random number may be employed. For example, a gaming device owner or operator may obtain sets of random numbers that have been generated by another entity. HotBits™, for example, is a service that provides random numbers that have been generated by timing successive pairs of radioactive decays detected by a Geiger-Muller tube interfaced to a computer. In another example, a blower mechanism that uses physical balls with numbers thereon may be used to determine a random number by randomly selecting one of the balls and determining the number thereof.

In yet another example, another device remote from and / or distinct from the gaming device 300 (e.g., a computer 110) may include a random number generator that generates random numbers to be provided to the gaming device 300. For example, in some embodiments, a gaming device may receive random numbers and / or any other data related to the random or pseudo-random determination of an outcome from a separate device, such as a server. It should be noted that such embodiments may be advantageous in environments or jurisdictions wherein the "central determination" of outcomes is required by regulation or otherwise preferred. Thus, for example, outcomes may be determined centrally by a server, and then propagated (e.g., electronically) such that indications of the outcomes may be viewed using one or more gaming devices (e.g., "Class II" gaming devices, Video Lottery Terminals, and so on).

The processor 305 is also operable to communicate with a benefit output device 350, which may be a component of gaming device 300. The benefit output device 350 may comprise one or more devices for outputting a benefit (e.g., a payout) to a player of the gaming device 300. It should be noted that a benefit output by a gaming device may, in some circumstances or embodiments, comprise a benefit defined by a contract that a player has qualified to receive as a result of compliance with the contract.

For example, in one embodiment the gaming device 300 may provide coins and / or tokens as a benefit. In such an embodiment the benefit output device 350 may comprise a hopper and hopper controller, for dispensing coins and / or tokens into a coin tray of the gaming device 300.

In another example, the gaming device 300 may provide a receipt or other document on which there is printed an indication of a benefit. For example, the gaming device may be operable to output one or more cash-out tickets. In such an embodiment the benefit output device 350 may comprise a printing mechanism and a document dispensing mechanism.

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In yet another example, the gaming device 300 may provide electronic credits as a benefit (which, *e.g.*, may be subsequently converted to coins and / or tokens and dispensed from a hopper into a coin tray). In such an embodiment the benefit output device 350 may comprise a credit meter balance and / or a processor that manages the amount of electronic credits that is indicated on a display of a credit meter balance. The processor may be the processor 305 or another processor.

In yet another example, the gaming device 300 may credit a monetary amount to a financial account associated with a player as a benefit provided to a player. The financial account may be, for example, a credit card account, a debit account, a charge account, a checking account, or a casino account. In such an embodiment the benefit output device 350 may comprise a device for communicating with a server on which the financial account is maintained.

Note that, in one or more embodiments, the gaming device 300 may include more than one benefit output device 350 even though only one benefit output device is illustrated in Fig. 3. For example, the gaming device 300 may include each of (i) a hopper and hopper controller combination, (ii) a credit meter balance, and (iii) a document printing and dispensing combination. Such a gaming device may be operable to provide more than one type of benefit to a player of the gaming device.

A single benefit output device 350 may be operable to output more than one type of benefit. For example, a benefit output device 350 may be operable to increase the balance of credits in a credit meter and communicate with a remote device in order to increase the balance of a financial account associated with a player.

The processor 305 is also operable to communicate with a display device 355, which may be a component of gaming device 300. The display device 355 may comprise, for example, one or more display screens or areas for outputting information related to game play on the gaming device, such as a cathode ray tube (CRT) monitor, liquid crystal display (LCD) screen, or light emitting diode (LED) screen.

In one or more embodiments, gaming device 300 may comprise more than one display device. For example, gaming device 300 may comprise an LCD display for displaying electronic reels, a display area that displays rotating mechanical reels, and an LED display of a player tracking device (e.g., such as player tracking device 360, described below) that outputs information to a player.

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The processor 305 may also be in communication with one or more other output devices besides the display device 355, for outputting information (*e.g.*, to a player or another device). Such other one or more output devices may also be components of gaming device 300. Such other one or more output devices may comprise, for example, an audio speaker (*e.g.*, for outputting audio information corresponding to audio / video content), an infra-red transmitter, a radio transmitter, an electric motor, a printer (e.g., such as for printing cashless gaming vouchers), a ticket or product dispenser, an infra-red port (e.g., for communicating with a second gaming device or a portable device of a player), a Braille computer monitor, and a coin or bill dispenser. For gaming devices, common output devices include a cathode ray tube (CRT) monitor on a video poker machine, a bell on a gaming device (e.g., rings when a player wins), an LED display of a player's credit balance on a gaming device, an LCD display of a personal digital assistant (PDA) for displaying keno numbers.

The display device 355 may comprise, for example, one or more display areas. For example, one of the display areas may display outcomes of games played on the gaming device (*e.g.*, electronic reels of a gaming device). Another of the display areas may display rules for playing a game of the gaming device. Yet another of the display areas may display the benefits obtainable by playing a game of the gaming device (*e.g.*, in the form of one or more payout tables). In one or more embodiments, the gaming device 300 may include more than one display device, one or more other output devices, or a combination thereof (*e.g.*, two display devices and two audio speakers). In one embodiment, a first display area and a second display area may comprise two distinct areas of the same display device (e.g., a slit screen or a window within a screen, etc.).

The processor 305 is also in communication with an input device 365, which is a device that is capable of receiving an input (*e.g.*, from a player or another device, such as a selection of an option or feature available on the gaming device, such as a selection of an episode of a television show) and which may be a component of gaming device 300. An input device may communicate with or be part of another device (*e.g.* a computer 110A or computer 110B, another gaming device, etc.). For example, a player may use a touch screen to indicate his desire to view contracts available for purchase and / or to view a status of a contract previously purchased or entered into by the player.

Some examples of input devices include: a bar-code scanner, an optical scanner configured to read other indicia of a voucher or cashless gaming ticket, a CCD camera, a magnetic stripe reader (e.g., for reading data encoded upon a player tracking card), a smart card reader (e.g., for reading data stored upon a smart card), a computer keyboard or keypad, a button, a handle, a lever, a keypad, a touch-screen, a microphone, an infrared sensor, a voice recognition module, a

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coin or bill acceptor, a sonic ranger, a computer port, a video camera, a motion detector, a digital camera, a network card, a universal serial bus (USB) port, a GPS receiver, a radio frequency identification (RFID) receiver, an RF receiver, a thermometer, a pressure sensor, an infrared port (e.g., for receiving communications from a second gaming device or from a another device such as a smart card or PDA of a player), and a weight scale. For gaming devices, common input devices include a button or touch screen on a video poker machine, a lever or handle connected to the gaming device, a magnetic stripe reader to read a player tracking card and / or contract card inserted into a gaming device, a touch screen for input of player selections during game play, a paper ticket acceptor for accepting paper tickets such as cash-out tickets and a coin and bill acceptor.

In some embodiments, a gaming device may comprise components capable of facilitating both input and output functions (i.e., input/output devices). In one example, a touch-sensitive display screen comprises an input/output device (e.g., the device outputs graphics and receives selections from players). In another example, a processor may communicate with a "ticket-in/ticket-out" device configured to dispense and receive cash-out tickets. Such a device may also assist in (e.g., provide data so as to facilitate) various accounting functions (e.g., ticket validation and redemption). For example, any or all of a gaming device, kiosk and casino personnel device maintained at a cashier cage may (i) comprise such a benefit input/output device, and / or (ii) communicate with a central server that manages the accounting associated with such ticket-in/ticket-out transactions (e.g., so as to track the issuance, redemption and expiration of such tickets). One example of ticket-in/ticket-out technology that may be adapted or utilized to implement embodiments described herein is the EZ Pay™ system, is manufactured by International Gaming Technology, headquartered in Reno, Nevada.

Of course, as would be understood by one of ordinary skill in the art, a gaming device may comprise various combinations of such component devices. For example, in one or more embodiments, the gaming device may include more than one display device, one or more other output devices, several input devices, and so on (e.g., two display screens, two audio speakers, a ticket-in/ticket-out device and several buttons).

The processor 305 is also in communication with a payment system 270, which may be a component of gaming device 300. The payment system 270 is a device capable of accepting payment from a player (*e.g.*, a bet or initiation of a balance, a payment in exchange for entering into a contract).

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Exemplary methods of accepting payment by the payment system 270 include (i) receiving hard currency (i.e., coins or bills), and accordingly the payment system 270 may comprise a coin or bill acceptor; (ii) receiving an alternate currency (e.g., a cash-out ticket, a coupon, a non-negotiable token), and accordingly the payment system 270 may comprise a bar code reader or other sensing means; (iii) receiving a payment identifier (*e.g.*, a credit card number, a debit card number, a player tracking card number, a code via a keypad or touch-screen); (iv) receiving a smart card having an indication of an amount of currency stored thereon; and (v) determining that a player has performed a value-added activity (e.g., participating in surveys, monitoring remote images for security purposes, referring friends to the casino).

The processor 305 is further operable to communicate with a player tracking device 360, which may be a component of gaming device 300. Player tracking device 360 may, in one or more embodiments, comprise a reader device operable to read information from and / or write information to a card such as a smart card and / or a player tracking card, such that (i) players may be identified, and (ii) various data associated with players may then be determined. For example, a contract previously entered into by the player may be identified, a status of the contract may be determined, a number of cashable credits available to the player may be determined, a number of promotional credits that may not be redeemed for cash but that are associated with the player may be determined, a code or other indication of a benefit to be provided to the player may be determined, a number of accumulated loyalty points associated with the player may be determined, a number of accumulated game elements such as symbols, cards or hands associated with the player may be determined, etc. In one example, a card reader device may determine an identifier associated with a player (e.g., by reading a player tracking card comprising an encoded version of the identifier), such that the gaming device may then access data (e.g., of a player database, a session database) associated with the player. In another example, a smart card reader device may determine data associated with a player directly by accessing a memory of an inserted smart card.

As described in more detail below, player database may be used, for example, to store player wager data (e.g., such that players wagering over a given threshold in a given amount of time may be rewarded for their patronage, qualify for a particular gaming contract, and so on). The player database may also contain other information that may be useful in, for example, promoting and managing player behaviors (e.g., information about the player's gaming preferences, lodging arrangements, and the like). Further, the player database may store data regarding a given player's standing in a game session, gaming contract or bonus game, so that the player can continue the game session, gaming contract or bonus game at a plurality of game machines that have common access to the player database. Such player data may be stored in a relational database and

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retrieved or otherwise accessed by the processor after receiving a "key" data point from the player, such as a unique identifier read from the player's player tracking card, contract card or cashout ticket.

In one embodiment, a player tracking device 360 may be operable to read an identifier that uniquely identifies a contract. For example, a card inserted into the player tracking device may have a contract identifier stored thereon, which contract identifier may be readable by the player tracking device 360. The player tracking device 360 may further be operable to retrieve data (e.g., from computer 110, a contract kiosk 140 and / or a contract server) associated with the contract and / or output an indication of the data.

In one embodiment, the player tracking device may comprise (i) a card reader (e.g., a port into which player tracking cards may be inserted), (ii) various input devices (e.g., a keypad, a touch-screen), (iii) various output devices (e.g., a small, full-color display screen), and / or (iv) combinations thereof (e.g., a touch-sensitive display screen that accommodates both input and output functions). Various commercially available devices may be suitable for such an application, such as the NextGen™ interactive player tracking panel manufactured by IGT or the iVIEW display screen manufactured by Bally® Gaming and Systems.

As known in the art, "smart cards" may incorporate (i) a memory, and (ii) means for accessing such a memory. For example, in one embodiment, the memory may store data related to aspects of the present invention. In one embodiment, data may be written to the smart card as a player plays one or more gaming devices (e.g., such that various data may be updated on a continuous, periodic or event-triggered bases). Accordingly, in one or more embodiments one or more devices operable to carry out various processes of the present invention (e.g., a gaming device or kiosk) may have associated therewith a smart card reader device, such that data may be read from the smart card pursuant to the execution of such processes. An example of a smart card system that may be used to implement one or more embodiments of the present invention is the s-Choice™ Smart Card Casino Management System from Smart Card Integrators, Inc.™.

Of course, other non-card-based methods of identifying players and / or contracts are contemplated. For example, a unique identification code may be associated with the player and / or contract. The player and / or contract may then be identified upon entering the code. For example, the code may be stored (e.g., within a database maintained within the gaming device, a contract kiosk 140, a contract server and / or a computer 110) such that the player may enter the code using an input device of a gaming device, and accordingly allow the player and / or contract to be uniquely identified. In other embodiments, player biometrics may serve as identification means (e.g., a player

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and / or contract is identified via a thumbprint or retinal scan of the player). In further embodiments, a barcode of a cashless gaming ticket may encode a player identifier and / or a contract identifier.

Thus, as described, various data associated with a player may be tracked and stored (e.g., in an appropriate record of a centrally-maintained database), such that it may be accessed as desired (e.g., when entering into a contract with a player, when determining a player's compliance with a contract, when determining promotional offers, contract and / or rewards to be provided or offered to a player, when determining the status of player with respect to a particular game, contract or period of gambling activity, and so on). Further, various statistics may be measured in association with a player (e.g., coin-in statistics, win/loss statistics, buy-in amount for a session) and similarly accessed.

Various systems for facilitating such monitoring of player behavior and activity are contemplated. For example, a two-wire system such as one offered by International Gaming Systems (IGT) may be used. Similarly, a protocol such as the IGT SAS™ protocol or the IGT SuperSAS™ protocol may be used. The SAS ™ protocol and the SuperSAS™ protocol each allows for communication between gaming machines and slot accounting systems and provides a secure method of communicating all necessary data supplied by the gaming device to the online monitoring system. One aspect of the SAS™ protocol and the SuperSAS™ protocol that may be beneficial in implementing aspects of the present invention is the authentication function which allows operators and regulators to remotely interrogate gaming devices for important memory verification information, for both game programs, and peripheral devices. In another example, a one-wire system such as the OASIS™ System offered by Aristocrat Technologies™ or the SDS slot-floor monitoring system offered by Bally Gaming and Systems™ may be used. Each of the systems described above is an integrated information system that continually monitors slot machines and customer gaming activity. Thus, for example, any one of these systems may be used to monitor a player's gaming activity in order to determine player outcomes, buy-in amounts, coin-in statistics, win/loss statistics and / or any other data deemed relevant.

In one embodiment, a player may operate a plurality of gaming devices. For example, a player may simultaneously play two side-by-side gaming devices, a player may play one gaming device (e.g. a gaming device) and then continue his gaming session at another gaming device (e.g. a video poker machine), and a player may remotely operate a gaming device, possibly by using a telephone, PDA or other device (i) to transmit commands (directly or indirectly) to the gaming device, such as wager amounts and commands to select certain cards; and / or (ii) to receive output (directly or indirectly) from the gaming device.

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In one embodiment, a gaming device may allow a player to play a game of skill rather than a game of chance. Such an embodiment may be more appealing to certain players or may be permitted in areas where it is illegal to gamble on games of chance.

In one or more embodiments, aspects of the present invention, such as facilitating play of a gaming device under the terms of a contract (e.g., providing a benefit during a period of time defined by the contract and / or monitoring the play to determine compliance with the contract), may be practiced by replacing and / or augmenting one or more components (e.g., hardware and / or software components) of an existing gaming device. Thus, in one or more embodiments, the invention may be applied as a retrofit or upgrade to existing gaming devices currently available for play within various casinos.

For example, a memory (e.g., computer chip) of the gaming device may be replaced or added, the replacement or additional memory storing a program for instructing the processor of the gaming device to operate in accordance with one or more embodiments. In another example, data output via the gaming device (e.g., graphical and / or textual data displayed on the gaming device) may be replaced or added, the replacement or additional data indicating to a player information relevant to one or more aspects of the present invention.

In a specific example, a gaming device may comprise various electronic components mounted to one or more printed circuit boards (PCBs). Such components may include various hardware described herein, such as a communications port and various controllers of peripheral devices (e.g., a display controller), as well as a memory for storing programming instructions (software) and a processor for carrying out such instructions. Forms of memory that may be found in a gaming device include electronically erasable programmable read-only memory (EEPROM), erasable programmable read-only memory (EPROM) and flash memory. Thus, in one or more embodiments of the present invention, an EPROM storing software with instructions for carrying out aspects of the present invention (as well as instructions for carrying out other functions traditionally performed by the gaming device) may replace an EPROM previously installed in a gaming device or may be reprogrammed in accordance with one or more embodiments described herein, such that the gaming device may be configured to operate in accordance with various processes described herein.

For example, a "contract play" module may be made available for purchase to various casino operators. The module, which may comprise various hardware and software (e.g., an EEPROM storing software instructions), may be installed in an existing gaming device (e.g., a video-reel slot machine, a video poker machine, etc.), such that when the module is installed, players of

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the device may elect (i) to play the gaming device in a manner that does not incorporate embodiments described herein, or (ii) to play the gaming device in a manner that incorporates embodiments described herein (e.g., be eligible for a benefit defined by a contract). Thus, players who are familiar with operating a gaming device may elect to pay for them in a different or similar manner as they are accustomed to.

Accordingly, a gaming device may be configured to allow a player to select one of two "modes" of the gaming device, and to enable the selected mode. If a player selects a "standard" mode, the gaming device may be configured to operate in a manner similar to how it operated before the installation of the module (e.g., the gaming device operates in a conventional manner, such that embodiments described herein may not be utilized). If a player selects "contract play" mode, the gaming device may then be operable to execute game play in accordance with one or more embodiments described herein.

In one example of allowing a player to select one or more modes, a touch-sensitive display screen may be configured to output a prompt asking a player to select a mode of operation. Such a prompt may be output in occurrence to various trigger conditions (e.g., coins, bills or tickets are inserted; a credit balance increases from zero to some other number; a player presses a "play" button; a motion, weight, infrared or other sensor detects the presence of a player; etc.). Accordingly, a player may select a mode of operation (e.g., by pressing an appropriately labeled icon of a touch-sensitive display screen), and upon receiving the player's selection, the gaming device may be configured to operate in the selected mode.

In another embodiment, a gaming device may be operable to automatically determine whether it should switch modes from a standard mode to a "contract play" mode. A gaming device may perform such a determination, for example, by evaluating data received from a player and / or another device and / or by querying another device. For example, a gaming device may be programmed to determine (e.g., upon receiving a player identifier and based upon the player identifier) whether the player currently playing the gaming device has entered into a contract. In another embodiment, a gaming device may be programmed to recognize that a player has entered a contract identifier into the gaming device. Upon determining that a player has previously entered into or purchased a contract, a gaming device may further be programmed to determine a status of the contract and / or whether a current game play of the gaming device is covered under the terms of the contract. For example, the gaming device may be programmed to access data (e.g., the terms of the contract) stored on another device (e.g., a contract kiosk 140, a contract server, computer 110, etc.) or query such other device for an answer to the determination. If the gaming

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device determines that current play of the gaming device qualifies for coverage under the terms of the contract, the gaming device may switch from a standard mode to a "contract play" mode. In "contract play" mode, for example, a gaming device may be operable to transmit information associated with the game plays being conducted to another device to enable the other device to determine compliance with the contract and / or to locally determine compliance with the contract. In one embodiment, a gaming device may be operable to output an indication that it is currently in "contract play" mode (e.g., to inform a player that the current play of the gaming device is covered under the terms of a contract). For example, the gaming device may turn on a light, change graphics, output a sound, etc.

In other embodiments, as described, a peripheral device may be useful for implementing one or more embodiments of the present invention into the operation of a conventional gaming device. For example, in order to avoid or minimize the necessity of modifying or replacing a program already stored in a memory of a conventional gaming device, an external or internal module that comprises a peripheral device may be inserted in, connected to or otherwise associated with the gaming device. Such a peripheral device may be operable to, for example, monitor and / or transmit information about a player's gambling activity at the gaming device to another device (e.g., computer 110, a kiosk 140 and / or a contract server). The peripheral device may monitor and / or transmit such information to enable a determination of compliance with the terms of a contract.

In still further embodiments, rather than configure existing gaming devices to execute embodiments described herein by installing or connecting new hardware and / or software, software may be downloaded into an existing memory of one or more gaming devices. U.S. Patent No. 6,805,634 to Wells et al. teaches methods for downloading data to gaming devices in such a manner. The entirety of U.S. Patent No. 6,805,634 is incorporated by reference herein for all purposes. Thus, in some embodiments, an existing gaming device may be reprogrammed to accommodate new functionality of the present invention without the need, or by minimizing the need, to remove and replace hardware within the gaming device.

In one embodiment, a gaming device 300 or another device operable to carry out one or more embodiments described herein (e.g., a contract kiosk 140) may be operable to output a menu of available contracts to a player via a player interface. A player interface may comprise, for example, a video screen that is a touch screen operable to display such one or more such menus. A menu so displayed to a player may provide the player with, for example, a choice of whether to play the gaming device in a conventional manner or in a manner consistent with one or more embodiments described herein. In another example, a menu so displayed to a player may provide

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the player with available contracts, contracts which the player has previously entered into and / or contracts for which the player is currently eligible. A player may be presented with a menu of options via a touch screen, for example, upon indicating a desire to consider options available via such a menu and / or upon initiating play at the gaming device 300. A player may select an option from such a menu by touching the area of the screen on which the option appears.

It should be appreciated that one or more embodiments may include storing graphic and / or sound elements that are used to construct the menu of available options. These elements may be store, for example, in EEPROM, flash memory, hard disk, CD ROM, or in any other suitable storage device. The menu may be displayed via any suitable display device, such as a CRT, LCD, VFC, LED display. In one embodiment, the menu may be implemented using only dedicated electromechanical switches. In one embodiment, a player operates an input device of the device operable to display the menu, in order to cause the menu to be displayed. In one embodiment, the device includes a touch screen and a touch screen controller (not shown) associated with a video monitor display device. The touch screen and touch screen controller may be operable to communicate with a video controller of the video monitor display device and a processor (e.g., a processor of gaming device 300). Thus, a player may be enabled to indicate decisions (e.g., which contract the player desires to view more detailed information about, which contract the player desires to purchase, which contract the player desires to reconcile, etc.) by touching the touch screen in the appropriate places.

In one embodiment, display of the menu preempts display of other information. For example, in one embodiment the same display device or screen used to display indicia indicative of an outcome by displaying the indicia as disposed along a payline during active game play may be used to display a menu of available contracts to a player upon an indication of a player to view the menu. In another embodiment, a dedicated display device or screen may be used to display a menu of available contracts on a continuous, periodic, or other basis.

EXEMPLARY EMBODIMENTS OF THE DATABASES

Example structures and sample contents of the (i) a player database 225; (ii) a player eligibility rules database 230; (iii) a gaming device database 235; (iv) a gaming device eligibility rules database 240; (v) a gaming device status database 245; (vi) a contract eligibility rules database 250; and (vii) a purchased contracts database 255 are shown in FIGS. 4 – 10, respectively. The specific data and fields illustrated in these drawings represent only some embodiments of the records stored in the databases described herein. The data and fields of these databases can be readily modified, for example, to include more or fewer data fields. A single database also may be employed. Note

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that in the databases, a different reference numeral is employed to identify each field of each database. However, in at least one embodiment, fields that are similarly named (e.g., session identifier fields) store similar or the same data in a similar or in the same data format.

The databases 225, 230, 235, 240, 245, 250 and 255 are described in detail below and example structures are depicted with sample entries in the accompanying figures. As will be understood by those skilled in the art, the schematic illustrations and accompanying descriptions of the sample databases presented herein are exemplary arrangements for stored representations of information. Any number of other arrangements may be employed besides those suggested by the tables shown. For example, even though seven separate databases are illustrated, the invention could be practiced effectively using one, two, three, four, five, six, eight or more functionally equivalent databases. Similarly, the illustrated entries of the databases represent exemplary information only; those skilled in the art will understand that the number and content of the entries can be different from those illustrated herein. Further, despite the depiction of the databases as tables, an object-based model could be used to store and manipulate the data types of the present invention and likewise, object methods or behaviors can be used to implement the processes of the present invention.

It should also be noted that some or all of the data or types of data illustrated in FIGS. 4 – 10 may be stored and managed in individual ones of the gaming devices 130, the contract kiosks 140, and / or a contract server, and may be used therein to manage, control and / or monitor contract play modes of the gaming devices 130.

Referring now to FIGS. 4A and 4B, illustrated therein is a tabular representation 400 of an example embodiment of a player database 225. Tabular representation 400 is referred to herein as player database 400. The player database 400 may be utilized by a device (e.g., a computer 110, a kiosk 140, a gaming device 130 and / or a contract server) to store and / or access information about players who are members of a loyalty club administered by a casino. As is well known, most casinos offers rewards (e.g., comp points) to players in exchange for the players providing personal information about themselves, being assigned a unique player tracking number, and allowing their gambling and / or other activities in the casino to be tracked. The data in the player database 400 may be input by, for example, a casino employee and / or a device (e.g., a gaming device 130, a computer 110, a contract kiosk 140, and / or a contract server). The data may be updated by one or more of these entities as well.

For example, upon a player signing up for a casino's loyalty club, a record may be opened for the player in the player database, the record being uniquely identifiable based on the player

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identifier assigned to the player. A device and / or person may access the player database 400 to determine, for example, whether a player is eligible for a contract; and / or whether an active contract is associated with the player. In another example, the player database 400 may be accessed by a device and / or person in order to update information associated with a player (e.g., to store an indication of a contract entered into by the player, to update the total amount wagered by the player, etc.).

The player database 400 includes a number of example records or entries, including records R400-1 through R400-4, each defining a player who has associated therewith a unique player identifier. Those skilled in the art will understand that the player database 400 may include any number of entries. The player database 400 also defines fields for each of the entries or records. The fields specify: (i) a player identifier 402; (ii) a player name 404; (iii) a player address 406 that stores a postal address and / or other contact information associated with a player; (iv) a member since 408 that indicates a date at which the player joined the casino loyalty club; (v) a total wagered 410 that indicates a sum of wagers posted by the player within a specified period of time (e.g., since the player joined the loyalty club); (vi) a theoretical win 412 of the player; (vii) an active contract(s) 414 that indicates a contract identifier for any currently active contract (e.g., any contract previously entered by the player that is not yet expired, not yet completed, not yet reconciled, etc); (viii) an expired contracts 416 that stores an indication of contracts previously entered into by the player that are currently expired or otherwise inactive (e.g., the duration of the contract has elapsed or the contract has otherwise been completed, fulfilled or terminated); and (ix) a hotel guest? 418 indication that indicates whether the player is currently registered as a guest in a hotel associated with the casino administering the loyalty club.

In one embodiment, a player database may not store an indication of contracts associated with a player. This information may instead be stored in a separate database, such as a purchased contracts database as described below.

To illustrate a usage of player database 400, assume a player has requested to purchase a contract which only players of a certain status are eligible to purchase (e.g., only players who are currently registered as hotel guests). In this example, a player database may be accessed to determine, based on the information stored in field 418, whether the player is eligible to purchase the requested contract. To illustrate another usage of the player database 400, assume a player has inserted a player tracking card into a gaming device. A computer 400 or another device may determine, based on the player identifier of the player tracking card, whether the player's play of the gaming device is covered under a contract by, for example, (i) determining whether the player is

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associated with a currently active contract, based on the information stored in field 414; and (ii) determining the terms of the contract (e.g., by accessing another database, such as a purchased contracts database 255, which is described below with respect to FIG. 10).

A player database may be used, for example, to store player wager data (e.g., such that players wagering over a given threshold in a given amount of time may be rewarded for their patronage, qualify for a particular gaming contract, and so on). The player database may also contain other information that may be useful in, for example, promoting and managing player behaviors (e.g., information about the player's gaming preferences, lodging arrangements, and the like). Further, the player database may store data regarding a given player's standing in a game session, gaming contract or bonus game, so that the player can continue the game session, gaming contract or bonus game at a plurality of game machines that have common access to the player database. Such player data may be stored in a relational database and retrieved or otherwise accessed by the processor after receiving a "key" data point from the player, such as a unique identifier read from the player's player tracking card, contract card or cashout ticket. The player database 400 may also store additional or different information from that described. For example, the player database may store information about an average wager amount posted by a player; games, features or other play options preferred by the player; gambling habits of the player; etc.

Referring now to FIG. 5, illustrated therein is a tabular representation 500 of a player eligibility rules 230. Tabular representation 500 is referred to herein as player eligibility rules database 500. The player eligibility rules database 500 may be utilized by a device (e.g., a computer 110, a kiosk 140, a gaming device 130 and / or a contract server) to store and / or access information about rules based on which it is determined whether a player is eligible to enter into contract. In accordance with one embodiment, only certain players are eligible to enter into contracts at all or into particular contracts. In other embodiments, player eligibility rules database 500 may not be used because all players may be eligible to enter into any available contract. The data in the player eligibility rules database 500 may be input by, for example, a casino employee and / or a device (e.g., a gaming device 130, a computer 110, a contract kiosk 140, and / or a contract server). The data may be updated by one or more of these entities as well.

The player eligibility database 500 includes a number of example records or entries, including records R500-1 through R500-4, each defining a rule in accordance with which it may be determined whether a player is eligible to enter into a contract. Those skilled in the art will understand that the player eligibility rules database 500 may include any number of entries. The player eligibility rules database 500 also defines fields for each of the entries or records. The fields

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specify: (i) a player eligibility rule identifier 502 that identifies (e.g., uniquely) a rule based on which it may be determined whether a player is eligible to enter into a contract; (ii) condition(s) 504 that specify a condition of a corresponding rule; (iii) an eligibility 506 that indicates a player's eligibility to enter into a contract if the corresponding condition(s) is satisfied; and (iv) a rule status 508 that indicates whether a rule is currently enabled (i.e., to be applied in a determination of whether a player is eligible to enter into a contract) or is disabled (i.e., is not to be applied in a determination of whether a player is eligible to enter into a contract). In one embodiment, casino personnel may enable a particular rule at certain desired time and may disable the rule at another time. In one embodiment, a rule may be enabled and / or disabled based on a schedule or other basis programmed into a device. For example, a computer 110 may be programmed to enable a rule if certain condition(s) are satisfied.

Thus, for example, record R500-1 indicates that, based on rule "R-001", a player who is not a hotel guest or does not have a guest pass is not eligible to enter into any available contract.

It should be noted that, in one embodiment, a player eligibility rule may be associated with one or more particular contracts, such that it may only be applied in a determination of whether a player is eligible to enter into the one or more particular contracts. This may be contrasted with another embodiment in which a rule may be of general applicability, such that it may be applied in a determination of whether a player is eligible to enter into any contract at all. In one embodiment, a player eligibility rules database may store some rules that are associated with one or more particular contracts and some rules that are of general applicability. In another embodiment, a rule that applies to a particular contract may be stored in a record of another database, such as database storing information on available contracts. For example, a record defining a particular contract available for purchase may store one or more player eligibility rules based on which it may be determined whether a player is eligible to purchase the particular contract.

To illustrate a usage of player eligibility rules database 500, assume a player has indicated a desire to enter into a contract. Based on rule R-001 of player eligibility rules database 500 it may be determined that the player is not eligible to enter into any contract if the player is not a hotel guest or does not have a guest pass. Thus, the player's player identifier may be requested and used to determine whether the player is a hotel guest (e.g., is currently registered as a guest in a hotel associated with the casino at which the player is attempting to enter into a contract) or has a guest pass. For example, the player database 400 and / or a hotel reservation system may be accessed to determine this information. If it is determined that the player is not a hotel guest or does not have a guest pass, it may be determined that, under Rule R-001, the player is not eligible

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to enter into any contract. Of course, the player may be eligible to enter into a contract under another rule that is currently enabled. Accordingly, each of the enabled rules in the player eligibility rules database 500 may be evaluated in turn to determine whether the player is eligible to enter into a contract. It should be noted that player eligibility rules database 500 may be accessed, for purposes of the determination described immediately above or for other purposes, by casino personnel and / or a device (e.g., a contract kiosk 140, a gaming device 130, computer 110, a contract server, another device, or a combination thereof).

Referring now to FIGS. 6A and 6B, illustrated therein is a tabular representation 600 of a gaming device database 235. Tabular representation 600 is referred to herein as gaming device database 600. The gaming device database 600 may be utilized by a device (e.g., a computer 110, a kiosk 140, a gaming device 130 and / or a contract server) to store and / or access information about gaming devices (e.g., gaming devices that may be available for contract play). The data in the gaming device database 600 may be input by, for example, a casino employee and / or a device (e.g., a gaming device 130, a computer 110, a contract kiosk 140, and / or a contract server). The data may be updated by one or more of these entities as well. For example, a casino employee may enter a record for a new gaming device once a new gaming device becomes available. In another example, a gaming device may update data in a record associated with the gaming device based on upgrades and / or other changes to the gaming device.

The gaming device database 600 includes a number of example records or entries, including records R600-1 through R600-4, each defining a gaming device that may be part of system 100. Those skilled in the art will understand that the gaming device database 600 may include any number of entries. The gaming device database 600 also defines fields for each of the entries or records. The fields specify: (i) a gaming device identifier 602 that (e.g., uniquely) identifies a gaming device or gaming device type; (ii) a game name 604 that specifies a name of a game playable on the corresponding gaming device (in one or more embodiments more than one game may be playable on a gaming device); (iii) a manufacturer 606 of the gaming device; (iv) a location 608 of a gaming device (e.g., a geographic location within a casino property); (v) a game type 610 that indicates a type of game(s) playable on the gaming device; (vi) a standard deviation 612 associated with the gaming device (as will be described further herein); (vii) a payout percentage 614 of the gaming device; (viii) a top jackpot 616 (in terms of number of credits) available for winning on the gaming device; and (ix) a denomination 618 accepted by the gaming device.

To illustrate a usage of gaming device database 600, assume a player has indicated a desire to play a gaming device under the terms of a contract (e.g., the player has provided a

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contract identifier to the gaming device). The gaming device database 600 may be accessed to determine whether play of the gaming device qualifies for coverage under the contract. For example, a term of the contract (which may be determined based on the contract identifier provided by the player) may specify that the contract only covers play on video poker machines. If it is determined that the gaming device which the player is attempting to play is not a video poker gaming device (e.g., based on the gaming device identifier, which may be received along with the contract identifier by a device performing this determination, if such a device is not the gaming device itself), it may be concluded that play of the gaming device will not be covered under the contract. The player may be notified of this conclusion (e.g., a warning message may be output to the player).

Referring now to FIG. 7, illustrated therein is a tabular representation 700 of a gaming device eligibility rules database 240. Tabular representation 700 is referred to herein as gaming device eligibility rules database 700. The gaming device eligibility rules database 700 may be utilized by a device (e.g., a computer 110, a kiosk 140, a gaming device 130 and / or a contract server) to determine whether a gaming device is eligible for contract play. A gaming device being eligible for contract play may mean, for example, that play of the gaming device will (i) qualify for coverage under the terms of a contract, (ii) aid a player in complying with one or more terms of a contract and / or (iii) aid a player in earning or otherwise qualifying for a benefit defined by a contract. The data in the gaming device eligibility rules database 700 may be input by, for example, a casino employee and / or a device (e.g., a gaming device 130, a computer 110, a contract kiosk 140, and / or a contract server). The data may be updated by one or more of these entities as well.

The gaming device eligibility rules database 700 includes a number of example records or entries, including records R700-1 through R700-4, each defining a rule based on which it may be determined whether a gaming device is eligible for contract play. Those skilled in the art will understand that the gaming device eligibility rules database 700 may include any number of entries. The gaming device eligibility rules database 700 also defines fields for each of the entries or records. The fields specify: (i) a gaming device eligibility rule identifier 702 that (e.g., uniquely) identifies a rule in accordance with which a determination may be made as to whether a gaming device is eligible for contract play; (ii) a condition(s) 704 that specifies one or more conditions to be satisfied and / or one or more characteristic(s) of a gaming device; (iii) an eligibility 706 that indicate whether (if the corresponding condition is satisfied or a gaming device is determine to possess the corresponding characteristic) a gaming device is eligible for contract play; and (iv) a rule status 708 that indicates whether a rule is currently enabled (i.e., to be applied in a determination of whether a gaming device is eligible for contract play) or disabled (i.e., not to be applied in a determination of

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whether a gaming device is eligible for contract play). In one embodiment, casino personnel may enable a particular rule at certain desired time and may disable the rule at another time. In one embodiment, a rule may be enabled and / or disabled based on a schedule or other basis programmed into a device. For example, a computer 110 may be programmed to enable a rule if certain condition(s) are satisfied.

Thus, for example, record R700-1 indicates that, based on rule "R-001", a gaming device that contributes to a progressive jackpot is not eligible for contract play.

It should be noted that, in one embodiment, a gaming device eligibility rule may be associated with one or more particular contracts, such that it may only be applied in a determination of whether a gaming device is eligible for contract play under the one or more particular contracts (e.g., whether play of the gaming device will be covered under the terms of the one or more particular contracts). This may be contrasted with another embodiment in which a rule may be of general applicability, such that it may be applied in a determination of whether a gaming device is eligible for contract play under any contract at all. In one embodiment, a gaming device eligibility rules database may store some rules that are associated with one or more particular contracts and some rules that are of general applicability. In another embodiment, a rule that applies to a particular contract may be stored in a record of another database, such as database storing information on available contracts. For example, a record defining a particular contract available for purchase may store one or more gaming device eligibility rules based on which it may be determined whether a particular gaming device is eligible for contract play under the particular contract.

To illustrate a usage of gaming device eligibility rules database 700, assume a player has indicated a desire to play a gaming device under the terms of a contract (e.g., the player has provided a contract identifier to the gaming device). The gaming device eligibility rules database 700 may be accessed to determine whether play of the gaming device qualifies for coverage under the contract. For example, rule "R-002" may be applied to determine whether the gaming device the player is attempting to play has a payback percentage of greater than 95%. This may be determined based on the gaming device identifier of the gaming device the player is attempting to play, which may have been received from the gaming device and by the device that is performing the gaming device eligibility determination (if the device is different from the gaming device). For example, the gaming device database 600 may be accessed and field 614 of the record corresponding to the gaming device identifier may be analyzed to determine the payback percentage of the gaming device. If it is determined that the gaming device which the player is

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attempting to play has a payback percentage that is greater than 95%, it may be concluded that play of the gaming device will not be covered under the contract and that the gaming device is not eligible for contract play. The player may be notified of this conclusion (e.g., a warning message may be output to the player).

Referring now to FIG. 8, illustrated therein is a tabular representation 800 of a gaming device status database 245. Tabular representation 800 is referred to herein as gaming device status database 800. The gaming device status database 800 may be utilized by a device (e.g., a computer 110, a kiosk 140, a gaming device 130 and / or a contract server) to store and / or access information about a current status of the gaming device (e.g., whether the gaming device is currently in use). The data in the gaming device status database 800 may be input by, for example, a casino employee and / or a device (e.g., a gaming device 130, a computer 110, a contract kiosk 140, and / or a contract server). The data may be updated by one or more of these entities as well. For example, a gaming device may update data in a record associated with the gaming device based on a change in its current status (e.g., when a player initiates play on the gaming device, the gaming device may transmit a signal that indicates it is currently in use, which signal may be received by controller 200 and used to update the status in the appropriate record of the gaming device status database 800).

The gaming device status database 800 includes a number of example records or entries, including records R800-1 through R800-4, each defining a status of a gaming device that may be part of system 100. Those skilled in the art will understand that the gaming device status database 800 may include any number of entries. The gaming device status database 800 also defines fields for each of the entries or records. The fields specify: (i) a gaming device identifier 802 that (e.g., uniquely) identifies a particular gaming device that may be located on a casino property or otherwise controlled by an entity practicing aspects of the present invention; (ii) a gaming device type identifier 804 that identifies (e.g., uniquely) the type of gaming device; and (iii) a gaming device status 806 that indicates a status of the gaming device (e.g., whether the gaming device is currently in use or is currently not in use). Other example statuses of a gaming device that may be stored in the gaming device status database 800 include an indication of whether a gaming device is currently off-line, is currently being serviced, and / or is currently engaged in contract play.

To illustrate a usage of gaming device status database 800, assume a player has indicated a desire to purchase a contract to cover game play on a particular gaming device. The gaming device status database 800 may be accessed to determine whether to authorize the sale of the contract to the player, based on whether the gaming device is currently in use.

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Referring now to FIG. 9, illustrated therein is a tabular representation 900 of a contract customization rules database 250. Tabular representation 900 is referred to herein as contract customization rules database 900. The contract customization rules database 900 may be utilized by a device (e.g., a computer 110, a kiosk 140, a gaming device 130 and / or a contract server) to store and / or access information about manners in which a player may build or customize a contract. The data in the contract customization rules database 900 may be input by, for example, a casino employee and / or a device (e.g., a gaming device 130, a computer 110, a contract kiosk 140, and / or a contract server).

The contract customization rules database 900 includes a number of example records or entries, including records R900-1 through R900-4, each defining respective boundaries for each of a plurality of contract terms. Those skilled in the art will understand that the contract customization rules database 900 may include any number of entries. The contract customization rules database 900 also defines fields for each of the entries or records. The fields specify: (i) a contract rule identifier that (e.g., uniquely) identifies a rule for customizing or building a contract; (ii) contract term boundaries 904 that specifies at least one boundary for a value of at least one contract term; (iii) a result 906 that indicates whether a contract should be approved or provided if the contract term(s) is as specified in the contract term boundaries. In one embodiment, casino personnel may enable a particular rule at certain desired time and may disable the rule at another time. In one embodiment, a rule may be enabled and / or disabled based on a schedule or other basis programmed into a device. For example, a computer 110 may be programmed to enable a rule if certain condition(s) are satisfied.

To illustrate a usage of contract customization rules database 900, assume a player has indicated a desire to build or customize a contract and has provided a desired value for a term of the desired contract. More specifically, assume the player has requested a contract that defines a period of 48 hours (e.g., the contract will cover play of a gaming device for a period of 48 hours). It may be determined, based on rule R-003 (record R900-3) of contract customization rules database 900 that the contract should not be approved or provided, since the defined contract period is greater than 24 hours.

Referring now to FIG. 10, illustrated therein is a tabular representation 1000 of an available contracts database 255. Tabular representation 1000 is referred to herein as available contracts database 1000. The available contracts database 1000 may be utilized by a device (e.g., a computer 110, a kiosk 140, a gaming device 130 and / or a contract server) to store and / or access information about contracts that are available for purchase. For example, a kiosk 140 or a gaming

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device 130 may access the available contracts database 1000 to determine what information to output to a player via a menu of available contracts. As described herein, in one or more embodiments, one or more contracts may be pre-defined (e.g., by a casino, game designer, gaming device manufacturer, or another entity) and offered for sale to players. A pre-defined contract may comprise a contract that has respective values specified for each of a plurality of terms that define the contract. Examples of terms of a contract include (i) a period of time defined by the contract, (ii) a price for the contract, (iii) a refund rate or other benefit provided under the contract, (iv) one or more conditions a player must comply with (e.g., a rate of play, a minimum wager amount per game play, etc.) in order to earn or qualify for the benefit defined by the contract, and (v) gaming devices and / or games eligible for play under the contract. In such an embodiment, information about the pre-defined contracts may be stored in a database such as available contracts database 1000, for output to a player who has indicated a desire to purchase an available contract. The data in the available contracts database 1000 may be input by, for example, a casino employee, employee of a game designer and / or gaming device manufacturer and / or by a device (e.g., a gaming device 130, a computer 110, a contract kiosk 140, and / or a contract server). For example, casino personnel may set initial values for respective terms of a contract and a device (e.g., computer 110) may update the values based on the success of the contract and / or feedback from the players.

The available contracts database 1000 includes a number of example records or entries, including records R1000-1 through R1000-4, each defining a respective contract that is available for purchase or that may otherwise be entered into by a player. Those skilled in the art will understand that the available contracts database 1000 may include any number of entries. The available contracts database 1000 also defines fields for each of the entries or records. The fields specify: (i) a contract type identifier 1002 that identifies a particular type of contract characterized by certain terms, though does not necessarily identify a unique contract provided to a particular player (note: a unique contract identifier may be assigned once a player purchases a contract type); (ii) a contract price 1004 that specifies a monetary amount or other form of consideration to be provided by a player in exchange for entering into the contract; (iii) a contract period 1006 that defines a period of time (which may be defined in terms of a number of game plays, a number of units of time, as ending upon an occurrence of a specified event, etc.) during which game play that complies with the remainder of the terms of the contract will be covered under the contract; (iv) a contract benefit 1008 that defines a benefit a player may earn or qualify for by complying with the terms of the contract; and (v) compliance requirements 1010 that define restrictions on game play that a player must comply with in order to earn or qualify for the benefit of the contract.

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Thus, for example record R1000-1 indicates that if a player purchases a contract of contract type "CT-01234" for a price of $20.00, the player will not need to provide any payment for 500 game plays of a "Double Gems Jackpots" game (beyond the $20.00 price of the contract) and the credit meter balance of a gaming device on which the player is playing the game will be allowed to become a negative number if necessary for the player to complete the 500 game plays.

To illustrate a usage of available contracts database 1000, assume a player has indicated a desire to purchase a contract. The player may be presented (e.g., via a touch-screen of a contract kiosk 140) with a menu of available contracts. The menu may be populated based on information obtained from the available contracts database 1000.

Referring now to FIG. 11, illustrated therein is a tabular representation 1100 of a purchased contracts database 260. Tabular representation 1100 is referred to herein as purchased contracts database 1100. The purchased contracts database 1100 may be utilized by a device (e.g., a computer 110, a kiosk 140, a gaming device 130 and / or a contract server) to store and / or access information about contracts that have been purchased or otherwise entered into by players. For example, a kiosk 140 or a gaming device 130 may access the purchased contracts database 1100 to determine a period remaining in a contract previously purchased by a player. The data in the purchased contracts database 1100 may be input by, for example, a casino employee and / or by a device (e.g., a gaming device 130, a computer 110, a contract kiosk 140, and / or a contract server). For example, casino personnel or a contract kiosk 140 may create a record in the purchased contracts database 1100 upon a player purchasing a contract and update the record as the player participates in play covered under the terms of the contract.

The purchased contracts database 1100 includes a number of example records or entries, including records R1100-1 through R1100-4, each defining a respective contract that has been purchased or otherwise entered into by a player. Those skilled in the art will understand that the purchased contracts database 1100 may include any number of entries. The purchased contracts database 1100 also defines fields for each of the entries or records. The fields specify: (i) a contract identifier 1102 that uniquely identifies a contract; (ii) a player identifier 1103 that identifies the one or more players associated with the contract (note that in some embodiments the player identifier and the contract identifier may comprise the same identifier); (iii) a contract period 1106 that specifies a period of time defined by the contract (e.g., a period of time during which the contract is active, a period of time during which play is covered under the terms of a contract, and / or a period of time defining an amount of play covered under the terms of the contract); (iv) a refund rate 1108 that specifies a percentage of losses or wagers posted by a player that will be refunded to the player, as

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one example of a benefit that may be provided to a player under a contract; (v) a contract fee 1110 that specifies a consideration to be exacted from a player in exchange for the benefit defined by the contract (which may be a price the player pre-pays for the contract or another form of consideration); (vi) a play requirement(s) 1112 that specifies one or more restrictions on game play that a player must normally comply with in order to earn or qualify for the benefit of the contract; (vii) a period remaining 1114 that specifies the period of time remaining in the contract (i.e., the total period of time defined by the contract less the period of the contract utilized by the player to date); (viii) a total wager 1116 that indicates a sum of wagers posted by the player while participating in play covered under the terms of the contract; (ix) a total payout 1118 that specifies a sum of payouts won by the player as a result of participating in play covered under the terms of the contract; and (x) a total loss 1120 that specifies the sum of losses incurred by the player as a result of participating in play covered under the terms of the contract. It should be noted that the example contracts illustrated in purchased contracts database 1100 are directed to a type of contract in which a benefit is a refund of losses incurred by a player as a result of participating in play covered under the terms of the contract. As described herein, other contracts may define different benefits. Accordingly, in some embodiments different fields may be appropriate to track information relevant to such different benefits.

Thus, for example record R1100-1 indicates that a player identified as "P-000927" has purchased a contract identified as "C-000001", and that this contract has an associated period of time of six (6) hours, a refund rate of 100% and a contract fee in which $0.01 will be charged to the player for each $0.25 wagered by the player while participating in play covered under the terms of the contract. The contract further specifies that a player must participate in 400 game plays per hour in order to qualify for the $100 refund rate and that the player has a remaining two (2) hours and thirty-four (34) minutes remaining under the contract. The record of the contract further specifies that the player has wagered a sum of $395.50 under the contract and received a sum of payouts equal to $181.75, which results in a loss to date of $213.75.

To illustrate a usage of the purchased contracts database 1100, assume a player provided contract identifier "C-000001" to a gaming device and indicated a desire that play of the gaming device be covered under the terms of the contract (e.g., the player has indicated a desire to engage in contract play). It may be determined, based on the contract identifier, whether the contract has a period of time remaining prior to affirming to the player that the play of the gaming device will be covered under the terms of the contract. Further, the required rate of play that is a play requirement defined by the contract may be determined, and the player's play of the gaming device may be monitored to determine whether the player is complying with the required rate of play. It should be

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noted that the required rate of play may be a minimum rate of play, a maximum rate of play and / or a specific rate of play with which the player must comply.

Referring now to FIG. 12, illustrated therein are two example contract cards that may be provided to a player who enters into a contract in accordance with one or more embodiments described herein. As described herein, in some embodiments, a contract card may have a substantially similar physical appearance and functionality as to that of a player tracking card, although a contract card may be associated with a unique contract identifier instead of or in addition to a player identifier (e.g., such that data may be read from and / or written to a contract database regarding the contract and / or game play data associated therewith). As illustrated in FIG. 12, a contract card may comprise a magnetic stripe, which when read by a card reader device, may indicate a gaming contract identifier and / or a player identifier. A variety of methods of encoding contract cards with contract identifiers and other data are imagined. For example, in one embodiment, a contract card comprises a "smart card" or other device comprising a memory, such that gaming contract data may be stored on the smart card (e.g., a gaming device and / or controller transmits data to the smart card device via radio frequency transmission). In another embodiment, a contract card may comprise a cashless gaming ticket (e.g., the barcode thereof may be read so as to determine a contract identifier).

In other embodiments, a player may not be provided with a contract card, but a controller may determine that one or more game plays should be monitored pursuant to contract play in some other manner. For example, in one embodiment, a player may be provided with a code. The player may then enter the code using an input device of a gaming device (e.g., a player enters a gaming contract identifier using a touch-sensitive display screen). In another embodiment, a player may be instructed to actuate one or more input devices of a gaming device in a specific sequence and / or for a particular period of time (e.g., "To initiate Contract Play, press and hold both the "Spin" button and the "Paytable" button for five seconds). In one or more embodiments, a player identifier may be received so as to signal contract play. Various methods of receiving player identifiers are contemplated. In one embodiment, a player may use a player tracking card in lieu of a contract card (e.g., such game play data may be monitored and then stored in a player database, as opposed to a contract database). In another embodiment, a player may be identified by biometric means (e.g., via a retina recognition device).

Turning now to the first example contract card 1200A, a front view 1205A and a back view 1210A of the contract card are illustrated. The front of the contract card 1200A includes a description of the benefit defined by the contract card (1215A), the name of the player associated

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with the contract card (1220A), the contract identifier uniquely identifying the contract of the contract card (1225A), the player identifier of the player associated with the contract card (1230A) and an indication of the period of time defined by the contract (1235A). The back of the contract card 1200A includes a magnetic stripe 1245A, as well as an area for the signature of the player associated with the contract card (1235A), and a description of the terms and conditions associated with the contract (1240A). The terms and conditions may describe, for example, any restrictions by which the player must abide in order to earn or otherwise qualify for the benefit defined by the contract. In another embodiment, the terms and conditions may pertain to the proper use of the contract card, irrespective of the terms of the contract associated with the card (e.g., the contract card may only properly be used by the player who rightfully purchased or otherwise entered into the contract associated with the card, etc.).

It should be noted that a player associated with a contract card may comprise a player who purchased or otherwise entered into the contract corresponding to the contract card.

Turning now to the second example card 1200B, the front view 1205B includes features substantially similar to those of example contract card 1200A: (i) a description of the benefit defined by the contract associated with the contract card (1215B), (ii) a name of the player associated with the contract card (1225B), (iii) a player identifier identifying the player associated with the contract card (1230B), and (iv) a contract identifier that uniquely identifies the contract associated with the contract card (1235B). In addition, the front 1205B of the contract card 1200B includes a photograph of the player associated with the contract card (1220B), which may be useful for security purposes (e.g., to ensure that the bearer of the contract card is the player who purchased or otherwise entered into the contract associated with the contract card).

The back 1210B of the example contract card 1200B includes features substantially similar to those of the back 1210A of example contract card 1200A: (i) a magnetic stripe 1250B, (ii) an area for a signature of a player associated with the contract card (1240B), and (iii) a description of the terms and conditions associated with the contract card (1245B).

Referring now to FIG. 13, illustrated therein is an example of a contract receipt that may be provided to a player upon an end of a contract, which receipt the player may use to obtain the benefit defined by the contract. A contract may be considered to end, for example,

(i) upon the occurrence of a period of time defined by the contract (e.g., a player plays the 100th game play of the 100 game plays defined by a contract, a

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player completes the 2nd hour of play of the two (2) hours defined by a contract);

(ii) upon a player completing all play requirements defined by a contract in a satisfactory manner (e.g., a player completes 500 game plays at a designated gaming device while maintaining a minimum required rate of play of 300 game plays per hour);

(iii) upon a player earning or otherwise qualifying for a benefit defined by a contract (e.g., a player has incurred at least $100 in losses within one hour); and / or

(iv) upon an occurrence of another designated event (e.g., the current time is 8:00pm on July 01, 2005, which is the expiration time of a contract; the player collects 100 "lemon" symbols through play of a slot machine game, and thus the contract ends; and so on).

It should be noted that a contract that has ended may not necessarily have been satisfactorily completed such that a player is necessarily entitled to a benefit defined by the contract. For example, upon determining that a contract has ended, casino personnel and / or a device (e.g., computer 110, contract kiosk 140, etc.) may perform a distinct determination of whether the player has complied with the terms of the contract and is thus entitled to a benefit defined by the contract.

Of course, as described herein, in some embodiments a benefit may be provided to a player under the terms of the contract during the duration of the contract and before an end of the contract. For example, the player may be provided with access to a feature of a gaming device and / or allowed to continue playing the gaming device (and receiving payouts for winning outcomes) even if the credit meter balance of the gaming device is depleted, while executing game plays covered under the contract and before an end of the contract.

Returning again to FIG. 13, in one embodiment a gaming device 130, contract kiosk 140, casino personnel device and / or another device may be operable to print a contract receipt for a player once a contract is complete. The receipt may entitle the player to a benefit defined by the contract (e.g., a monetary amount based on a refund of at least a portion of losses incurred by the player as a result of participating in game plays under the contract). For example, the player may present the receipt to casino personnel at a casino cage or to a contract kiosk 130 in order to receive the benefit. In one embodiment, the receipt may include machine readable indicia (e.g., a

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bar code) that instructs a device (e.g., a contract kiosk 130) to provide the specified benefit to the player.

In one example, a player may have purchased a contract with an associated refund rate of 100% and contract fee of 1¢ per 25¢ wagered. After a contract period concludes, the player may have accumulated $135.87 in losses and $13.17 in contract fees. This information may be, for example, monitored and tracked by computer 110 as the player plays one or more gaming devices 130. Accordingly, as the player is owed a refund, the player may approach a casino representative stationed at a location within the casino. The player may provide his contract card to the representative, such that she may access contract data (e.g., the representative enters a contract identifier using a keypad of a computer device in communication with one or more databases of the present invention). It may then be determined (e.g., based on the information monitored, tracked and stored by computer 110) that the player is owed $122.70 (e.g., the refund amount of $135.87, minus the $13.17 in contract fees). The representative may then pay the player with cash in the appropriate amount. In one embodiment, the player may be provided with a physical "contract receipt" (e.g., in addition to or in lieu of being provided with the cash). If the receipt is provided in lieu of cash, the receipt may be exchangeable for the appropriate amount of cash at an appropriate casino counter, at a contract kiosk 140 or via another means. The contract receipt may comprise, for example, a sheet of printed paper, an exemplary illustration of which is depicted by Fig. 13.

A contract receipt, as illustrated in the example of FIG. 13, may include, for example,

(i) an indication of the casino or other entity that entered into the contract with the player (1305);

(ii) a contract identifier and / or player identifier (1310);

(iii) a win and / or loss amount associated with the contract (1315) that may be calculated, for example, by subtracting the amount of coins wagered by the player (1320) from the amount of coins paid to the player (1325);

(iv) an indication of a refund rate (1330) or other benefit defined by the contract;

(v) an indication of a gross value of the benefit earned by the player as a result of the contract, such as the gross amount to be refunded to the player (1335);

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(vi) an indication of contract fees or other fees (e.g., taxes) to be subtracted from the gross value of the benefit earned by the player as a result of the contract (1340);

(vii) an indication of the net value of the benefit earned by the player as a result of the contract, such as the net amount to be refunded to the player (1345), which net value may be calculated by deducting any applicable fees from the gross value of the benefit;

(viii) a summary of the play that was covered under the contract (1350), which may be a summary of all game plays that contributed to the determination of the gross value of the benefit earned by the player as a result of the contract; and

(ix) an area for the signature of the player associated with the contract (1355).

It should be noted that in some embodiments a player may be provided a monetary amount that is a benefit earned by the player as a result of a contract by having the amount credited to an account associated with the player (e.g., a credit card account, a debit card account, a casino-maintained account, etc.). In such embodiments, a contract receipt may include an indication of the account to which the monetary amount was added.

In some embodiments, a contract receipt may not comprise a physical contract receipt. For example, in one embodiment, text and / or graphics representative of a contract receipt may alternately or additionally be output by a display screen of a kiosk.

In one embodiment, a contract receipt may be provided to a player before completion of a contract. For example, if a player terminates play of a gaming device before completion of a contract, the gaming device or another device may print a receipt for the player that is readable by another device and that allows the other device to read or derive information about the player's contract (e.g., how many game plays and / or time the player is entitled to under the contract, etc.).

EXEMPLARY PROCESSES

FIGS. 14 - 16 are flow charts of respective exemplary processes 1400, 1500 and 1600 that may be practiced via, for example, system 100 (FIG. 1). Any and all of the processes of FIGS. 14, 15 and 16 (or any portion of any such process) may be embodied within computer program code of one or more programs described herein and may comprise a computer program product.

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The processes described herein, and variations thereof that will be apparent from the disclosure herein, may be performed, for example, as a result of operation of the processor 205 of the computer 200, processor 305 of gaming device 300, a processor of a contract kiosk 140, a processor of a contract server, a processor of another device and / or a combination of any of the aforementioned processes (e.g. working in series, parallel, cooperatively, or otherwise in combination).

Except where impractical, it is contemplated that in one embodiment the processes and / or methods described herein and / or illustrated in FIGS. 14, 15 and 16 may be performed by a computer 110 interactive with one or more gaming devices 130 and / or one or more kiosks 140. It is also contemplated that the method or methods of the present invention may be performed on a stand-alone gaming device.

Referring now to FIG. 14, process 1400 begins with step 1405, in which a contract is established with a player. Establishing a contract may comprise, for example, entering into a commitment with a player, in which commitment it is promised that a benefit defined by the contract will be provided to the player if the player complies with the terms of the contract. It should be understood that establishing a contract with a player includes determining that a player has purchased or otherwise entered into a contract (e.g., via a contract kiosk 140, via a gaming device 130, via a casino employee, etc.).

It should further be noted that process 1400, as any process described herein, need not necessarily be performed all at one time (i.e., a step of the process need not begin immediately after a preceding step has been completed). In some embodiments, a significant amount of time (e.g., minutes, hours, days , week, etc.) may pass between steps. For example, in one embodiment step 1405 (determining that a contract has been established) may be performed at a first time and step 1410 (determining contract initiation signal from gaming device) may be performed several hours or days later).

A contract may be established in a variety of manners and via a variety of entities. As described, various process steps of embodiments described herein (including embodiments in which a contract is established with a player) may be performed by one or more of a variety of entities, including a computer 110, a gaming device 130, a contract kiosk 140, casino personnel, etc.

In some embodiments, a player may indicate a desire to enter into or establish a contract. For example, a player may approach a casino representative in the interest of establishing a contract. In a more specific example, in one embodiment a booth or other location within casino

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premises may be dedicated to selling, establishing, and / or administering contracts, and may be staffed with personnel and casino personnel devices accordingly (e.g., a desk behind which staff operate computer terminals, such that requests to purchase contracts may be received). In another embodiment, a player may approach a "mobile" casino representative to establish a contract (e.g., a casino "floor representative" may be given a PDA or other handheld computing device, which may communicate with any of the devices/computers described herein such that a request to provide a contract may be received). In other embodiments, a player may approach a "contract kiosk" and indicate an interest in establishing a contract (e.g., by actuating an input device of the kiosk, such as a graphic of a touch-sensitive display screen that reads "Press here to get your losses covered!"). In another embodiment, a player may establish a contract upon checking in to a hotel associated with a casino. In further embodiments, a player may request to establish a contract by dialing a particular phone number and accessing an IVRU (e.g., a tent-card advertisement placed on top of a slot machine reads, "Dial 1-888-CONTRACT" and get 50% of your gambling losses covered – FREE!", such that the player dials the phone number, listens to a menu of options, and selects an option to purchase a contract by pressing an appropriate button of a cellular phone keypad). In one embodiment, a player may indicate a desire to establish a contract by actuating an actuatable input device of a gaming device. In this manner, a request to establish a contract may be received by a system of the present invention in a variety of manners.

As described, in one embodiment all or some available contracts may only be available to some players. For example, only certain players may be eligible to establish a particular contract or any contract at all (e.g., based on a characteristic associated with the player). Accordingly, in some embodiments the step of establishing a contract may comprise reviewing player data to determine player eligibility for establishing a contract. For example, in one embodiment, only players characterized by certain data may establish a contract (e.g., only registered hotel guests). Further, in some embodiments, players associated with certain player data may receive only certain contract terms (e.g., "high rollers" may be eligible to receive a higher percentage refund of gambling losses, longer contract periods, and so on) and / or may only be eligible for certain contracts but not others. It should be noted that, in an embodiment in which it is being determined whether a player is eligible to enter into a particular contract, the identifier of the contract and / or the terms of the contract may first be determined, prior to determining the player's eligibility to enter into the contract.

In some embodiments, a player database (e.g., a player database as illustrated in FIGS. 4A and 4B) may be accessed in accordance with a particular player identifier or player name (e.g., a casino representative keys-in a player name, swipes a player tracking card through a card-reader device in communication with a casino personnel device, etc.) so as to determine player eligibility.

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Data stored within a player database may then be used to determine whether or not a particular player (i) is a registered hotel guest, (ii) has wagered a certain amount of money over the course of one or more trips to a casino, (iii) has generated a certain amount of "theoretical win" for the casino (e.g., which may be determined by multiplying a total amount wagered by a "house edge" metric of, e.g., 9%), (iv) has generated a certain amount of actual winnings or losses over the course of one or more trips to the casino, (v) is associated with any active contracts, (vi) has completed (e.g., successfully) a contracts in the past, (vii) has registered for a casino "player account" membership (e.g., signed up for a player tracking card) perhaps on or before a certain date, and / or (vii) otherwise is eligible to establish a contract.

As described with reference to FIGS. 4A and 4B (player database 400), player data may be collected and / or stored in a variety of manners. For example, a player may have previously registered for a player tracking card. Thus, various game play data (e.g., payout data, win/loss data, wager data, etc.) may have been tracked and stored in association with a player identifier as is known in the art. It should be noted that, in some embodiments, a player may not have previously registered for a player tracking card or registered as a casino hotel guest. Accordingly, a player database may contain no data stored with reference to the player (e.g., a casino representative uses a computer of the present invention to search for the player's name, but no record is revealed). In some embodiments, a player having no record or account may not be eligible to establish a contract or may only be eligible to establish a particular contract(s) and / or contract(s) with particular terms. In one such embodiment, a player may be offered an opportunity to establish a player record or account. For example, the player may be presented with an opportunity sign up for a player tracking card (e.g., open a player account). In another example, a player may receive a "guest pass" in exchange for performing a particular task (e.g., filling out a survey, eating at a casino-maintained restaurant, etc.); such a guest pass may then permit the player to establish a contract, a particular contract and / or a contract defining particular terms. In other embodiments, a player having no record may receive a contract characterized by only certain contract terms.

As described, player eligibility to establish a contract may be determined based on the player data associated with the player. For example, a player eligibility rules database (such as the exemplary player eligibility rules database 500 depicted in FIG. 5) may be accessed and one or more rules stored therein may be applied to determine the player's eligibility to enter into a contract, based on the player data associated with the player in conjunction with the one or more rules. For example, a rule may indicate that if a player is associated with an active contract, the player may not establish a second contract (e.g., as specified by rule R-002 of the player eligibility database 500 (record R500-2)). In another example, a rule may indicate that if a player has generated more than

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$10,000 in theoretical win, the player may establish any contract (e.g., a contract with any terms that the player desires; as specified by rule R-003 of player eligibility rules database 500 (record R500-3)). In yet another example, a rule may indicate that if a player had not registered for a player tracking card before a particular date, the player may only be eligible to establish a contract with an associated refund rate of less than 51% (e.g., as specified by rule R-004 of the player eligibility rules database 500 (record R500-4)).

As also described, in one embodiment establishing a contract may include determining an eligibility of one or more gaming devices for facilitating game plays that are covered under the contract. A gaming device being eligible for contract play may comprise, for example, the gaming device being authorized, approved, operable and / or available to facilitate game plays that, when participated in by a player who has established a contract, aid the player in earning or otherwise qualifying for a benefit defined by the contract (e.g., "count" as game plays covered under the contract).

A determination of whether a gaming device or type of gaming device is eligible for contract play (or a determination of which gaming devices or gaming device types are eligible for contract play) may be performed at one or more times, as deemed appropriate and desirable. In one embodiment, before a contract is established with a player, it may be determined whether or not a particular gaming device or type of device is permitted for contract play (e.g., this may be particularly useful in a scenario in which a player requests a contract to be executed on a particular gaming device or type of gaming device). For example, the determination may be performed after a player requests to establish a contract but prior to establishing the contract with the player. In another embodiment, the determination may be performed before a player ever requests to enter into a contract. The determination of gaming device eligibility may be helpful in order to inform a player, prior to the player establishing a contract, as to which gaming devices and / or types of gaming devices the player may play in order to earn or otherwise qualify for a benefit under the contract.

It should be noted that in some embodiments available contracts may be pre-packaged and displayed on a menu of available contracts to a player, as described herein. In such embodiments, the determination of whether a particular gaming device and / or particular type of gaming device is eligible for facilitating game play under a contract (e.g., whether play of the gaming device will aid a player in earning or otherwise qualifying for a benefit defined by the contract) may be performed at a time the contract is being defined and prior to a time at which a player is requesting to establish a contract. For example, a casino or other entity defining a contract to be included on a menu of available contracts may define, as one of the terms of the contract, the gaming devices and / or

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types of gaming devices the play of which will comply with the terms of the contract. This determination may be made, for example, based on some of the considerations described below. Accordingly, in such pre-packaged contract embodiments, upon a time of a player attempting to establish a contract, there may be no need to determine gaming device eligibility or the determination of gaming device eligibility may simply comprise retrieving the previously made decision as to which gaming device and / or types of gaming devices are eligible for play under the contract.

In some embodiments, it may be beneficial to restrict certain gaming devices or gaming device types characterized by certain attributes from a contract. Restricting a gaming device or type of gaming device from contract play may comprise rendering the gaming device unauthorized, unapproved, inoperable and / or unavailable to facilitate game plays that, when participated in by a player who has established a contract, aid the player in earning or otherwise qualifying for a benefit defined by the contract (e.g., the game plays do not "count" as game plays covered under the contract). A gaming device or gaming device type may be restricted from all contract play in general and / or from contract play under one or more particular contracts. A gaming device or gaming device type that is restricted from contract play may be flagged as such in a database, associated with a restricted status in a memory of a device (e.g., a memory of a kiosk 140 or computer 110) and / or may display or otherwise output an indication of its restricted status (e.g., to all players or to players who attempt to initiate contract play on the gaming device). In one embodiment, an indication of which gaming device(s) and / or gaming device type(s) are restricted from contract play may be output to a player considering a purchase of a contract. For example, such an indication may be output via a display screen of a device via which the player is purchasing the contract, printed on a receipt provided as a proof of a purchase of a contract, printed on a contract card, or otherwise provided to a player who has purchased or otherwise entered into a contract. In some embodiments, a gaming device itself may output an indication of whether the gaming device is restricted from contract play (e.g., an LED is lit, a sound is emitted, and so on). An indication of which gaming device(s) and / or gaming device type(s) are eligible for contract play may be output in similar manners.

It should be noted that whether a particular gaming device or gaming device type is restricted or eligible for contract play may change during a period defined by a contract. For example, a particular gaming device may be restricted from contract play at a time a player enters into a contract but may become eligible for contract play while the contract is active and before the contract ends.

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Various characteristics or attributes may be considered when determining whether a gaming device and / or gaming device type is eligible for contract play. In one or more embodiments, a gaming device may be restricted from contract play (i.e., a player would not earn or qualify for a benefit defined by the corresponding contract by playing the gaming device) if a standard deviation metric associated with the gaming device is too high. In some embodiments, a standard deviation metric associated with a gaming device may be determined by the following calculation:

Let x be a random variable that can take on experimental values of x_1, x_2, ... x_n, with corresponding probabilities p_1, p_2, ... p_n. For example, x may represent a model of a game play of a gaming device. The experimental values would be payouts, such as -1, 1, 5, 100, and so on. The probabilities would be the probabilities of the corresponding payouts occurring. For example, the payout "-1" might occur with probability 0.9. The expectation of x is denoted E[x]. The expectation of x, which may also be known as the mean, or average, is defined as

$$E[x] = p_1*x_1 + p_2*x_2 + \ldots + p_n*x_n$$

$$= \sum_{k=1..n} p_k x_k$$

The variance of x is denoted σ_x^2. The variance is defined as

$$\sigma_x^2 = p_1*(x_1-E[x])^2 + p_2*(x_2-E[x])^2 + \ldots p_n*(x_n - E[x])^2$$

$$= \sum_{k=1..n} p_k*(x_k-E[x])^2$$

Thus, the standard deviation metric associated with the gaming device, σ_x, is the square root of the variance.

In other embodiments, a gaming device may be restricted from contract play if it is characterized by a relatively high payback percentage. In some embodiments, a gaming device payback percentage may be determined based on a house edge metric. For example, a gaming device that statistically retains 9¢ of every dollar wagered for the house (i.e., a house edge metric of .09) may be thought of as a "91% payback" device.

In further embodiments, a variety of other characteristics or attributes may be considered when determining gaming device eligibility for contract play. Such attributes include, but are not limited to: (i) the gaming device's manufacturer (e.g., the name of the company that manufactured

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and distributed the device), (ii) the gaming device's location on the casino floor (e.g., a device is in a particular room or part of a particular bank of devices), (iii) the gaming device's wager denomination (e.g., a 5¢-per-line slot machine may be allowed, but a 25¢-per-line slot machine may not), (iv) the number of paylines which may be activated during one game play, (v) the number of hands of poker which may be played during one game play, (vi) a "game type" associated with the gaming device (e.g., a "slot machine" may be allowed but a "video poker" machine may not, a "Double Gems Jackpots" game may not be eligible), (vii) the conditions under which the casino purchased or leased the gaming device (e.g., a "participation" gaming device for which casinos must pay another entity a percentage of the gaming device's win may not be eligible), (viii) the jackpot amount associated with the gaming device (e.g., the top payout amount associated with the gaming device; it should be noted that a "progressive" jackpot may have a variable value, which may be accumulated by setting aside a small fraction of each wager amount into a jackpot pool, as is known in the art), (ix) the time of day (e.g., certain gaming devices may only be eligible for contract play during certain "off-peak" times), (x) the average or maximum speed at which the gaming device is operable to conduct a game play, and so on.

In one embodiment, a gaming device database (such as that illustrated in FIG. 6) may store data which may be useful in determining an eligibility of a gaming device for contract play. For example, in one embodiment, a casino server (e.g., computer 110) may maintain a gaming device database which may store data associated with gaming devices and / or gaming device types currently positioned on casino premises. Thus, a gaming device eligibility rules database (such as that illustrated in FIG. 7) may be used in conjunction with a gaming device database to determine whether or not a gaming device type and / or gaming device is eligible for contract play.

For example, in one embodiment, any gaming device characterized by a "progressive" jackpot as indicated by a gaming device type database may not be eligible for contract play (i.e., rule R-001 of gaming device eligibility rules database 700). In another embodiment, if a gaming device database indicates that a standard deviation metric associated with a gaming device is greater than a predetermined threshold amount (e.g., "6") the gaming device may not be eligible for contract play. In yet another example, a gaming device manufactured by a certain company may not be eligible for contract play (e.g., rule R-00N of gaming device eligibility database 700). As described, in some embodiments rules may be enabled or disabled as a casino operator or other entity finds desirable and / or appropriate (e.g., a gaming device eligibility rules database is updated to reflect which rules the casino desires to enable).

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In one embodiment, a determination of whether to establish a contract with a player and / or a determination of eligibility of a gaming device and / or gaming device type for contract play may be based on a level of utilization of the gaming device and / or type of gaming device. Thus, in some embodiments, step 1405 may comprise determining a level utilization of a gaming device and / or type of gaming device. For example, in one embodiment, a gaming contract may only be provided if it is determined that there is sufficient capacity for contract play (e.g., enough slot machines located on the floor of a casino are not currently being utilized, such that adding another player to the floor for the duration of a particular contract period will not result in a shortfall of gaming device capacity that is deemed unacceptable by a casino). In one embodiment, gaming device utilization data may be stored in a database, such as the example gaming device status database 800 depicted in FIG. 8. For example, a gaming device database may indicate a status associated with a gaming device (e.g., identified by a unique gaming device identifier, such as "GD-000001"), which may describe whether the particular device is currently "in use" or "not in use." A variety of methods of monitoring gaming devices to detect such utilization are contemplated (e.g., detecting game play activity, detecting the insertion of a player tracking card or contract card, detecting the presence of a player using a sensor device, monitoring gaming devices with video cameras, etc.). In some embodiments, a device (e.g., computer 110) may track gaming device utilization in a substantially automatic manner (e.g., computer 110 determines use of a gaming device and updates a status of the gaming device in the gaming device status database, as necessary or appropriate). In one embodiment, a percentage utilization metric may then be calculated with respect to all gaming devices within a casino (e.g., 37% of all gaming devices are in use) or a percentage of gaming devices being associated with a particular characteristic (e.g., 59% of all video poker machines are in use, etc.).

Accordingly, in some embodiments, a gaming contract may or may not be established depending on a determined percentage utilization metric (e.g., if a percentage utilization metric is above a certain threshold, no gaming contracts are to be provided). In another embodiment, a gaming contract may be established but a beginning time of the contract (e.g., a time at which a player may begin playing one or more gaming devices in order to earn or otherwise qualify for a benefit under the contract) may be deferred until a level of utilization is deemed to be acceptable.

In one embodiment, historic gaming device utilization data may be considered when determining whether or not a gaming contract is to be established and / or whether a beginning time of a contract is to be deferred. For example, it may be determined that, on average, gaming device utilization from 12 p.m. until 6 p.m. on Wednesdays has been 23% at Casino A.

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In one embodiment, step 1405 may comprise determining one or more terms of a contract. Determining a term of a contract may comprise, for example, determining the nature of the term and determining a value for the term. For example, a nature of a term may be determining a period defined by a contract while determining the value for the term may comprise determining the actual value of the period (e.g., three hours, 100 game plays, until a payout of at least 1000 credits is won, until a loss of at least $100 is incurred etc.). In one embodiment (e.g., an embodiment in which a player selects a contract to enter into from a menu of available pre-packaged contract), the terms (and values thereof) of the contract may already be defined and step 1405 may simply comprise determining the previously defined terms. In one embodiment, a player may be allowed to customize a contract by changing a value of one or more terms or selecting all terms and values for the contract.

In one embodiment, once (i) a request to establish a gaming contract has been received from a player, (ii) the player's eligibility has been determined, (iii) eligible/ineligible gaming device types have been identified, and / or (iv) gaming device utilization has been determined, one or more terms of the contract may be determined before the contract is established with a player. A variety of example contract terms will now be described in further detail.

One example term of a contract is the benefit to be provided to the player if the player complies with other terms of the contract. The term defining the benefit may further define how a value of the benefit is to be determined (e.g., a formula based on which the value of the benefit is to be determined).

A benefit may comprise, for example, a refund amount. As described, in one or more embodiments a benefit defined by a contract may comprise a refund of at least a portion of the losses incurred by a player, or wagers posted by a player, for game plays covered under the contract. In some embodiments, a refund amount may be based on amount of losses incurred by a player or a sum of wagers posted by the player. In such embodiments, a refund rate may be defined by the contract, the refund rate comprising a percentage (e.g., 100%, 75%, 50%, etc.) of the losses incurred by the player or sum of wagers posted by the player that is to be paid to the player. Accordingly, a refund rate associated with a gaming contract may comprise a formula based on which a refund amount may be determined.

In one embodiment, a refund rate may be greater than 100% (e.g., "We'll refund all your losses plus pay you 5%!"). In yet another embodiment, a contract may entitle a player to receive a payment based on a win amount (e.g., "Get double your winnings!").

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In another embodiment, a refund amount may be a predetermined amount that is not based on losses incurred by the player or wagers posted by the player (e.g., if a player agrees to play 12 hours of slots, the player receives a $50 bonus payment at the conclusion of the contract). In one embodiment, a refund amount may be provided to a player at the end of a gaming contract.

In one embodiment, as described herein, a contract may define a benefit other than a refund amount. For example, a benefit may comprise access to a feature of the gaming device, a reduced maximum wager amount, a more favorable payout table and / or probability table, an ability to continue playing a gaming device once a credit meter balance is depleted, goods, services, and / or an increased rate of earning comp points, etc. As described, in one embodiment a benefit may be provided to a player during a period of time defined by a contract (e.g., so long as the player is complying with other terms, such as play requirements (described below) of the contract.

In one embodiment, a benefit may be provided only once under the terms of the contract (e.g., at the end of the contract). In another embodiment, a benefit may be provided to a player (i) a plurality of times (e.g., periodically, in response to a predetermined event, etc.) and / or (ii) continuously or substantially continuously (e.g., so long as the player is complying with the play requirements defined by the contract, the player enjoys an increased rate of earning comp points).

Another example of a term of a contract may be a contract fee. A contract fee may comprise, for example, a purchase price of a contract and / or consideration to be provided by the player in exchange for being entitled to earn or otherwise qualify for the benefit defined by the contract. A contract fee may be required to be provided at the time the player enters into the contract, to be provided (e.g., in increments or based on another basis) during a period of time defined by the contract, at the end of a contract, or another time, as appropriate and / or desirable. As described herein, in various embodiments, a gaming contract may be provided only if a player (i) pays or agrees to pay a premium, fee or surcharge, which may be associated with one or more game plays and / or wager amounts, and / or (ii) agrees to a predetermined contract period.

Accordingly, in one example, a contract fee may comprise a flat fee associated with the contract (e.g., a player agrees to pay $30 in exchange for the activation of a contract). In another example, a player may agree to pay an incremental fee, which may be based on (i) one or more game plays initiated during contract play (e.g., a player agrees to pay a fee of 5¢ for each hand of video poker played during the contract period), and / or (ii) one or more wager amounts provided during contract play (e.g., a player agrees to pay 1¢ for every 25¢ wagered during the contract period). Again, a contract fee may be paid (i) before a gaming contract is provided (e.g., a player pre-pays a flat $30 contract fee); (ii) during a contract period (e.g., a player establishes a debit

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account with a casino, such that the debit account is deducted by an incremental fee amount in accordance with each game play); (iii) after a contract period concludes (e.g., a player provides a credit card before a gaming contract is activated, but the card is not charged until contract play concludes and the contract is reconciled); and / or (iv) at another time.

As stated, in some embodiments, a player may agree to a predetermined contract period in lieu of, or in addition to, a monetary fee. A player may thus provide consideration other than money in exchange for being entitled to earn or otherwise qualify for a benefit defined by the contract. For example, a player may agree to 12 hours of slot machine play in exchange for a contract offering a 100% refund of all losses at a premium of 1¢ per every 25¢ wagered. In another example, a player may agree to six hours of slot play in exchange for a contract offering a 50% refund of all losses with no associated contract fee. It should be noted that a casino may agree to such an arrangement, whereby a player agrees to an amount or period of game play in addition or as an alternative to providing a contract fee, because a house edge metric associated with play of one or more gaming devices may provide a casino with a statistically predictable amount of profit should players play such devices for prolonged periods of time (e.g., even though a contract fee was not received, revenue may still be generated through players' repeated play of such devices).

In one embodiment, a contract fee for a particular contract may comprise a first fee for a first player and a second fee for a second player. For example, the first player may receive a reduced fee due to a favorable characteristic associated with the player (E.g., the player is a member of a loyalty club of the casino, the player is a frequent gambler, an average maximum wager amount associated with the player is at least a predetermined amount, the player is a hotel guest, etc.).

Another example of a term of a contract may comprise a period of time defined by a contract. The period of time may comprise, for example, a period of time during which the contract is active, a period of time during which game plays participated in by the player count towards the player earning or otherwise qualifying for a benefit defined by the contract, etc.

A period of time may comprise, for example, (i) a minimum period of time, (ii) a maximum period of time, (iii) a specific period of time, or (iv) a range of time. In one or more embodiments, a term of a contract may define when the period of time defined by the contract begins (e.g., upon purchase of the contract, at 2:00 p.m., upon a player initiating a game play covered under the terms of the contract, etc.) and when it ends.

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In some embodiments, a period of time defined by a contract may be defined in terms of one or more of (i) a predetermined, minimum, and / or maximum number of game plays, or (ii) an indeterminate number of game plays to be initiated within a predetermined, minimum or maximum period of time (e.g., one hour). Thus, in one example, a period of time defined by a contract may comprise 5,000 handle pulls of a slot machine (e.g., a player agrees to receive a 50% refund on all losses incurred at any eligible slot machine, so long as the player initiates 5,000 game plays in total). In another example, a period of time defined by a contract may comprise six hours (e.g., a player agrees to receive a 75% refund on all losses incurred during six hours of gaming device play). In a further example, a period of time defined by a contract may comprise a specific period of hours during one or more days (e.g., contract play comprises any game plays initiated between 8 a.m. and 1 p.m. on a particular day).

Another example of a term of a contract may comprise one or more play restrictions or play requirements. A play requirement and / or a play restriction may comprise a condition associated with play of one or more gaming devices that a player may be required to satisfy in order to earn or otherwise qualify for a benefit defined by a contract. A variety of play requirements and play restrictions are contemplated. In some embodiments, a play requirement of a contract may specify that a player must maintain a predefined rate of play while participating in game plays covered under the contract. For example, a player may receive a 50% refund on any losses incurred during a six-hour contract period, so long as the player agrees to maintain a minimum rate of three game plays per minute. Methods and apparatus for determining a gaming device player's rate of play and providing a benefit based at least thereon are described in Applicant's issued U.S. Patent No. 6,238,288, entitled "METHOD AND APPARATUS FOR DIRECTING A GAME IN ACCORDANCE WITH SPEED OF PLAY," filed December 31, 1997, the entirety of which is incorporated herein by reference for all purposes.

In other embodiments, a play requirement may define a wager amount to be posted for a game play (e.g., in order for the game play to be covered under the contract and / or in order for the game play to "count" towards the player satisfying the contract). For example, a play requirement may specify (i) a particular wager amount that a player must post for a game play, (ii) a minimum wager amount that a player must post for a game play, and / or (iii) a maximum wager amount (e.g., an average wager amount calculated based on all game plays covered under the contract) that a player must post for a game play. For example, a play requirement may require a player to wager at least 25¢ per game play of a slot machine. In another example, a play requirement may require a player to wager a maximum of 75¢ per game play of a slot machine.

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In further embodiments, a play requirement may specify a particular manner of game play. For example, a play requirement may specify one or more of (i) a number of slot machine paylines which a player must activate in accordance with each game play; (ii) a strategy which a player must employ for a game play; and / or (iii) a feature of a gaming device which a player must active during a game play. For example, a play restriction may indicate that a player must activate a maximum of three slot machine paylines in accordance with each game play initiated during contract play.

It should be understood that a play requirement may apply to all or a subset of game plays covered under a contract.

Accordingly, step 1405 (or another step of another process performed in accordance with embodiments of the present invention) may comprise determining one or more contract terms. In some embodiments (whether a contract is being pre-defined prior to any player requesting the contract or whether the contract is being defined for a particular player in response to the player's request for a contract (e.g., based on specifications input by the player)), one or more contract terms may be determined such that the establishment of the resultant contract defined by the terms may be profitable for a casino. As described, in one or more embodiments a casino may pre-define and make available one or more "pre-packaged" contracts that may then be marketed as products to prospective customers (e.g., signs positioned on a casino floor advertise: "100% CASH REFUND – Get all your losses back – Play 12 Hours of Slots During Your Trip – Just 1¢ per Spin!").

In one example, a casino (e.g., a casino-maintained computer system programmed to execute various processes of the present invention) may calculate that at a contract fee of 1¢ per every 25¢ wagered, a casino may stand to generate a profit even after reimbursing a player for 100% of the player's losses, so long as the player plays at a reasonable rate of play (e.g., 500 game plays per hour) for a period of 12 hours. Assuming the player wagers an average of 75¢ per game play and a house edge metric of .08 (e.g., gaming devices are programmed to statistically hold 8% of coin-in for the house), it may be determined that, statistically, the player will generate $180 in contract fees and accumulate $360 in losses during the contract period. Accordingly, as the player will be refunded the $360 loss amount, the casino may generate $180 in profit from the gaming contract. It should be noted that though gaming devices may be programmed to statistically maintain a house edge, thereby generating an 8% loss on average for players, some players may achieve a win amount as the result of contract play (such a win amount may have decrease casino profits). While there may be some players who will generate a win amount during a period of time defined by a contract, by requiring the period of time to be relatively long and / or to encompass a relatively large number of game plays, a casino may reduce the number of such winners.

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It should also be noted that, in some embodiments, while such an amount of profit may be comparably less than would have been generated had the player played for 12 hours without a contract (e.g., wherein the player's losses would have been held by the casino), the contract may be advantageous in that it may (i) motivate a player to play only at the gaming establishment wherein the player's losses are "covered," thereby decreasing the likelihood that the player will gamble at a competitor's property, (ii) motivate a player to gamble for longer periods of time, (iii) increase the likelihood that a gaming establishment will derive additional revenue from the player's patronage of non-gaming casino activities (e.g., eating at restaurants, attending shows), as the player is motivated to gamble only within the establishment that provided the contract, (iv) increase the likelihood that a player afraid of losing a large sum of money will gamble within a gaming establishment, as the cost of playing gaming devices may be considered fixed (e.g., a player may play five hours of slot machines, with a chance to win a large jackpot, for only a flat cost of $50), and so on.

In another example of a contract that a casino or other entity may pre-define and market as a product to players, a gaming establishment may advertise that a player may receive a 50% refund on all losses incurred within a given time period (e.g., any game play between 6 a.m. and 1 p.m.) without paying any associated contract fee. Thus, a gaming establishment may benefit by maintaining 50% of the financial losses incurred by the player, as well as by ensuring that the player's business is captured for a period of several hours.

In yet another example of a contract that a casino or other entity may pre-define and market as a product to players, a contract may allow a player to pay an up-front contract fee of $50 for a contract lasting a period of six hours. The contract may define a benefit comprising a 100% refund of all losses incurred as a result of game plays completed during the period of time defined by the contract.

In yet another example of a contract that a casino or other entity may pre-define and market as a product to players, a contract may allow a player to pay an up-front contract fee of $20 for a contract defining a period of time of one hour. The contract may define a benefit comprising a 100% refund of all losses incurred as a result of game plays completed in accordance with the terms of the contract. The contract may further define a play requirement requiring the player to only use a particular type of gaming device (e.g., only Nickel Frenzy machines are eligible).

In yet another example of a contract that a casino or other entity may pre-define and market as a product to players, a contract may allow a player to provide a credit card when signing up for the contract, in exchange for which the player will be authorized to initiate 1,000 game plays

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(e.g., at 25¢ per game play) on any eligible gaming device. The contract may define a benefit comprising a 75% refund of all losses incurred as a result of the 1,000 game plays. The contract may define a contract fee of $60, to be charged to the provided credit card once a contract has ended. In one embodiment, the amount, if any, to be charged to the credit card at the end of the contract may be determined by subtracting the $60.00 from a refund amount due to the player as a result of the losses incurred by the player.

Thus, as some pre-defined contracts may be associated with a variety of pre-defined contract terms (e.g., "Contract A" has a refund rate of 100%), certain pre-defined contracts may be unavailable to players characterized by certain player data. For example, a player eligibility rule of a player eligibility rules database may indicate that a player who is not a registered hotel guest may not receive a contract with an associated refund rate of greater than 75%. Accordingly, in some embodiments, a player requesting a contract defining a benefit of a refund rate greater than 75% may be denied an opportunity to establish the contract if the player is not a registered hotel guest. Alternately or additionally, in some embodiments, an identified player (e.g., a player inserting a player tracking card or providing a last name, such that player data may be accessed) requesting generally to establish a contract (e.g., a player selects "Show me Gaming Contracts" or "I'd Like Loss Insurance" as an option of a menu output by a touch-screen kiosk or IVRU) may not receive the option of selecting certain contracts. For example, contracts which the player is not eligible to establish (e.g., contracts characterized by certain terms) may not be included in a menu of contracts output to the player. Alternatively, the contracts for which a player is not eligible may be "grayed out" or otherwise indicated as unavailable on a menu of contract output to the player.

In some embodiments, a player may request to receive a "custom gaming contract." For example, a player may desire to select or adjust one or more contract terms or values thereof (e.g., contract period, refund rate, etc.). In one such embodiment, various contract terms (and / or certain values of certain contract terms) may be made available to a player based on the player's eligibility (e.g., as determined by analyzing player data). Thus, in some embodiments, players characterized by certain data (e.g., players that have established long-standing player accounts, generated large amounts of theoretical win, etc.) may select certain contract terms or certain values of certain contract terms (e.g., higher refund rates, longer/shorter contract periods, fewer play requirements, lower contract fees, etc.) as indicated by player eligibility rules. For example, a player may approach a booth dedicated to administering contracts, and communicate verbally to a casino representative a desire to receive a custom contract. The casino representative may then, for example, use a computer device in communication with any or all of the databases described herein (e.g., a player database, a player eligibility rules database, a gaming device eligibility rules

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database, etc.) to determine which contract terms or which certain values of certain contract terms the player may be eligible to select.

It should be noted that, in some embodiments, a contract characterized by certain predetermined combinations of contract terms may not be offered or made available to any player. For example, no player may be offered or approved for a contract wherein the associated contract terms comprise the following combination: a refund rate of greater than 75%, a contract fee of less than $10 and a period of time defined by the contract that is shorter than one hour or twenty-five (25) game plays. In another example, no player may be offered or approved for a contract that defines a minimum rate of play requirement of fewer than 300 game plays per hour. In yet another example, no player may be offered or approved for a contract wherein an associated contract term comprises a refund rate of greater than 100%. Such rules may be stored, read from and / or written to a database, such as the contract customization rules database 900 (FIG. 9). It should be noted that, in some embodiments, such rules may have the effect of establishing the boundaries of contracts, setting the boundaries for contract terms in order to exclude from approval contracts that will not result in an acceptable level of profit for a casino. Use of such a database, or a similar methodology, may help ensure that contracts with a low likelihood of generating a minimum acceptable level of profit for a casino and / or other entity may not be provided. As described previously, such rules may be enabled and / or disabled as desired and / or appropriate. In this manner, a player may identify, select and / or define a contract characterized by a number of contract terms and values thereof that are desirable to the player.

In some embodiments (e.g., before a customized contract is established or before any contract is established), step 1405 may comprise receiving a confirmation from a player that the player desires a contract characterized by indicated contract terms.

A confirmation may be received in a variety of manners. In one example, a player may actuate an input device of a kiosk or other electronic device (e.g., gaming device, PDA) so as to signal confirmation (e.g., the player actuates a "YES" graphic of a touch-sensitive display screen, above which text reads "By pressing YES below, I agree to pay $50 and receive a contract card. By inserting the contract card before I play a slot machine, I will receive a 100% refund of any losses incurred between 11 a.m. and 5 p.m. today"). In another example, a player may signal confirmation verbally (e.g., by speaking to a casino representative, saying "YES" when prompted by an IVRU, etc.). In yet another example, a player may signal confirmation by actuating an appropriate button of a telephone, as prompted by an IVRU (e.g., "If you would like to purchase this contract, press 1"). In yet another example, a player may signal confirmation by signing or initialing a physical contract

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agreement form (e.g., a paper form which describes contract terms and includes an area for receiving a signature).

Additionally, in some embodiments, step 1405 (or another process consistent with embodiments of the present invention) may comprise receiving a contract fee or portion thereof, such that establishing a contract may comprise receiving the contract fee or a commitment to the contract fee. In one embodiment, establishing a contract may comprise determining that a contract fee has been received and / or determining that a commitment to a contract fee has been received. In one example, a player may tender a cash payment (e.g., a player provides cash to a casino representative, a player inserts cash into a bill acceptor of a kiosk, etc.). In other embodiments, a player may provide a credit card, which may be billed immediately. In further embodiments, a contract fee associated with a contract may be added as a charge to a hotel bill associated with a player.

As described, in some embodiments, step 1405 may comprise receiving a commitment from a player to pay a contract fee at a later time and / or determining that a player has provided a commitment to pay a contract fee at a later time. For example, in one embodiment, before a contract is activated (e.g., before a player is authorized to participate in play in order to earn or otherwise qualify for a benefit defined by a contract), a player may provide a credit card and sign a contract agreement form describing contract terms, one of which is an incremental contract fee of 1¢ for every 25¢ wagered. Thus, at the end of the contract period, if the player wagered a total of $247.25, the player's credit card may be charged $9.89. In some embodiments, a player may provide a credit card before activating a contract, and a pre-authorization process may "freeze" an amount of credit in association with the provision of the contract, such that a gaming establishment or other entity may charge up to the frozen amount of credit upon reconciliation of the contract. In other embodiments, a player may establish a debit account before receiving a contract. For example, a player may provide $50, which may be established as a balance of a financial account associated with the player (e.g., associated with a player identifier and / or contract identifier). Thus, should the player accrue any incremental contract fees during contract play (e.g., a fee of 5¢ per every three game plays), the account balance may be decremented accordingly.

A contract may be established in step 1405 upon a player selecting and / or customizing a contract that the player is eligible to enter into and upon the player providing (or committing to provide at a future time) a contract fee associated with a contract. In some embodiments, establishing a contract may comprise associating a contract identifier with a type of contract and / or a player identifier (e.g., a new record is established in a purchased contracts database, such as the

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example one illustrated in FIG. 11). Thus, in some embodiments, a player may be provided with a contract identifier upon a contract being established with the player. In some embodiments, a player may use a contract identifier so as to signal that one or more game plays should be monitored pursuant to contract play (e.g., a player provides a contract identifier before initiating play of a gaming device, such that all subsequent game play data may be stored in association with a particular gaming contract).

Referring now to step 1410, a contract initiation signal is received from a gaming device (e.g., by a device monitoring play of the gaming device, in order to monitor, analyze and / or store game play data associated with a contract, for purposes of calculating and / or providing a benefit defined by the contract). A contract initiation signal may comprise, for example, an indication that play of a gaming device has been initiated, which play is associated with a contract. For example, the signal may indicate that one or more game plays to be initiated after the contract initiation signal are covered by a contract or may potentially be covered by a contract (e.g., such that a player's participation in the game plays may aid the player in earning or otherwise qualifying for a benefit defined by the contract associated with the contract initiation signal). In one embodiment, a contract initiation signal includes a contract identifier.

In one example, step 1410 may comprise monitoring a gaming device to determine whether contract play has been initiated on the gaming device. This may be done in lieu of, or in addition to, receiving a contract initiation signal. For example, a device (e.g., computer 110) may monitor a state of a gaming device to determine whether a contract identifier, or other indicator associated with a contract, has been input to the gaming device in a manner that may be interpreted as an initiation of contract play on the gaming device. This determination may comprise, for example, whether an initiation for contract play has been requested at a gaming device (e.g., that a player has inserted a contract or other identifier as an indication that the player desires subsequent play of the gaming device to count towards the player earning or otherwise qualifying for a benefit defined by the associated contract). For example, the gaming device may be monitored to determine whether a contract card has been inserted into the gaming device or a player identifier that is associated with an active contract has been inserted into the gaming device. In one embodiment, determining that contract play has been initiated on a gaming device and / or that a request to initiation contract play at a gaming device has been received at the gaming device may include determining the contract identifier associated with the contract play.

A controller of the present invention (e.g., computer 110) may receive an initiation signal associated with a contract identifier in a variety of manners. For example, a card reader device in

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communication with the controller and / or the gaming device may detect the insertion of a contract card and / or player tracking card (e.g., a player is instructed to "Make sure your play is covered! Insert your Contract Card before you play any slot machine"). The card reader (i.e., a processor thereof, operating in accordance with a program stored in the memory of the card reader) may then determine a contract identifier associated with the card (e.g., by reading an encoded magnetic strip and / or retrieving contract data from a database). Thus, as a controller may communicate with a card reader device, a controller may receive a contract identifier. In some embodiments, a controller receiving a contract identifier may then store game play data associated with the contract identifier (as will be described with reference to step 1415), such that each time a player approaches a gaming device, so long as a contract card is inserted into a card reader device, game play data will be stored (e.g., a controller does not store game play data unless a contract card is inserted). As described, in other embodiments, a controller may receive a contract identifier in any of the manners described above (e.g., a gaming device in communication with a controller receives a PIN code representing a contract identifier via an input device).

In one or more embodiments, step 1415 may further comprise determining whether play of the gaming device from which the contract play initiation signal was received is covered by the associated gaming contract. For example, it may be determined whether play of the gaming device complies with one or more terms of the contract and / or the gaming device is eligible for contract play in accordance with the contract. As described, in some embodiments, one or more gaming devices maintained by a gaming establishment (e.g., slot machines positioned on a casino slot floor) may be ineligible for contract play in association with one or more contracts. Accordingly, in various embodiments of the present invention, an "eligibility indication" may be associated with a gaming device and / or may be determined for the gaming device (e.g., upon receiving a contract initiation signal or determining that a request for contract play has been received at a gaming device). An eligibility indication may comprise an indication of whether the gaming device is eligible for contract play in general and / or for contract play in accordance with certain contracts, certain contract types and / or contracts defining certain terms.

For example, in one or more embodiments, a gaming establishment or other entity may mark, equip or otherwise configure one or more gaming devices to output or display a "static" eligibility indication. A static eligibility indication may inform a prospective player of the eligibility status of one or more particular gaming devices (e.g., a gaming device is or is not eligible for contract play), such that the indication may not change over time (e.g., the associated gaming device is always ineligible for contract play pursuant to any gaming contract). A variety of static eligibility indications are contemplated within the scope of the present invention, including but not

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limited to stickers, signs or other physical objects affixed to or placed on or near a gaming device, such that text, graphics and / or icons indicate an eligibility status (e.g., a sticker reads "This machine eligible for Contract Play"). In one example, a gaming establishment or other entity may fit all eligible machines with such eligibility indications before any gaming contracts are provided to players.

In other embodiments, a "dynamic" eligibility indication may be associated with one or more gaming devices. A dynamic eligibility indication may inform a prospective player of the eligibility status of one or more particular gaming devices (e.g., a gaming device is or is not eligible for contract play), such that the indication may change over time (e.g., the associated gaming device may at times be eligible for contract play, and at other times may not be eligible). A variety of dynamic eligibility indications are contemplated within the scope of the present invention. In some embodiments, a dynamic eligibility indicator may comprise a light (e.g., when an LED under which text reads "Contracts OK" is lit, the machine is eligible). In other embodiments, a dynamic eligibility indicator may comprise text, icons and / or graphics output by a gaming device display screen (e.g., while a gaming device is idle, an "attract mode" sequence indicates "This machine eligible for Contract Play"). In further embodiments, a dynamic eligibility indicator may comprise a voice recording output via one or more gaming device speakers (e.g., a voice indicates "This machine eligible for Contract Play"). Such dynamic eligibility indicators may be programmed on a periodic or continual basis such that an eligibility status associated with one or more gaming devices may be changed as desired For example, if a payback percentage or jackpot amount associated with a gaming device changes such that it is outside of an acceptable range, a gaming device eligibility rules database may indicate that the gaming device is no longer eligible for contract play, and thus, a status indicator may change.

In some embodiments, a gaming device may be eligible for contract play in accordance with some contracts or contracts defining certain terms but not others. In such embodiments, the gaming device may indicate which contracts, or contract terms, the gaming device is authorized to support.

In this manner, a player who has established a contract (e.g., a player bearing a contract card) may recognize whether a particular gaming device is eligible for contract play (or eligible for contract play in accordance with the player's particular contract), so as to prevent a situation wherein a player believes a refund is due for a loss amount that was incurred by game play at an ineligible gaming device. Further, in some embodiments, a player may (i) approach an ineligible gaming device, (ii) provide a contract identifier, and (iii) receive an "ineligibility warning indication"

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(e.g., a display screen reads, "You have inserted a Contract Card, but this machine is ineligible for Contract Play. Any losses you incur will not be refunded. Would you still like to play?"). In other embodiments, a casino representative may provide an ineligibility indication warning (e.g., verbally). Thus, in one embodiment step 1410 may comprise determining whether or not an associated gaming device is eligible for contract play, and if not, outputting an ineligibility warning indication.

Referring now to step 1415, data associated with play of the gaming device at which contract play has been initiated is stored. In one embodiment, the data is stored provided it is verified that play of the gaming device is covered under the terms of the contract (e.g., the gaming device is eligible for contract play in accordance with the contract and play of the gaming device complies with one or more the terms of the contract). The data may be stored, for example, in a memory of the device that is monitoring play of the gaming device (e.g., computer 110). For example, computer 110 may, upon receiving the contract initiation signal in Step 1410, open a record in a database used to track sessions associated with contract and / or access the appropriate record of a purchased contracts database based on the contract identifier associated with the subject contract. The data determined based on the play of the gaming device may thus be stored in such a record.

As stated, in some embodiments, a player may establish a contract, approach an eligible gaming device, and indicate a desire to initiate contract play associated with a contract identifier (e.g., the player inserts a contract card into a card reader). Accordingly, a controller (e.g., computer 110) in communication with a gaming device and / or peripheral device may store data (e.g., game play data) associated with a contract identifier.

For example, turning to Fig. 11 and record R1100-3 thereof in particular, a player P-000165 may have been provided with a contract card associated with a contract identified as C-000003. The contract may entitle the player to receive a 100% refund of any incurred losses between 9 a.m. and 3 p.m., provided the player pays an up-front, flat contract fee of $40 and maintains a rate of play of at least 500 game plays per hour. The player may then approach a 25¢-denomination five-reel, video slot machine and insert the contract card into a card reader. The player may then establish a credit balance (e.g., the player deposits a $20 via a bill acceptor device) and begin to gamble. For example, before spinning the reels, the player may activate nine paylines at a cost of 25¢ each, thus establishing a wager amount of $2.25 (i.e., nine credits) in association with the game play. The reels may then spin, and resolve to an outcome of "lime-lime-lime-plum-bell," yielding a payout of $1.00 (i.e., payout amount) associated with the game play. Thus, a loss amount associated with the game play may be $1.25 (i.e., the payout amount subtracted from the wager amount). Play may

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continue in this manner for some period of time, such that a controller may track a wager amount, payout amount and / or win/loss amount associated with each game play. Such data may then be stored in a database in association with the contract identifier. For example, in one embodiment, a controller may store a "total wager," "total win" and "total loss" associated with a gaming contract (e.g., the controller sums data associated with a plurality of game plays, as is depicted by Fig. 11).

Additionally, a controller may determine a "period remaining" associated with a contract, based on the data determined and / or stored in Step 1415. For example, in one embodiment, a contract may define a total period of time a certain number of hours (e.g., six hours of game play). Thus, in one embodiment, upon receiving a contract initiation signal (e.g., a player inserts a contract card), a controller may decrement (e.g., continuously, periodically, in response to a passage of a unit of time or an initiation of a game play, as appropriate) the time played from the total period of time, thereby determining a "period remaining" for a contract. Such a period remaining may be stored in an appropriate record of a database (e.g., a record for tracking a player's play in accordance with the subject contract) in accordance with the time elapsed. Further, in one or more embodiments, a controller may be programmed to determine a contract play termination signal (e.g., the player's removal of a contract card from a card reader device in communication with a controller), as described below with respect to step 1420. Accordingly, in one example, if a period of time defined by a contract comprises a certain number of hours, and a player removes a contract card from a card reader, the controller may no longer decrement a period remaining in an appropriate record of a database (e.g., the appropriate record of the purchase contracts database 1100) in accordance with the time elapsed. In this manner, a player may (i) insert a contract card and initiate a number of game plays associated with contract play at a first gaming device, (ii) remove the card such that a period remaining record is no longer decremented, (iii) re-insert the card at a second gaming device (e.g., a second contract initiation signal is received) and continue game play associated with a gaming contract (e.g., a player may move from slot machine to slot machine, without the time spent traveling between devices being held against him).

In another embodiment, a period of time defined by a contract may define a period of time that is a certain time period during one or more particular days (e.g., a contract period is August 31, 2004 between 9 a.m. and 3 p.m.). In one such example, a controller may decrement a "period remaining" record of a contract database as the end of the period approaches (e.g., "2 hours, 10 minutes" remain before 3 p.m.). In a further embodiment, a period of time defined by a contract may comprise a number of game plays (e.g., 1,000 game plays), in which case a controller may decrement a number of game plays remaining as a player associated with the contract participates in game plays covered by the contract. In another embodiment, a period of time defined by a

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contract may comprise a number of hours within a range of hours (e.g., two hours between 9 a.m. and 2 p.m.). Accordingly, a controller may decrement a period remaining record of a database in accordance with each game play covered under the contract and occurring during the period between 9am and 2pm.

It should be noted that, in some embodiments, a player may have entered into a contract that is active, but may participate in one or more game plays that are not associated with the contract (e.g., a controller may determine "non-contract play" associated with a player, such that inapplicable game plays may not be decremented from a period remaining record of a contract database and the player's participating in the game plays not covered under the contract does not aid the player in qualifying for or otherwise earning a benefit defined by the contract). For example, in one embodiment, a player may approach a gaming device and insert a player tracking card instead of a contract card. Thus, any play that occurs while the player tracking card is inserted may not count towards the player qualifying for or otherwise earning a benefit under the contract. In another embodiment, upon a player inserting a player tracking card into a gaming device it may be determine that the player is associated with an active contract and that the gaming device is eligible for contract play in accordance with the contract. Accordingly, the player may be queried (e.g., via an output device of the gaming device or a component thereof) whether the player would like to have the game play the player participates in on the gaming device be covered under the contract. In one embodiment, such a player may have an option to designate one or more game plays as covered under the contract at any time while playing the gaming device.

It should be noted that an identified player associated with an active contract (e.g., as indicated by a player database) who attempts to initiate a game play without indicating that the play of the gaming device is to be covered under the active contract (or who indicates that the play of the gaming device is not to be covered under the active contract) may receive a warning message via any of the output devices described herein (e.g., "Your losses will not be covered. Are you sure you'd like to continue?", if the benefit defined by the contract is a refund of losses).

In some embodiments, a controller or other device may store a wager, payout and / or win/loss data associated with each game play associated with a contract. For example, a database may comprise a "game play-by-game play" record of wager, win and / or loss data for each game play completed under a contract. In one such embodiment, a controller or other device may also store outcome data, gaming device data and / or time data in association with each game play (e.g., the outcome "cherry-cherry-cherry" was achieved on gaming device D-000192 at 3:10 p.m. on August 31, 2004), irrespective of whether the game play is determined at the time to be associated

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with or covered by a contract. Such data may subsequently be accessed, for example, to determine whether a player has complied with one or more terms of a contract and / or earned or otherwise qualified for a benefit defined by a contract. Thus, in an alternate embodiment, one or more records of a database used for storing game data for game plays completed on one or more gaming devices may store the following example information for each game play (wherein each game play may or may not be associated with a particular gaming contract):

DEVICE	TIME	OUTCOME	WAGER	PAYOUT
D-000192	3:10	Ch-ch-ch	$1.50	$10.00
D-000192	3:11	Pl-pl-bar	$1.50	$0.00

It should be noted that such game play-by-game play records may be used in Step 1140, described below, in determining whether a benefit is due to a player in accordance with a contract. Such data may also be used when printing a contract receipt, such as the example one illustrated in FIG. 13.

As stated, in some embodiments, an incremental contract fee may be associated with a contract (e.g., a player is charged 1¢ for every 25¢ wagered). Thus, in some embodiments, step 1415 (or an additional and distinct step of process 1400) may comprise assessing or determining an incremental fee to be paid by a player. As described, this may be done in a variety of manners. For example, in one embodiment, a player may establish a debit account balance from which incremental fees may be deducted (e.g., a controller tracks wagering activity associated with a contract, such that 1¢ is deducted from an associated account in accordance with every 25¢ wagered). In another embodiment, incremental contract fees may be charged to a player's credit card (though it should be noted that, in some embodiments, it may be preferable to wait and "batch" such charges at once). In an alternate embodiment, a player may provide an incremental contract fee via a gaming device (e.g., during contract play, each payline of a 5¢-denomination slot machine costs 10¢ to activate).

In some embodiments, a player may be provided with a "contract status update." Accordingly, Step 1420 (or another distinct step of process 1400) may comprise outputting a contract status update to a player. A contract status update may comprise, for example, an indication of the status of a player's compliance with one or more terms of a contract, a status of a current value of a benefit earned by a player in accordance with a contract, and / or a status of a player's progress in earning or otherwise qualifying for a benefit defined by a contract. In one or

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more embodiments, a contract status update may be output to a player in response to a player's request for such an update. In another embodiment, a contract status update may be output continuously, substantially continuously, periodically, in response to one or more qualifying events, or on another basis. A contract status update may be provided, for example, via a gaming device or component thereof (e.g., computer 110 may direct a player tracking device to output the contract status update), a contract kiosk, casino personnel, a smart card, a Web site, or via another appropriate and / or desirable means. In one embodiment, a contract card may comprise one or more input devices (e.g., a "check status button") and / or output devices (e.g., a small LED display screen), such that the card may be configured to output contract status updates.

As described, in one embodiment a player may proactively request a contract status update. For example, a player may request a contract status update in a variety of manners (e.g., actuating an input device of a gaming device or kiosk, dialing in to an IVRU, asking a casino representative, etc). For example, in one embodiment, a player may check the status of a contract by inserting a contract card into a kiosk and selecting "See My Contract Status."

As also described, in other, "passive", embodiments, a player may be provided with a status update without proactively requesting an update. For example, a display device in communication with a controller, but affixed to a gaming device (e.g., an LED screen of a player tracking card reader device), may periodically (or on another basis) output a contract status update message.

In various embodiments, a contract status update may comprise a variety of contract terms and the status thereof and / or other data, including but not limited to (i) "period remaining" data, such that a player may learn how much time and / or how many game plays remain in association with the subject contract (e.g., a display indicates "35 minutes remaining"); (ii) contract fee data, such that a player may learn of any incremental fees that have accrued in association with the subject contract (e.g., an IVRU indicates "You have totaled $5.87 in contract fees thus far"); (iii) loss data, such that a player may learn of any losses that a player has incurred during contract play (e.g., a representative accesses contract data using a casino personnel device, and tells the player "You've accumulated $105.40 in losses so far"); (iv) refund data, such that a player may learn of any refund amount which may be due to a player (e.g., a controller multiplies a loss amount by a refund rate, and determines that $45.70 is to be refunded to the customer); and so on.

In one or more embodiments, Step 1420 (or another distinct step of process 1400) may comprise determining whether a player is in compliance with one or more terms of a gaming contract. For example, it may be determined, based on game play data, whether a game play a

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player has initiated, has requested to initiate, or has completed, complies with one or more play requirements or play restrictions defined by the subject contract. As described, in some embodiments, one or more play requirements or play restrictions may be associated with a contract. For example, in one embodiment, a play restriction comprises a maximum wager amount associated with each game play initiated during contract play (e.g., a player must not bet more than 50¢ each time he spins a slot machine). Accordingly, in some embodiments, a controller or another device may be operable to (i) determine a play restriction associated with a contract, (ii) determine whether or not a player is in compliance with the play restriction, and if not (iii) output a "play restriction noncompliance warning." Continuing with the above example, a player who then activates three 25¢-denomination slot machine paylines (e.g., establishes a wager amount of 75¢ associated with a game play, which is greater than the 50¢ maximum as indicated by the contract) and presses "spin" may be prompted with a noncompliance warning via any of the output devices described herein (e.g., a gaming device display screen indicates: "Warning! You are wagering more than is covered by your contract! Any losses you incur for this game play will not be eligible for a refund. Would you like to continue anyway?"). In an alternate embodiment, a player who is not in compliance with a play restriction of a contract may not be permitted to play a gaming device and / or to initiate the game play that would cause the player to not be in compliance with the contract.

Referring now to Step 1420, it is determined whether a contract play termination signal has been received. This determination may comprise, for example, determining whether a player and / or gaming device has caused a signal to be transmitted to the controller or other device monitoring play of the gaming device, the signal indicating a termination of play of the gaming device in accordance with the contract. For example, in one embodiment a contract play termination signal may comprise a signal that a player has removed a contract card and / or a player tracking card from the gaming device. In another example, a contract play termination signal may comprise a signal that the player has indicated that game plays initiated on the gaming device are no longer to count towards the player satisfying the requirements of the contract (e.g., unless and until the player indicates otherwise). In yet another example, a contract play termination signal may comprise a signal that the player has moved away from a proximity of the gaming device (e.g. based on data determined by a proximity, motion and/ or weight sensor associated with the gaming device) or has otherwise discontinued play of the gaming device or play of the gaming device in accordance with the contract.

It should be noted that, in some embodiments in which a gaming device is completely or relatively passive in aiding a controller to monitor play of the gaming device in accordance with a contract, a contract termination signal may not be received from the gaming device. Rather, the

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controller or other device monitoring play of the gaming device may determine that contract play has been terminated at the gaming device by determining one or more of (i) determining that a contract and / or player card has been removed from the gaming device; (ii) determining that a player has indicated to a casino attendant that the player no longer desires to have play of the gaming device covered by the contract; and / or (iii) determining that the player has moved away from the gaming device or otherwise discontinued play of the gaming device completely or at least in accordance with the contract. In such an embodiment, Step 1420 may comprise determining, from data obtained from the gaming device, that play of the gaming device in accordance with the contract has been terminated.

In one embodiment, a player may (i) insert a contract card, (ii) initiate a number of game plays pursuant to contract play, and (iii) leave a gaming device, but forget to remove a contract card. In some embodiments, a controller or other device may be operable to detect such "breaks in play" (e.g., periods of time during which a contract card is inserted during which no game plays have been initiated). For example, a contract card may be inserted at 5:05 p.m. A player may then play a number of game plays, the last of which occurs at 5:23 p.m. If the contract card then sits idle in the reader for a predetermined period of time (e.g., the player leaves, forgets his card, and doesn't come back for more than 10 minutes), a controller may determine that only the period of time during which the gaming device was not idle may count toward the contract (e.g., a period remaining field of a contract database is decremented by only 18 minutes, the time span from when the player inserted the card until the last game play was initiated).

If it is determined in Step 1420 that a contract play termination signal has been received, the process continues to Step 1430. Otherwise, the process continues to Step 1425.

Referring now to Step 1425, it is determined whether an end of a period of time defined by the contract has occurred. For example, it may be determined whether a maximum units of time defined by the contract have occurred (e.g., the contract defines a period of two (2) hours and the player has completed two (2) hours of play under the terms of the contract). In another example, it may be determined whether a maximum number of game plays defined by the contract have been completed in accordance with the contract. In yet another example, it may be determined whether an ending time defined by the contract (e.g., 2 p.m. on July 01, 2005) is a current time. In one embodiment, determining that a period of time defined by the contract has ended may comprise, for example, informing the player associated with the contract of this determination (e.g., causing a gaming device to output a message informing the player that no more game plays will be covered by the contract because the period of time defined by the contract has ended). In one embodiments,

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determining that a period of time defined by the contract may further comprise causing play of the gaming device to be paused, ended or otherwise interrupted (e.g., so as to inform the player that subsequent play of the gaming device is no longer covered by the contract).

It should be noted that, in one embodiment, a gaming device may be operable to determine that a period of time defined by a contract has ended and transmit a contract play termination signal based upon such a determination. In such an embodiment, Steps 1420 and 1425 may effectively be combined and / or performed by different devices (e.g., Step 1425 is performed by a gaming device and prior to Step 1420, while Step 1420 is performed by a controller). It should again be emphasized that the steps of process 1400 (or of any other process described herein) may be performed in an order different from that described, as is practicable, convenient and / or desirable.

If it is determined, in Step 1425, that a period of time defined by the subject contract has not ended, the process 1400 returns to Step 1415, in which data associated with play of the gaming device is stored. Otherwise, the process 1400 continues to Step 1430.

It should be noted that Steps 1430, 1435, 1440 and 1445 may be considered a "reconciliation process" for a contract and, in some embodiments, may be performed as a subroutine distinct from the remainder of process 1400. For example, while one or more of the Steps 1430, 1435, 1440 and 1445 may be performed by a contract kiosk 140 or a contract server, the remainder of process 1400 may be performed by computer 110. A reconciliation process (e.g., a process via which a contract is reconciled) may comprise, for example, a process via which it is determined (i) whether a player has complied with a contract such that a player has qualified for or otherwise earned a benefit defined by the contract; (ii) what the value, if any, is of a benefit to be provided to a player as a result of complying with the terms of the contract; (iii) providing the player with the benefit; and / or (iv) obtaining or attempting to obtain any contract fee or other consideration due from a player in exchange for the contract, if such fee or other consideration has not yet been obtained or has not been attempted to be obtained.

In one embodiment, a reconciliation of a contract may be initiated by a player. For example, a player approaches a casino booth, casino attendant and / or contract kiosk and requests a benefit defined by the contract (e.g., refund amount), thereby requesting reconciliation of the contract. In another embodiment, a reconciliation of a contract may be initiated by a device (e.g., computer 110, kiosk 140) in response to an occurrence of one or more predetermined events. For example, the device may reconcile all contracts every night at midnight or may reconcile each contract as contract play under the contract is terminated and / or a period of time defined by the contract is determined to have ended.

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In some embodiments, reconciling a contract may comprise providing a refund or other benefit based at least in part on the data stored during Step 1415. In general, it may be advantageous to record the refund that is due as a debt, an account payable, or in another form that is readily managed by known accounting systems (e.g., which a casino uses) and / or advantageous to a casino or other entity.

In one example, a player may provide a credit card to purchase a contract with an associated refund rate of 75% and a contract fee of $50. Thus, in some embodiments, a $50 charge may be pre-authorized (or "frozen") in association with the player's credit card, as is known in the art (e.g., $50 in funds are reserved against the card's credit limit, though this may not be the amount that is ultimately charged). After it is determined that a period of time defined by the contract is determined to have ended, it may be determined that the player has accumulated $85 in losses. Accordingly, the player may then approach a contract kiosk 140, insert a contract card, and be presented with a menu of options (e.g., "Purchase a contract extension," "Review your contract," "Settle your contract and receive a receipt"), from which the player may elect to reconcile a contract (e.g., the player selects "Settle your contract"). Thus, as the player may be entitled to a refund amount of $63.75 (i.e., 75% of $85), the player's credit card may be charged $13.75, (e.g., the refund amount owed to the customer minus the $50 contract fee). It should be noted that, in an alternate embodiment, a player may be provided with a refund amount in cash (e.g., a kiosk outputs $63.75 in cash via a benefit output device), while the player's credit card may be charged the contract fee amount (e.g., $50 is charged to the player's credit card).

In yet another example of reconciling a contract, a player may establish an $80 balance in a financial account associated with a contract. The contract may allow the player to receive a 100% refund on any losses incurred over the course of a 12 hours of game play, and a contract fee associated with the contract may decrement the financial account balance by $1 every 150 game plays. Thus, the player may have initiated 9,435 game plays, totaling $62 in contract fees which may be decremented against the account balance (i.e., leaving the player with an $18 account balance). The player may have also accumulated $302.40 in losses during contract play. Accordingly, once the period of time defined by the contract is determined to have ended (e.g., and a display device of a card reader device outputs a "contract complete" indication to the player after 12 hours of play are complete), the player may dial-in to an IVRU operable to facilitate one or more embodiments, and be provided with a menu of options (e.g., "Press '1' to reconcile your contract, press '2' to extend your contract..."), such that the player may indicate a desire to reconcile a contract (e.g., the player presses the appropriate button of a cellular phone keypad). Accordingly, an IVRU in communication with a controller may indicate that a casino representative must be

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dispatched to a particular location on the casino floor (e.g., to a particular gaming device, as identifier by the player when prompted by the IVRU). Thus, a representative may approach the player, and provide a payment of $320.40 (i.e., the refund amount plus the remaining financial account balance), as well as a receipt therefore.

In some embodiments, a player must confirm or acknowledge that the player has received a refund amount. For example, a contract receipt (e.g., such as the example one illustrated in FIG. 13) may require that a player sign to acknowledge receipt of payment and a copy of the signed receipt may be collected by the casino.

Further, in some embodiments, providing a refund amount to a player may comprise updating casino accounting data so as to reflect the payment (e.g., a debit of $53.05 from a casino account is marked as being paid to player P-000529 pursuant to a refund associated with gaming contract C-011245).

Further still, in some embodiments, upon the ending of a period of time defined by a contract, a player may be provided with a "contract period complete" message. Such a message may be output via any of the output devices described herein.

Still further, in one embodiment, a third party may process the management and payment of refunds or provision of other benefits defined by a contract. For example, a third party may (i) determine a refund amount due to a player, (ii) pay the player the refund amount, and / or (iii) charge the casino/operator for the refund amount. Such an embodiment may be advantageous in freeing the casino from the associated operating overhead of managing payment of refunds.

Referring now to Step 1430, it is determined whether the data stored in Step 1415 indicates compliance with the subject contract. Such a determination may comprise, for example, determining one or more terms of the contract (e.g., play requirements or play restrictions defined by the contract) and determining, based on the stored data, whether the one or more terms have been satisfied. For example, if a player requirement specifies a minimum acceptable rate of play, determining compliance with the contract may comprise calculating a rate of play achieved and / or maintained by the player while participating in game plays covered by the contract and determining whether the calculated rate is at least the minimum acceptable rate.

It should be noted that, in one embodiment, a determination of compliance with a contract may be performed during a period of time defined by the contract and / or prior to receiving a contract play termination signal, in lieu of or in addition to being performed after a period of time

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defined by the contract is determined to have ended and / or a contract play termination signal is determined to have been received. For example, while game play data is being determined and stored in Step 1415, the data may be analyzed and compared to the terms of the subject contract (e.g., in a continuous, substantially continuous, or periodic manner) to determine whether the player is complying with the terms of the contract. Accordingly, Step 1430 may be performed earlier in process 1400 than is depicted.

If it is determined, in Step 1430, that the contract has not been complied with, process 1400 continues to Step 1430, in which step an indication of non-compliance with the contract is stored (e.g., in a database, such as the purchased contracts database depicted in FIG. 11). Additionally, a message informing the player of the determined non-compliance (and, for example, the reasons therefore) may be output to the player. If, on the other hand, it is determined that the contract has been complied with, the process 1400 continues to Step 1440.

In step 1440 it is determined whether a benefit is due to a player associated with the contract. For example, if the determination of compliance with the contract has been performed prior to an ending of a period of time defined by the contract (e.g., the determination of compliance was performed during the period of time) and the contract specifies that the benefit is to be provided at the end of the period of time, it may be determined that a benefit is not yet due to the player. If it is determined that a benefit is not yet due, the process 1400 ends (Step 1450). Otherwise, the process 1400 continues to step 1445.

In Step 1445, the benefit due to the player is provided to the player. Providing the benefit to the player may comprise, for example, authorizing a device and / or casino personnel to provide the benefit to the player. For example, if the benefit comprises a monetary amount, a device (e.g., contract kiosk or gaming device) may be directed to dispense an appropriate amount of cash or coins or a cashless gaming receipt redeemable for the appropriate amount of cash. In another example, if a benefit comprises an amount of comp points to be awarded to a player, a device (e.g., computer 110) may cause the appropriate amount of comp points to be added to an account of comp points associated with the player. In yet another example, if a benefit comprises a discount or gift certificate to a retail establishment (such that a player may receive goods and / or services by providing such a gift certificate or voucher), providing the benefit may comprise printing or otherwise providing an instrument entitling the player to the discount or appropriate gift certificate amount. Other manners of providing a benefit would be understood by one of ordinary skill in the art upon reading the present disclosure.

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In one embodiment, providing the benefit to the player may comprise determining a value of a benefit to be provided to the player. Determining a value of a benefit to be provided to the player is described in more detail below with respect to Step 1540 of process 1500.

It should be emphasized again that in one or more embodiments, a benefit may be provided to a player during a period of time defined by a contract (e.g., a number of comp points may be earned by the player and added to an account of comp points associated with the player, a feature of a gaming device is to be activate, a gaming device is authorized and / or directed to allow a player to continue gambling even though a credit meter balance of the gaming device has been depleted below a predetermined level, etc.).

Referring now to FIG. 15, illustrated therein is a flowchart of a process 1500 that is consistent with one or more embodiments encompassed by the present description. The process 1500 illustrates various uses of the various databases described herein. Process 1500 may be performed, for example, by computer 110 that is monitoring activity at gaming devices in order to, among other things, gather data for purposes of determining whether players have earned or otherwise qualified for benefits defined by contracts entered into by the players. It should be noted that, as is true for all processes described herein, a first portion of process 1500 may be performed by a first device (e.g., computer 110) while a second portion of the process 1500 may be performed by a second device (e.g., contract kiosk 140).

Referring now to Step 1505, a determination is made as to whether game play has been initiated at a gaming device. This determination may be made based on, for example, a signal received from a gaming device and / or based on monitoring activity at the gaming device. Determining that game play has been initiated at a gaming device may comprise determining, for example, (i) that a credit meter balance has been established at a gaming device, (ii) that a start button has been actuated or handle has been pulled at the gaming device, (iii) that a player identifier and / or contract identifier has been inserted into the gaming device, (iv) that the presence of a player has been detected within proximity to the gaming device, and / or (v) that a player has begun configuring the gaming device to his preferences. It should be noted that determining that game play has been initiated does not necessarily mean that a particular game play has yet been initiated but may merely indicate that it appears as if a player intends to shortly initiate a particular game play.

In Step 1510 it is determined whether a contract identifier has been received at the gaming device. This determination may comprise, for example, determining whether a player has keyed in a contract identifier to a keyboard of the gaming device, has inserted an instrument (e.g., paper

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receipt bearing machine readable indicia, contract card, player identifier associated with an active contract, etc.) indicating the contract identifier into the gaming device, has spoken the contract identifier into the gaming device, or has otherwise indicated a contract identifier to the gaming device. An indication being received by or input into a gaming device encompasses, of course, the indication being received by or input into a component of the gaming device.

If it is determined that a contract identifier has not been received, the process 1500 ends (process 1515). Otherwise, the process 1500 continues to step 1520.

In Step 1520 it is determined whether the contract associated with the contract identifier applies to the current play of the gaming device (e.g., whether play of the gaming device is covered under the contract). For example, it may be determined (i) whether play of the gaming device would potentially satisfy a play requirement defined by the contract, (ii) whether the gaming device is eligible for contract play in accordance with the contract, and / or (iii) whether a period of time defined by the contract has not yet expired. If these example determinations (or other appropriate determinations) are answered in the affirmative, it may be determined that the contract is applicable to the current play of the gaming device and the process 1500 may continue to step 1530. Otherwise the process 1535 may continue to Step 1535, wherein a warning message may be output to the player (e.g., computer 110 directs the gaming device to output the message), informing the player that play of the gaming device will not be covered under the contract and thus the player may not earn or otherwise qualify for the benefit defined by the contract by playing the gaming device.

In Step 1530, data associated with play of the gaming device is determined. Determining the data may comprise, for example, receiving data associated with one or more game plays initiated and / or completed at the gaming device (e.g., wager posted, outcomes and / or payout received, time each game play is initiated, etc.) and / or determining such data by monitoring the events at the gaming device. Determining such data may further comprise storing such data. Many manners of determining (e.g., monitoring, receiving, storing, etc.) data associated with play of a gaming device have been described with respect to Step 1415 of process 1400, above, and will be described with respect to Step 1605 of process 1600, below. These descriptions are equally applicable to Step 1530 and need not be repeated herein for purposes of brevity.

In some embodiments, Step 1530 may further comprise analyzing such data to determine whether the player is satisfying one or more play requirements defined by the contract, whether a period of time defined by the contract has ended, and / or to determine another piece of information relevant to the contract. In other embodiments, determining the data may not involve any analysis of the data during Step 1530.

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In Step 1535 it is determine whether a benefit is due to a player associated with the contract play of the gaming device for which data is being determined in Step 1535. For example, it may be determined whether a player has earned or otherwise qualified for the benefit defined by the contract. As described, in one or more embodiments, a benefit may be provided to a player while the player is participating in game plays covered by the contract and before a period of time defined by the contract has ended. For example, assume a benefit defined by the contract entitles the player to complete 500 game plays in exchange for a single pre-payment of a predetermined amount (e.g., $20.00) and irrespective of whether the credit meter balance of a gaming device on which the player is participating in the game plays is depleted below a predetermined level. In such an example, Step 1535 may comprise determining whether the credit meter balance has been depleted below the predetermined level and, if so, whether the player has any game plays remaining to be completed under the terms of the contract. If so, an additional amount of credits may be added to the credit meter balance of the gaming device (e.g., by computer 110), without requiring payment therefore from the player, and / or the gaming device may be authorized to allow the player to continue posting wagers and track the posted wagers by continuing to subtract them from the credit meter balance and allowing the credit meter balance to reflect an amount less than zero. In another example, a benefit defined by a contract may comprise an earning of comp points at an accelerated rate and / or access to a bonus round or other feature of the gaming device that would not otherwise be accessible to the player (e.g., without providing additional payment therefore or not at all). In such an example, determining whether the benefit is due to the player may comprise determining whether the player has satisfied the play requirements defined by the contract such that the appropriate amount of comp points (calculated at the accelerated rate) should be added to the player's comp point account and / or whether the player should be granted access to the bonus round or other feature of the gaming device.

If it is determined, in Step 1535, that a benefit is not due, the process 1500 continues to Step 1550. Otherwise, the process 1500 continues to Step 1540, in which the benefit due to the player is determined. Determining the benefit may comprise, for example, calculating a value of the benefit (e.g., calculating a number of comp points to be provided to the player, calculating a monetary amount to be provided to the player, calculating an amount of free additional game plays to be provided to the player, etc.). This may comprise, for example, retrieving a formula from a memory (e.g., the formula may be stored in an available contracts database or a purchased contracts database, which may be accessed based on the contract identifier and using the formula to determine the value of the benefit. In other embodiments, the value of the benefit may be static and not dynamic (e.g., the value of the benefit is predetermined and does not vary based on any behavior or activity of the player). In such an embodiment, determining the benefit may simply

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comprise determining the nature and value of the benefit based on data stored in memory (e.g., by retrieving it from an available contracts database or a purchased contracts database, based on the contract identifier).

In step 1545, the benefit is provided to the player. Providing the benefit may comprise, for example, causing the gaming device to provide the benefit to the player (e.g., causing the gaming device to activate a feature, causing the gaming device to add credits to the credit meter balance, causing the gaming device to dispense a cashless gaming receipt, coins and / or tokens, etc.). In another example, providing the benefit may comprise crediting an account (e.g., a financial account, a comp point account, an account of accumulated free game plays, etc.) associated with the player and causing the gaming device to inform the player of the provided benefit. In yet another example, providing the benefit may comprise directing a casino attendant to approach the player and provide the benefit to the player. Many other manners of providing a benefit have been described with respect to Step 1445 of process 1400, are equally applicable herein and need not be repeated herein for purposes of brevity.

Once the benefit has been provided, process 1500 continues to Step 1550. In Step 1550 it is determined whether an additional game play has been initiated and / or completed at the gaming device (e.g., while the Steps 1535 – 1545 were being performed and / or since the Step 1530 was last performed). If so, the process 1500 returns to Step 1520, in which it is determined whether the contract is applicable to the game play. Otherwise, the process 1500 ends (Step 1525).

It should be understood that many variations on the above-described embodiments are encompassed by the spirit and scope of the present invention. Some of these variations will now be described.

It should be noted that in some embodiments more than one player identifier may be associated with a contract identifier. For example, two players may together receive a multiplayer contract (e.g., two player identifiers are associated with a single contract identifier, and two contract cards comprising the same contract identifier are issued, one to each of the two players). Accordingly, two or more players may simultaneously engage in contract play (e.g., game plays initiated by either of the two players are associated with contract play). In one embodiment, a game play initiated by two or more players may have a cumulative effect of decrementing a "period remaining" associated with the associated contract. For example, if two players receive a contract defining a period of time comprising eight hours, a first player may insert a contract card into a card reader associated with a first gaming device, and a second player may simultaneously or soon thereafter insert a second contract card into a card reader associated with a second gaming device.

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Each player may then play for 30 minutes with the contract card inserted, such that a "period remaining" record of a purchased contracts database may be decremented by one hour. Further, in some embodiments, other data may be aggregated in association with a contract provided to more than one player (e.g., two or more loss amounts are totaled, two or more wager amounts are totaled, etc.), such that a refund amount may be provided to one or more players (e.g., one player accepts a refund amount on behalf of two players, a first and second player each receive half of a total refund amount, etc.) based on the aggregate of the play data associated with the two players.

In some embodiments, a player may be provided with a "cash advance amount." For example, in one embodiment, a player may have paid $100 to establish a contract entitling the player to receive a 100% refund on all losses incurred by game play between 11 a.m. and 9 p.m. Accordingly, the player may incur a substantial amount of losses before the period of time defined by the contract ends (e.g., by 5 p.m.), such that the player may have spent through a gambling budget. Thus, the player may have no more cash with which to wager, though the player may desire to play further, as the player may be entitled to a 100% refund on all losses (e.g., the player thinks, "Even if I spend more cash, I'll get a refund for it all anyway at the end of the contract, so I can't really lose any more money than the $100 contract fee I spent already"). Accordingly, the player may request a cash advance amount. A request for a cash advance may be received by a variety of entities described previously herein (e.g., gaming devices, kiosks, casino representatives operating computing devices, etc.). In some embodiments, a cash advance may comprise a payment of a refund amount (e.g., or portion thereof) that is already due to a customer. For example, a player may have incurred $200 in losses before a period of time defined by a contract ends. Thus, the player may approach a casino representative or contract kiosk and may receive $200 in cash (e.g., in one embodiment, a cash advance comprises an "early and partial reconciliation" of a contract, such that the player may no longer be entitled to receive a refund for the $200 he was paid). In other embodiments, a player may be loaned a cash advance amount, such that the loan amount may be reflected during a contract reconciliation process described herein (e.g., when a player reconciles a contract, a player owes any contract fees and loan amounts, less any refund amounts due). In some embodiments, a fee may be associated with a cash advance (e.g., $1 per cash advance). In one such embodiment, a cash advance fee amount may agreed upon as a term of a contract (e.g., before a contract is established with the player, the player agrees to pay a $2 fee associated with any cash advance subsequently provided to a player).

In one embodiment, a play restriction may indicate a period of time during which one or more particular gaming devices or type of gaming devices must be played. For example, a play requirement defined by a contract may specify that a first gaming device type (e.g., "Any video poker

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machine") must be played for at least a specified first portion of the period of time defined by the contract (e.g., at least one hour out of four hours defined by the contract), and a second gaming device type (e.g., "Wild West Win Slots") must be played for at least a second specified portion of the period of time defined by the contract (e.g., at least 20 minutes out of the four hours defined by the contract).

In some embodiments, a contract may be valid at more than one gaming establishment. For example, a player may purchase a gaming contract entitling the player to receive a 50% refund on any losses incurred during the month of April at any "Casino XYZ" property. In this manner, the player may gamble at a first property maintained by Casino XYZ on a first day in April, and gamble at a second property maintained by Casino XYZ on a second day in April, and expect to have 50% of all the player's losses refunded.

In another embodiment, a player may purchase a gaming contract from a contract facilitator (e.g., "Gaming Contract Company X"), such that the contract is valid at any indicated properties with which the contract facilitator has partnered (e.g., a player purchases a "Las Vegas Casino Pass" from Gaming Contract Company X). In this manner, various systems (e.g., controllers, kiosks, etc.) that are produced, operated, owned and / or operable to communicate with a device operated by the contract facilitator may be installed in one or more participating casinos.

As described, in some embodiments a controller may be operable to detect various "breaks in play" (e.g., a player leaving a contract card in a card reader device without initiating a game play for a period of time), such that the time which a player is not playing a device may not count against a contract (e.g., a value in a "period remaining" field of a purchased contracts database is not decremented). In one such embodiment, the time a player spends in a "bonus round" or other secondary game may not be counted against a period of time defined by a contract.

As is known in the art, player tracking cards typically provide players with an amount of "complimentary points" based on game play (e.g., a player earns one point for each game play, such that a player may later redeem such points for merchandise or other benefits). In one embodiment of the present invention, a player may earn such traditional "comp points" during contract play. In another embodiment, a player may not earn such traditional comp points during contract play. For example, a player associated with an active contract who desires to earn comp points may be required to insert a traditional player tracking card. Accordingly, a controller may be operable to detect whether a player wishes to play for comp points, or engage in contract play (e.g., depending on the type of card the player inserts into a reader device).

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In some embodiments, a player may receive a "contract extension" that entitles the player to an extension of the period of time defined by the contract. For example, a player may have purchased a contract entitling the player to receive a 100% refund of all losses incurred within six hours of game play. As described previously, after six hours have elapsed (e.g., a "period remaining" field of a purchased contracts database is completely decremented), the period of time defined by the contract may be considered to have ended, such that a player may not receive a refund associated with any further play. Thus, a contract extension may allow a player to receive a longer contract period (e.g., the player gains another hour of play during which any losses will be covered by a 100% refund). A player may be provided with a contract extension in a variety of manners. In one example, a player whose period of time defined by a contract has ended may approach a casino representative and pay a fee (e.g., $10 per hour) to receive a contract extension (e.g., such that the representative uses a computer device in communication with one or more databases of the present invention to update one or more terms associated with the player's contract). In another example, a player may approach a contract kiosk 140 and select an "Add time" option from a menu of options output via a display screen. In some embodiments, a player establishing a contract may select or otherwise be provided with an "automatic extension" option, such that should the period of time defined by the contract end (e.g., the player completes six hours of play), the player may remain eligible to earn a refund amount based on subsequent play initiated after the end of the period of time if the player continues to play. For example, an automatic extension term associated with a contract may stipulate that once an initial period of time defined by a contract has ended, a player may be entitled to one or more "contract extension periods" (e.g., one hour increments of time), with which a "contract extension fee" may be associated (e.g., $10 for the first additional hour, $15 for the second additional hour, etc.). Additionally, similar or different contract terms may be associated with one or more contract extension periods (e.g., a refund rate is 100% during an initial contract period, but falls to 90% during a contract extension period). Thus, in one example, a player may purchase a contract for six hours of play with a 100% refund rate. After the six hours elapse, the player may continue to play (e.g., a contract card remains inserted in a card reader device and the player continues to play even after a "contract period complete" message is output to a player as described). Accordingly, contract data (e.g., game play data) may then be stored in association with (i) the original contract identifier or the initial period of time, and / or (ii) a newly-created contract extension identifier or an additional period of time by which the initial period of time has been extended.

In one embodiment, a player may win a contract extension (e.g., on a random basis and / or in response to certain desirable gambling behavior by the player). For example, a player may be provided with a "bonus contract extension" if certain criteria are met (e.g., a contract extension for

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which no fee is associated). For example, a player may be provided with a "free extra hour" of coverage if the player (i) plays during a certain period of time (e.g., "Play for one hour before 7 a.m., and get an extra hour FREE after 5 p.m."); (ii) maintains a certain rate of play (e.g., "Average more than 600 spins per hour, and get an hour of coverage for FREE"); (iii) wagers a certain amount in association with one or more game plays (e.g., "Wager more than $4000 during your contract and get an hour FREE"), and / or (v) otherwise qualifies for the contract extension.

In accordance with some embodiments, gaming device output device(s) may be configured to output information (e.g., received from the controller and / or contract kiosk) pertaining to one or more statuses (and / or other information) associated with a contract. For example, a gaming device LCD (or other output device) may display information pertaining to the status of a particular contract to an associated player (e.g., based on a player identifier, gaming device identifier and / or contract identifier). Such status information may include, for example, an indication of one or more of the following: (i) an amount of elapsed time or number of elapsed game plays associated with the contract; (ii) an amount of time or number of game plays remaining subject to the contract; (iii) a net present refund amount associated with the contract (e.g., a dollar amount and / or percentage of total session wager or session loss that may be refunded to the player); (iv) net present win/loss associated with the contract; (v) an amount of wager remaining subject to the contract; (vi) an indication of one or more game play parameters required to fulfill the contract; (vii) offers or instructions to renegotiate or reestablish an existing contract; (viii) offers or advertisements outlining other available contracts or contract terms; (ix) the status of another contract (e.g., the status of a wife's contract may be output to her husband at a gaming device associated with the husband's player identifier); (x) information indicating that the terms of a contract have been fulfilled; and / or (xi) information indicating that the player is in breach of one or more terms of a given contract (e.g., a text message indicating "In order to be eligible a loss refund, you may wager only one coin per line").

Such information may be provided and / or updated on a continuous basis (e.g., after each wager or handle pull) and / or periodic basis (e.g., the information may be updated twenty times or at regular intervals over the course of a given contract). Accordingly, players may be apprised of various statuses or other information associated with one or more contract(s) while executing play at a gaming device. Alternatively, the execution of game play may not be necessary in order for a player to inquire or ascertain the status of his or her contract at a gaming device. For example, various functions of a contract kiosk 140 (described above) may be incorporated into that of a gaming device 130, such that a player may utilize a gaming device in order to inquire about and ascertain (e.g., status) information pertaining to a particular contract (e.g., by inputting a contract

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card to a gaming device card reader and actuating an "acquire contract status" button of a gaming device). Further, in some embodiments, status information may be output to a player's cellular phone (e.g., an IVRU may be configured to periodically dial a player's number and output status information) or other device associated with the player (e.g., to an e-mail account associated with the player viewable by a portable computing device). Contract status information may be output at a gaming device via a dual-use output device (e.g., an LCD capable of outputting both a player's current credit balance and various contract status information) and / or via a dedicated output device (e.g., a peripheral device with display screen dedicated to solely outputting contract status information).

In some embodiments, a player may be allowed to indicate whether a game play is to be covered by a contract (e.g., or be used to decrement a period remaining associated with a contract) essentially on a game play-by-game play basis. For example, prior to initiating a particular game play (e.g., if the player is feeling unlucky and has entered into a contract which defined a benefit comprising a refund amount), the player may indicate that this particular game play is to be covered under the contract (e.g., by inserting his contract card or actuating an appropriate button on the gaming device). In such an embodiment, unless the player provides an appropriate indication prior to or at the time of initiating a game play, the game play may not be covered by the contract. In another embodiment, once a player provides an indication that a game play is to be covered under a contract, all subsequently initiated game plays are covered by the contract (if the game plays qualify for coverage under the contract) unless and until the player indicates otherwise.

In some embodiments, a player may be restricted from establishing a contract if the player has previously abused a previously entered contract as determined by a gaming establishment. For example, in some embodiments, a player may initiate a number of game plays that is not consistent with an acceptable manner of play (e.g., a player initiates no game plays during the first several hours of a period of time defined by a contract, then initiates a large amount of game plays during the final 30 minutes). Accordingly, such a player may be "flagged" as a problem player, such that the player is no longer to eligible to enter into a contract and / or no longer eligible to enter into a contract defining a certain contract term. For example, a "problem flag" may appear in association with a player identifier of a player database, and a rule of a player eligibility rules database may indicate that should there be a "problem flag," the player may not be eligible to establish a contract. A process for determining whether a player should be prevented from establishing a contract in the future will now be described in more detail with respect to FIG. 16.

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Referring not to FIG. 16, illustrated therein is a flowchart of an example process 1600 that is consistent with one or more embodiments encompassed by the present description. In general, the process 1600 may be performed in order to avoid or reduce a likelihood of players gaming a casino or other entity via purchase of contracts consistent with the present invention. In another aspect of the embodiments encompassed by the process 1600, the process 1600 may be helpful in determining which types of contracts and / or contract terms a player should be eligible for (or restricted from) in the future.

For example, in accordance with one or more embodiment, apparatus, systems and methods may be provided for monitoring a contract (e.g., an agreement between a player and a casino establishment relating to game play within the casino). In one or more embodiments, one or more devices (e.g., computer 110, a contract kiosk 140, a gaming device 130, and / or a contract server) may be operable to (i) provide a contract associated with a contract identifier (e.g., establish a contract and provide a player a contract card), (ii) receive a contract initiation signal (e.g., detect the insertion of the contract card into an eligible gaming device), (iii) monitor play data associated with the contract identifier (e.g., track actions by the player), and / or (iv) determine whether to prevent the player from purchasing one or more contracts in the future based on the monitored play. Such a system may be advantageous in that contracts may be administered with less risk that a player may intentionally or unintentionally violate the terms or spirit of the contract (e.g., since a player who knows his game play is being monitored for such a purpose may desire avoiding any activity or behavior that may cause the player to be prevented from purchasing a contract in the future).

For example, in one scenario a player may be tempted to "game" a casino via abuse of a contract be removing a player tracking card during certain game plays (e.g., in order to maximize losses incurred under the contract) and / or by inserting a contract card into a gaming device being played by another player (e.g., unbeknownst to the other player), in order to earn a refund based on losses incurred by the other player. The embodiments described with reference to FIG. 16 aim to prevent or at least lessen the likelihood of a player gaming a casino in such a manner.

Referring now to Step 1605, play of a gaming device is monitored by a device (e.g., by a computer 110, contract kiosk, 140, gaming device 130, a contract server). The game play may comprise game play associated with a contract. For example, it may first be determined (e.g., as described with respect to Steps 1405 and 1410 of process 1400 and / or as described with respect to Steps 1505 through 1520) that a contract has been established and that play of the gaming device is covered under the contract. This may comprise, for example, determining that a player of

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the gaming device is engaged in contract play. In one embodiment, monitoring of play of a gaming device may include storing and / or analyzing data associated with the monitored play. It should be noted that monitoring play of a gaming device may comprise monitoring play of several gaming devices (e.g., gaming devices that a player plays consecutively, simultaneously or at various times).

Monitoring the play of the player who is engaged in contract play of a gaming device may be performed in a variety of manners. For example, in one embodiment, a controller or other device may receive game play data from the gaming device and store it in an appropriate record of a database (e.g., a record for recording game play data in association with a particular contract identifier). Such game play data may include:

(i) Outcome achieved (e.g., bar-bar-bell, As Qh Qs 3d 2h in video poker);

(ii) Payout amount (e.g., three coins paid for a pair of jacks or better);

(iii) Wager amount (e.g., player wagered two quarters);

(iv) Game actions (e.g., player drew three cards to a pair of queens, player selected first of three locations in a bonus round selection stage);

(v) Type of gaming device played (e.g., stepper, video poker, five reel video);

(vi) Denomination of gaming device played (e.g., nickel, quarter, dollar);

(vii) Manufacturer of gaming device played;

(viii) Location of gaming device played;

(ix) Rate of play (e.g., number of handle pulls per unit time);

(x) Acceleration of play (e.g., rate of increase or decrease in rate of play);

(xi) Variation in wager amount (e.g., increases or decreases in the amount of the wager over time);

(xii) Player tracking card and / or contract card usage (e.g., is the player frequently removing and re-inserting his player tracking card and / or contract card, has the card been inactive for a long period of time, etc.);

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(xiii) Precision of player strategy (e.g., is the player playing jacks or better 6/9 video poker according to optimum play); and / or

(xiv) Strategy variations (e.g., has the player switched from an optimal video poker strategy to a strategy of sacrificing optimal play to maximize his chances at completing a royal flush).

In one embodiment, Step 1605 includes monitoring of player behavior and / or activities other than game play activity at a gaming device. For example, actions that the player makes while establishing and / or reconciling a contract may be monitored as well.

In one embodiment, the monitoring of play of a gaming device may include comparing a player identification presented when establishing and / or reconciling a contract (e.g., at a slot booth) with identification information stored at a controller. This may be done, for example, to check that the same person who purchased the contract is the person attempting to reconcile the contract and / or who has participated in game plays covered by the contract.

In one embodiment, the monitoring of play need not rely on data received from a gaming device. For example, some or all of the data may stored at a controller (*e.g.*, a slot server) or other device (e.g., contract kiosk). In some embodiments, data related to monitored play may be observed and / or input by casino personnel. Some types of data may be received via a contract kiosk or other type of terminal (*e.g.*, player inputs a contract password at a contract kiosk in order to receive a refund amount defined by a contract).

Data associated with monitored play of a gaming device may be stored in a database (e.g., a player database, a purchased contracts database, and / or another database) or other memory means of a device. A player database, for example, may be accessed in accordance with a particular player identifier or player name (e.g., a casino representative keys-in a player name, swipes a player tracking card through a card-reader device in communication with a casino personnel device, etc.) so as to determine information about the player and / or play by the player.

In Step 1610, a determination is then made as to whether or not the player should be prevented from purchasing or otherwise entering one or more contracts in the future. This determination may be made based on play of the gaming device (and / or other behavior or activities of a player) monitored and / or stored in Step 1605. In one embodiment, determining whether a player should be prevented from purchasing a contract in the future may comprise determining

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whether the player should be prevented from purchasing or otherwise entering into any contract in the future. In another embodiment, determining whether a player should be prevented from purchasing or otherwise entering into a contract in the future may comprise determining whether the player should be prevented from purchasing or otherwise entering into a specific contract and / or a contract defining one or more specific terms or value thereof.

In one embodiment, determining whether a player should be prevented from purchasing or otherwise entering into a contract in the future may further comprise causing the player to be prevented from purchasing or otherwise entering into a contract in the future. For example, an indication of the player's ineligibility to establish a contract, a particular type of contract, and / or a contract defining certain terms may be stored in an appropriate record of a database (e.g., the record corresponding to the player in the player database). In one embodiment, if the player is to be prevented from purchasing or otherwise entering into a contract in the future for a predetermined period of time, an indication of the period of time may also be stored in association with the player's ineligibility.

In one embodiment, the determination of whether a player should be prevented from purchasing or otherwise entering into a contract in the future, based on play of a gaming device monitored previously, may be performed in response to a player's request to establish a contract. In such an embodiment, an analysis of the stored data may be performed and a message informing the player of his ineligibility may be output based on the analysis at the time of the request. This may be done in some embodiments in lieu of the determination being made based on retrieving a previously stored indication of the player's ineligibility from a record of a database).

In one embodiment, determining whether a player should be prevented from purchasing or otherwise entering into a contract in the future may comprise determining whether the player has complied with one or more terms of the contract the player has previously established. For example, a player whose rate of play during the contract period is below a minimum acceptable rate of play defined by a contract may be prevented from establishing future contracts and / or from establishing future contracts with the minimum acceptable rate of play (in one example, a lower minimum rate of play may be defined by a future contract provided to a player). To make a determination of whether the game play data indicates a compliance with one or more terms of a contract, a controller may access game play data and compare it with the terms defined by the subject contract. In the current example, the play data may indicate that the player made 120 handle pulls per hour during the period of time defined by the contract while the contract associated with the player may require a minimum acceptable rate of 200 handle pulls per hour. In one

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embodiment, while the player may still receive a refund of losses despite not having complied with the minimum acceptable rate of play, the player may be prevented from establishing a contract in the future and / or from establishing a contract that has a minimum acceptable rate of play of 200 handle pulls per hour or any greater minimum acceptable rate of play.

It should be noted that determining whether a player should be prevented from purchasing or otherwise entering into a contract in the future may comprise determining that a player should be prevented from entering into a contract for a predetermined period of time and / or until a predetermined condition is satisfied. For example, the player may be prevented from entering into a contract for one month, one year, until the player's average minimum rate of play is at least a predetermined average minimum rate of play, until a status associated with the player changed, etc. In one embodiment, step 1610 may further comprise determining the period of time for which the player is to be prevented from purchasing or otherwise entering into a contract.

In one embodiment, monitored game data may indicate that the player has left his contract play card three times in machines that have not seen play for five minutes or more. While this may be an indication of a forgetful customer, it could also be a signal that the player may be intentionally leaving the contract play card in unattended machines in the hopes that another player will unknowingly sit down at that machine and begin a non-contract gaming session. In this way, the player who sat down might thus generate losses associated with that particular gaming contract without costing the first player any money (since the first player did not post the wagers for the game plays while the contract card was in the gaming device). These false losses might then result in substantial refund payments to the first player at the conclusion of the period of time defined by the contract. To address this issue, a controller might direct casino personnel to talk with the player when an orphaned card was detected more than three times. Alternatively or in addition, the controller may prevent such a player from establishing contracts in the future (e.g., by flagging the player, in the record of the player database that corresponds to the player, as a player who is not eligible to establish contracts). In another embodiment, a player might be required to visit a slot club booth to reactivate a contract card if it had been sitting idle in a machine for five minutes or more.

In one embodiment, a controller or other device may adjust game play data associated with the subject contract (e.g., to bring it in line with one or more terms of the contract and / or to compensate for one or more behaviors of a player that appear to be aimed at inappropriately maximizing the value of the benefit defined by the contract). For example, if it is determined that the player is removing his contract card after being dealt a strong initial hand in video poker (e.g. four queens) in an effort to generate large false losses (due to the fact that the controller would not track

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the final outcome if the card had been removed), then the controller may be programmed to automatically add outcomes subsequently achieved by the player after the card was removed. The controller may also be operable to track the initial hand dealt to the player and keep tracking (for the purposes of determining win/loss) until the hand was completed. In one embodiment, a warning message may also be output to casino personnel whenever a player withdrew his contract card after being dealt an initially winning (or likely to result in a winning outcome) video poker hand. Such tactics may also be used in other multi-stage games, such as video blackjack or even reel-based games if the player has an ability to pull a contract card out of a gaming device after seeing winning results on the first three reels of a five reel game.

In one embodiment, determining whether a player should be prevented from purchasing or otherwise entering into a contract in the future may be based on a determination of whether a player's gambling behavior changed in a certain manner during the period of time defined by the contract and / or as compared to the player's gambling behavior while the player was not participating in play covered by a contract. For example, monitored game play data may indicate that a player began a period of time defined by a contract by posting relatively small wagers per game play but then increased the size of the wager per game play dramatically as the contract neared the end of the period of time. This behavior of the player might be consistent with a player attempting to artificially decrease the effective standard deviation of the period of time defined by the contract. While this may not violate the terms of the contract, the casino may choose not to enter into contracts with this player in the future.

In one embodiment, determining whether a player should be prevented from purchasing or otherwise entering into gaming contracts in the future may be based on a determination of whether monitored game play data indicates that the player identifier presented at the reconciliation of a contract matches that provided at the establishment of the contract. Non-matching identification may indicate that a player has sold his contract to anther player (perhaps exploiting the fact that contracts may be limited in number and thus may be highly desirable on some days or that only certain player may be eligible to enter into contract in general or into certain highly desirable contracts). The selling player may be prevented from entering into a contract in the future. Similarly, game play data may indicate that a first player has handed his contract card to another player (perhaps determined through the review of surveillance cameras). If such behavior is contrary to the terms of the contract, the player may have restrictions placed on his ability to enter into a contract in the future.

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In accordance with some embodiments, a gaming device may have a feature which allows a player to build up equity, such as by collecting diamonds or other benefits or symbols upon an occurrence of a predetermined event during game play (e.g., whenever a special symbol appears on the payline and / or a predetermined outcome is achieved). At such machines, a player participating in contract play may advantageously play with his contract card in the machine until achieving a number of diamond symbols. At this point the may remove the contract card and quickly achieve a bonus payout for accumulating enough diamond symbols. This method of play may be determined by the controller based on the monitored game play data and the player may be prevented from using that particular type of equity machine in future contract play and / or may have other restrictions place on his ability to purchase or otherwise enter into contracts.

In one embodiment, a controller may be operable to terminate contract play under a contract based on the monitored play of the gaming device. The controller may be operable to do so addition to or in lieu of preventing a player from purchasing or otherwise entering into a contract in the future. Alternatively, the controller may reduce benefits to the player associated with the contract. For example, if the contract defines a refund rate of 100% of a player's losses, the controller may determine to pay back only 50% of the player's losses based on the monitored play of the gaming device.

As described, in one or more embodiments, rather than preventing the player from purchasing or otherwise entering into a contract in the future, the controller may be operable to add rules/restrictions regarding the player's eligibility to enter into contracts in the future. Such rules/restrictions might include, for example:

(i) that the player must pay 50% more for a contract than the player would otherwise be required to pay;

(ii) that the player is eligible for some types of contracts or contract terms, but ineligible for other types of contracts or contract terms;

(iii) that the player may continue to be eligible to enter into a contract, but not for a contract that is eligible for contract play on video poker devices;

(iv) that the player may only establish one contract per month or per other unit of time;

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(v) that the player is eligible only for certain value or value ranges of certain contract terms (e.g., a refund rate of up to 50% of losses); and / or

(vi) that the player must maintain a minimum of 500 handle pulls per hour during all contract play.

The foregoing description discloses only exemplary embodiments of the invention; modifications of the above disclosed apparatus and methods which fall within the scope of the invention will be readily apparent to those of ordinary skill in the art.

For example, it should be understood that aspects of the invention may be utilized in connection with a device or devices located at a table game which facilitate placement of bets or other activities at a table game while reducing or eliminating actions required on a part of a player of the table game. For example, the MP21 table manufactured by Bally Table Management Systems (TMS) division of Bally Systems® is an advanced blackjack table that includes an array of state-of-the-art optical and electronic sensors. The MP21 constantly captures real-time data to instantly track and record every card dealt and every wager made to determine an accurate reporting of table game results. A device such as the MP21 may be used in embodiments of the present invention to monitor contract play at a table game. Other products manufactured by Bally TMS may also be used in embodiments of the present invention to monitor contract play at a table game. For example, Bally TMS produces the technology formerly known as MindPlay, which includes touch-screen data ratings products (formerly known as eTABLE), card security (Bally MPBaccarat(TM), UCS intelligent card shoe), and the MP21. Any and all of these products may be used in an embodiment of the present invention. Further, U.S. Patent No. 6,460,848 to Soltys et al., entitled "Method and Apparatus for Monitoring Casinos and Gaming" describes a "system [that] automatically monitors playing and wagering of a game, including the gaming habits of players and the performance of employees." (Abstract). The systems and methods of this invention may be used some embodiments described herein to monitor gaming activity of a player (e.g., at a table game) and is hereby incorporated by reference herein for all purposes.

It should also be understood that aspects of the present invention may be applicable to games in which the skill of the player and / or player input may partially or completely determine the outcomes. Such games may include video poker and video blackjack and may also include other games not usually present in casinos. For example, such games may include a simulation of a golf

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putting game, in which player input causes a simulated golf ball to be propelled toward a simulated golf hole. If the simulated ball lands in the simulated hole, a prize may be awarded. A machine which allows playing of such a simulated golf game is to be included in the term "gaming device" as used herein.

Accordingly, while the present invention has been disclosed in connection with exemplary embodiments thereof, it should be understood that other embodiments may fall within the spirit and scope of the invention as defined by the following claims.

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What is claimed:

1. A method comprising:

determining that play of a gaming device qualifies for coverage under a contract previously purchased;

monitoring the play; and

reconciling the contract based on the monitored play.

2. The method of claim 1, wherein determining is based on receiving, from a gaming device, an indication that an identifier that is associated with the contract has been inserted into the gaming device, and further comprising:

determining terms of the contract; and

determining that play of the gaming device satisfies the terms.

3. The method of claim 1, wherein reconciling comprises:

determining whether the contract has been complied with; and

providing a benefit to a player who purchased the contract only if the contract has been complied with.

4. The method of claim 3, wherein the benefit is a refund of at least a portion of losses incurred by the player during a period of time defined by the contract.

5. The method of claim 3, further comprising:

determining that the contract has been complied with.

6. The method of claim 5, wherein determining that the contract has been complied with comprises:

determining that an amount of play defined by the contract has been completed in a satisfactory manner.

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7. The method of claim 6, wherein determining that the amount of play defined by the contract has been completed in a satisfactory manner comprises at least one of:

determining that the amount of play is not less than a minimum amount of play;

determining that the amount of play is not more than a maximum amount of play;

determining that the amount of play equals a specified amount of play;

determining that the play was conducted on a gaming device approved for play under the contract;

determining that the play was conducted within a period of time defined by the contract;

determining that the play required a minimum sum of wagers;

determining that the play was conducted at a minimum required rate; and

determining that a minimum wager amount was posed for at least one game play encompassed by the play.

8. A method, comprising:

receiving a contract initiation signal from a gaming device;

storing data associated with game play of the gaming device until one of a contract play termination signal is received and an end of a contract period is determined; and

providing a benefit defined by the contract based on whether the data indicates a compliance with terms of the contract.

9. The method of claim 8, wherein the benefit comprises a refund of at least a portion of losses incurred by a player associated with the contract during a period of time defined by the contract.

10. The method of claim 8, wherein the benefit comprises a refund of at least a portion of wagers posted by a player associated with the contract during a period of time defined by the contract.

11. The method of claim 8, wherein the benefit comprises authorizing the gaming device to allow play of the gaming device once a credit meter balance of the gaming device has been depleted below a predefined level.

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12. The method of claim 11, wherein authorizing the gaming device to allow play of the gaming device comprises authorizing the gaming device to allow the credit meter balance to be a negative number.

13. The method of claim 11, wherein authorizing the gaming device to allow play of the gaming device comprises authorizing the gaming device to add credits to the credit meter balance without requiring payment therefore from a player playing the gaming device.

14. A system, comprising:

a computing device operable to communicate with a plurality of gaming devices, each of the gaming devices operable to facilitate a wagering game, the computing device being further operable to:

determine an initiation of a game play at one of the gaming devices;

determine an identifier of a contract associated with the game play,

wherein the contract has been entered into by a player prior to the initiation of the game play, and

wherein the contract defines a contract period and a benefit to which the player is entitled if the terms of the contract have been satisfied;

determine data associated with the game play; and

determine whether the player is entitled to the benefit based on the data and the terms.

15. The system of claim 14, the system further comprising:

the plurality of gaming devices.

16. The system of claim 14, wherein the computing device is further operable to:

store the data in association with data from at least one other game play, thereby storing data indicative of a plurality of game plays; and

determine whether the player is entitled to the benefit based on the data indicative of the plurality of game plays.

17. The system of claim 14, wherein the benefit is provided to a player at an end of a period defined by the contract, provided the player has complied with the terms of the contract.

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18. The system of claim 14, wherein the benefit is provided to a player during a period of time defined by the contract, provided the player is currently complying with the terms of the contract.

19. The system of claim 14, wherein the contract comprises a contract in exchange for which the player provided payment.

20. The system of claim 14, wherein the computing device is further operable to:

determine whether the game play qualifies as a game play that is covered under the terms of a contract.

21. The system of claim 20, wherein the computing device is further operable to:

store the data associated with the game play in association with the identifier only if the game play qualifies as a game play that is covered under the terms of a contract.

22. The system of claim 14, wherein the computing device is further operable to:

identify the contract based on an identifier provided by the player to the gaming device.

23. The system of claim 22, wherein the identifier is an identifier uniquely identifying the contract.

24. The system of claim 22, wherein the identifier uniquely identifying the player.

25. The system of claim 14, wherein the computing device is further operable to:

provide the benefit to the player.

26. The system of claim 14, wherein the computing device being operable to provide the benefit to the player comprises the computing device being operable to cause a gaming device of the plurality of gaming devices to output the benefit to the player.

27. The system of claim 14, wherein the computing device being operable to provide the benefit to the player comprises the computing device being operable to authorize a casino employee to provide the benefit to the player.

28. The system of claim 14, wherein the benefit is a monetary payment.

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29. The system of claim 28, wherein the monetary payment is an amount based on a refund of at least a portion of losses incurred by the player during the contract period.

30. The system of claim 14, wherein the computing device is further operable to:
receive a request from the player for the benefit; and
determine, in response to the request, whether the player is entitled to the benefit based on the data and the terms.

31. The system of claim 14, wherein the computing device is further operable to:
determine the benefit based on the data and the terms of the contract.

32. The system of claim 31, wherein the computing device being operable to determine the benefit based on the data and the terms of the contract comprises the computing device being operable to determine a value of the benefit based on the data and the terms of the contract.

33. The system of claim 14, wherein the computing device is further operable to:
authorize a sale of the contract to the player.

34. A method, comprising:
determining data associated with play of a gaming device by a player; and
determining, based on the data, whether to prevent the player from entering into a contract based on the data.

35. The method of claim 34, wherein the contract allows a player to earn a benefit defined by the contract in exchange for participating in play of a gaming device in accordance with terms of the contract and during a period of time defined by the contract.

36. The method of claim 34, wherein the data associated with the play of the gaming device is also associated with a contract previously entered into by the player.

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37. The method of claim 34, wherein determining whether to prevent the player from entering into a contract comprises at least one of:

determining whether to prevent the player from entering into a particular contract;

determining whether to prevent the player from entering into a contract defining a particular term;

determining whether to prevent the player from entering a particular type of contract; and

determining whether to prevent, for a period of time, the player from entering a contract.

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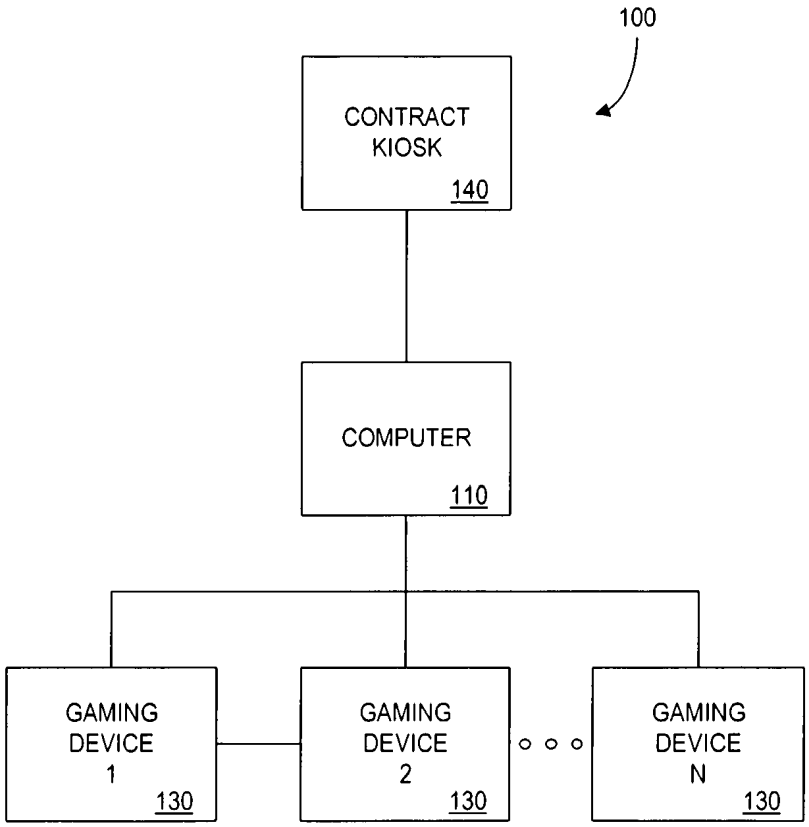
100
CONTRACT KIOSK
140
COMPUTER
110
GAMING DEVICE 1
130
GAMING DEVICE 2
130
GAMING DEVICE N
130

FIG. 1

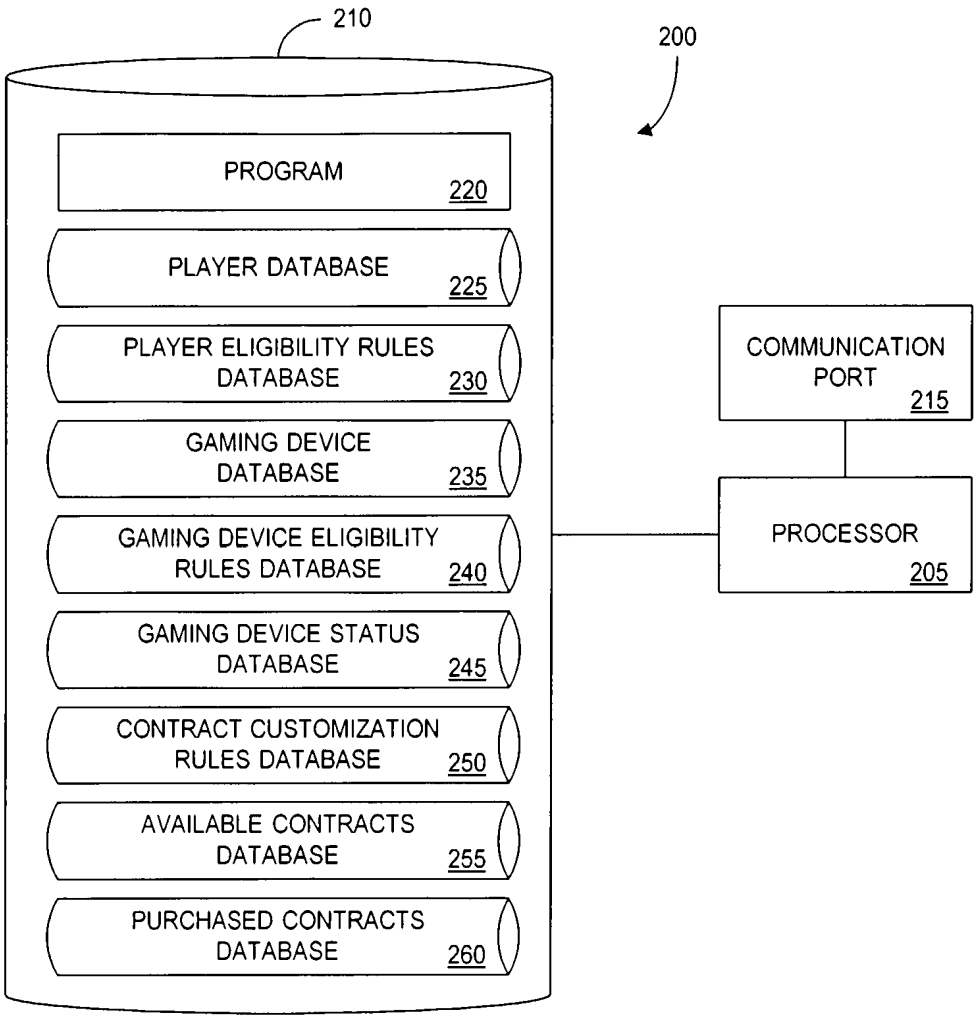
210
200
PROGRAM
220
PLAYER DATABASE
225
PLAYER ELIGIBILITY RULES DATABASE
230
GAMING DEVICE DATABASE
235
GAMING DEVICE ELIGIBILITY RULES DATABASE
240
GAMING DEVICE STATUS DATABASE
245
CONTRACT CUSTOMIZATION RULES DATABASE
250
AVAILABLE CONTRACTS DATABASE
255
PURCHASED CONTRACTS DATABASE
260
COMMUNICATION PORT
215
PROCESSOR
205

FIG. 2

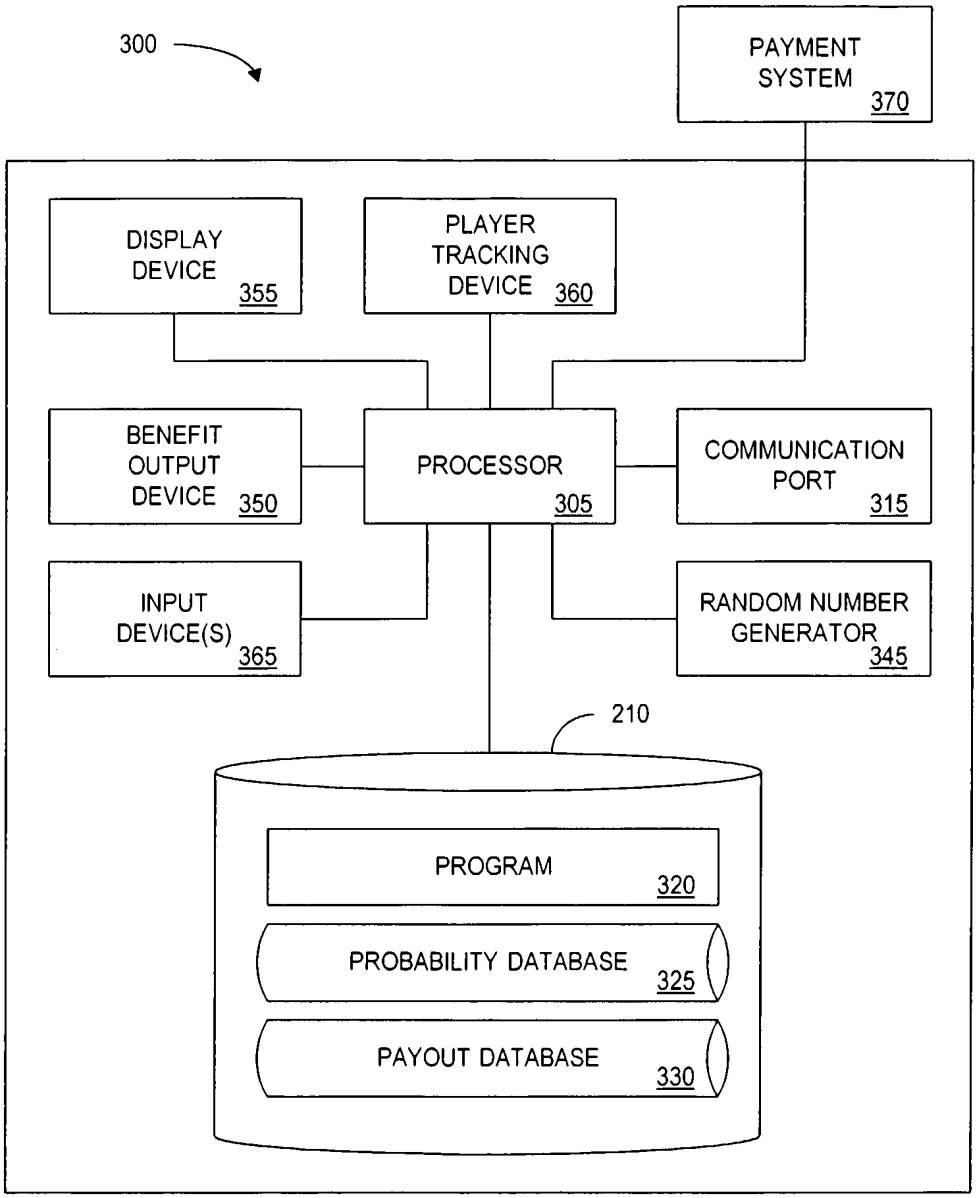
300
PAYMENT SYSTEM 370
DISPLAY DEVICE 355
PLAYER TRACKING DEVICE 360
BENEFIT OUTPUT DEVICE 350
PROCESSOR 305
COMMUNICATION PORT 315
INPUT DEVICE(S) 365
RANDOM NUMBER GENERATOR 345
210
PROGRAM 320
PROBABILITY DATABASE 325
PAYOUT DATABASE 330

FIG. 3

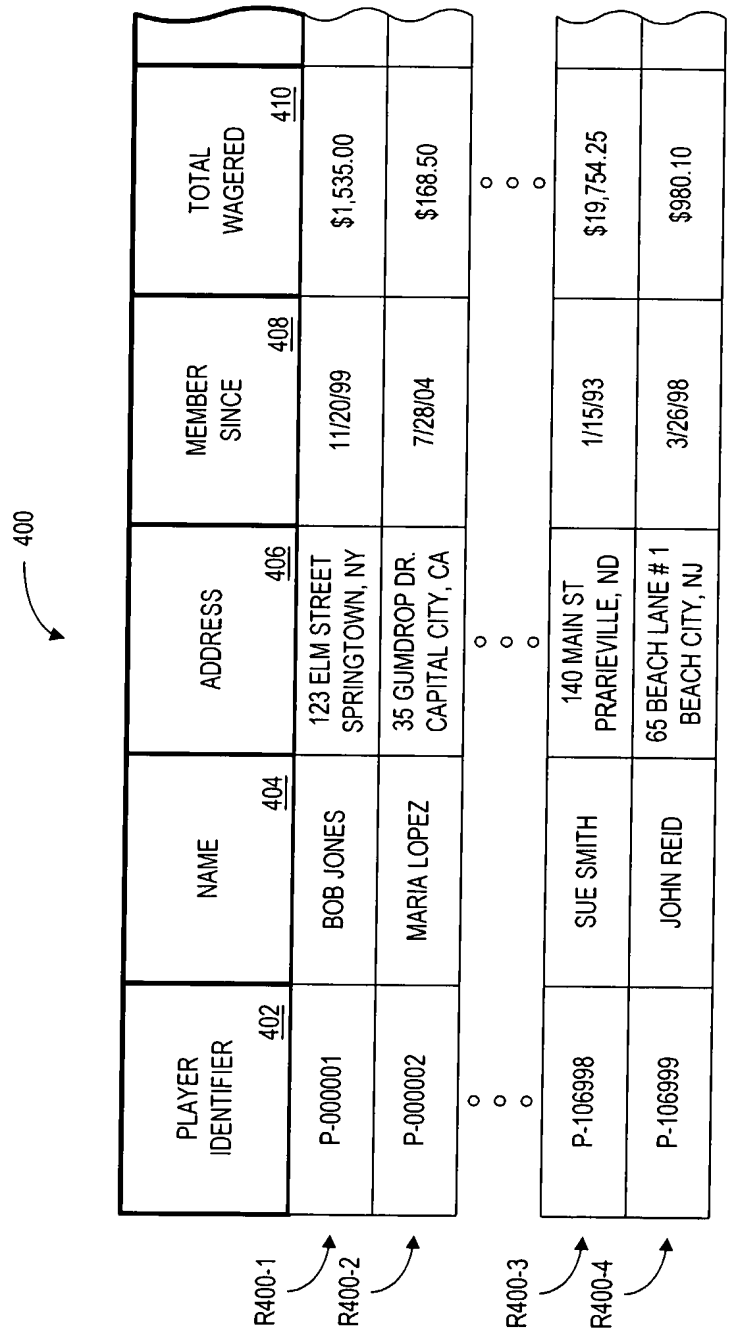
400
PLAYER IDENTIFIER 402
NAME 404
ADDRESS 406
MEMBER SINCE 408
TOTAL WAGERED 410
P-000001
BOB JONES
123 ELM STREET SPRINGTOWN, NY
11/20/99
$1,535.00
P-000002
MARIA LOPEZ
35 GUMDROP DR. CAPITAL CITY, CA
7/28/04
$168.50
P-106998
SUE SMITH
140 MAIN ST PRARIEVILLE, ND
1/15/93
$19,754.25
P-106999
JOHN REID
65 BEACH LANE # 1 BEACH CITY, NJ
3/26/98
$980.10
R400-1
R400-2
R400-3
R400-4

FIG. 4A

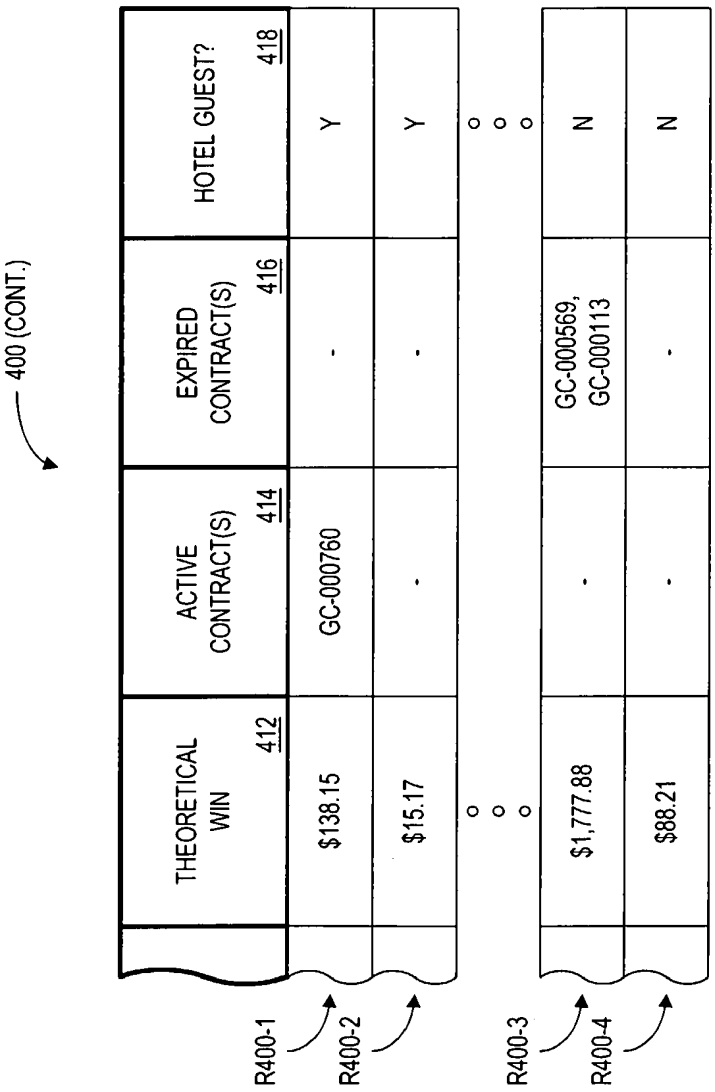
400 (CONT.)
THEORETICAL WIN 412
ACTIVE CONTRACT(S) 414
EXPIRED CONTRACT(S) 416
HOTEL GUEST? 418
R400-1
$138.15
GC-000760
-
Y
R400-2
$15.17
-
-
Y
R400-3
$1,777.88
-
GC-000569, GC-000113
N
R400-4
$88.21
-
-
N

FIG. 4B

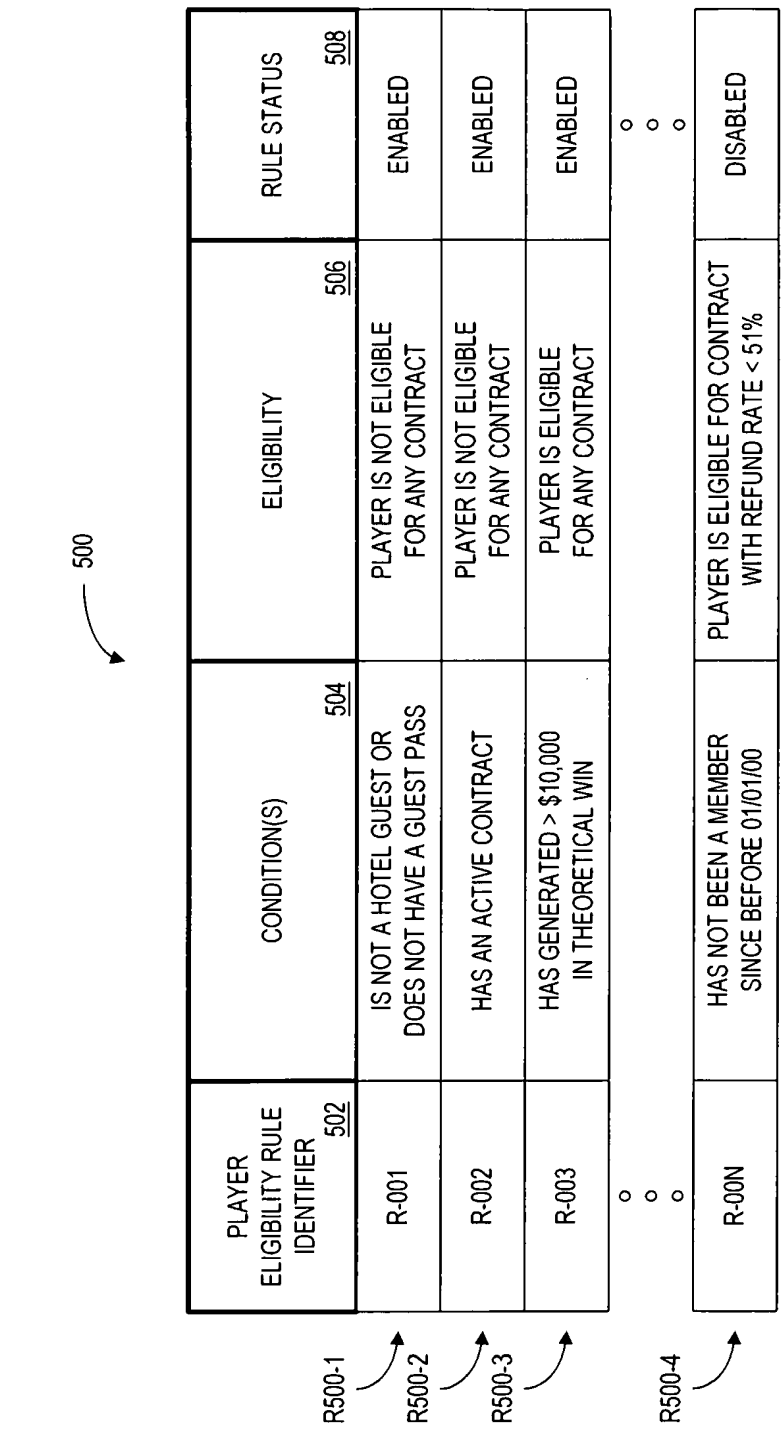
500
PLAYER ELIGIBILITY RULE IDENTIFIER 502
CONDITION(S) 504
ELIGIBILITY 506
RULE STATUS 508
R-001
IS NOT A HOTEL GUEST OR DOES NOT HAVE A GUEST PASS
PLAYER IS NOT ELIGIBLE FOR ANY CONTRACT
ENABLED
R-002
HAS AN ACTIVE CONTRACT
PLAYER IS NOT ELIGIBLE FOR ANY CONTRACT
ENABLED
R-003
HAS GENERATED > $10,000 IN THEORETICAL WIN
PLAYER IS ELIGIBLE FOR ANY CONTRACT
ENABLED
R-00N
HAS NOT BEEN A MEMBER SINCE BEFORE 01/01/00
PLAYER IS ELIGIBLE FOR CONTRACT WITH REFUND RATE < 51%
DISABLED
R500-1
R500-2
R500-3
R500-4

FIG. 5

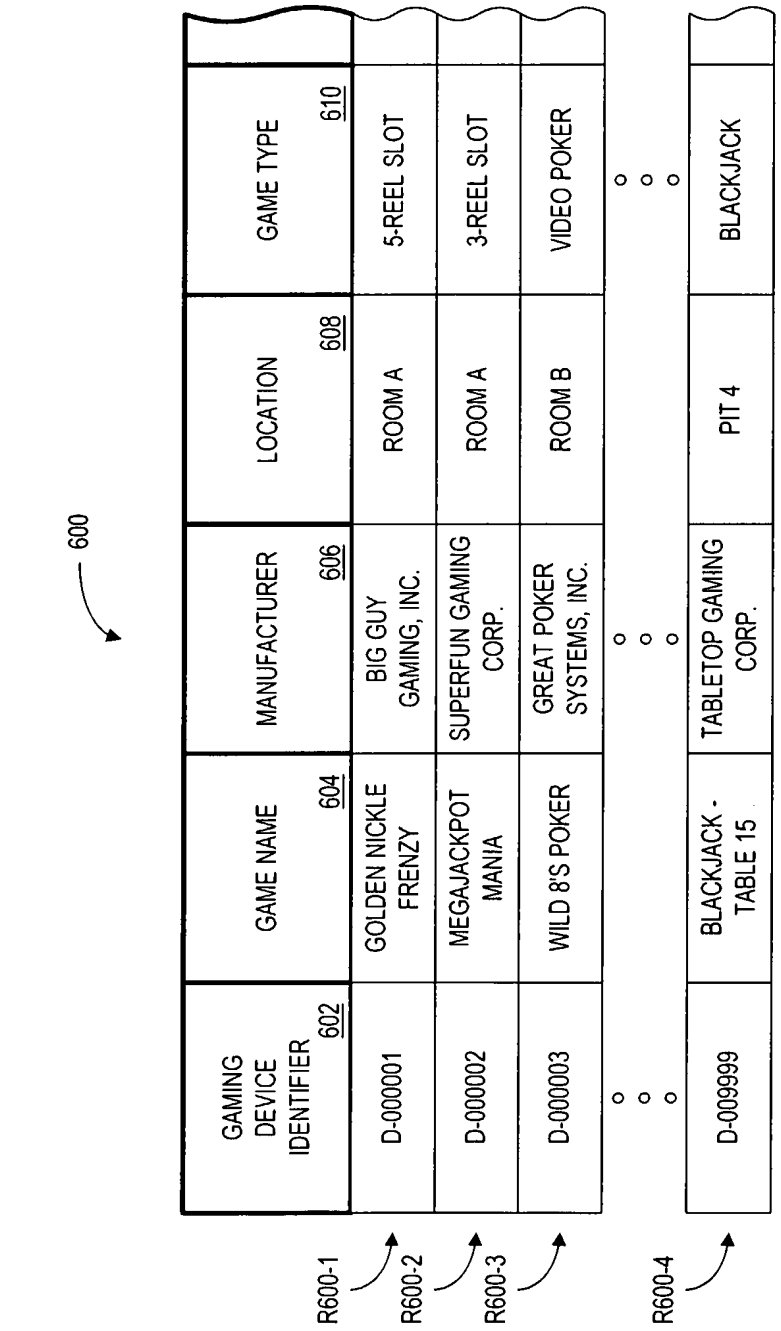
600
GAMING DEVICE IDENTIFIER 602
GAME NAME 604
MANUFACTURER 606
LOCATION 608
GAME TYPE 610
D-000001
GOLDEN NICKLE FRENZY
BIG GUY GAMING, INC.
ROOM A
5-REEL SLOT
D-000002
MEGAJACKPOT MANIA
SUPERFUN GAMING CORP.
ROOM A
3-REEL SLOT
D-000003
WILD 8'S POKER
GREAT POKER SYSTEMS, INC.
ROOM B
VIDEO POKER
D-009999
BLACKJACK - TABLE 15
TABLETOP GAMING CORP.
PIT 4
BLACKJACK
R600-1
R600-2
R600-3
R600-4

FIG. 6A

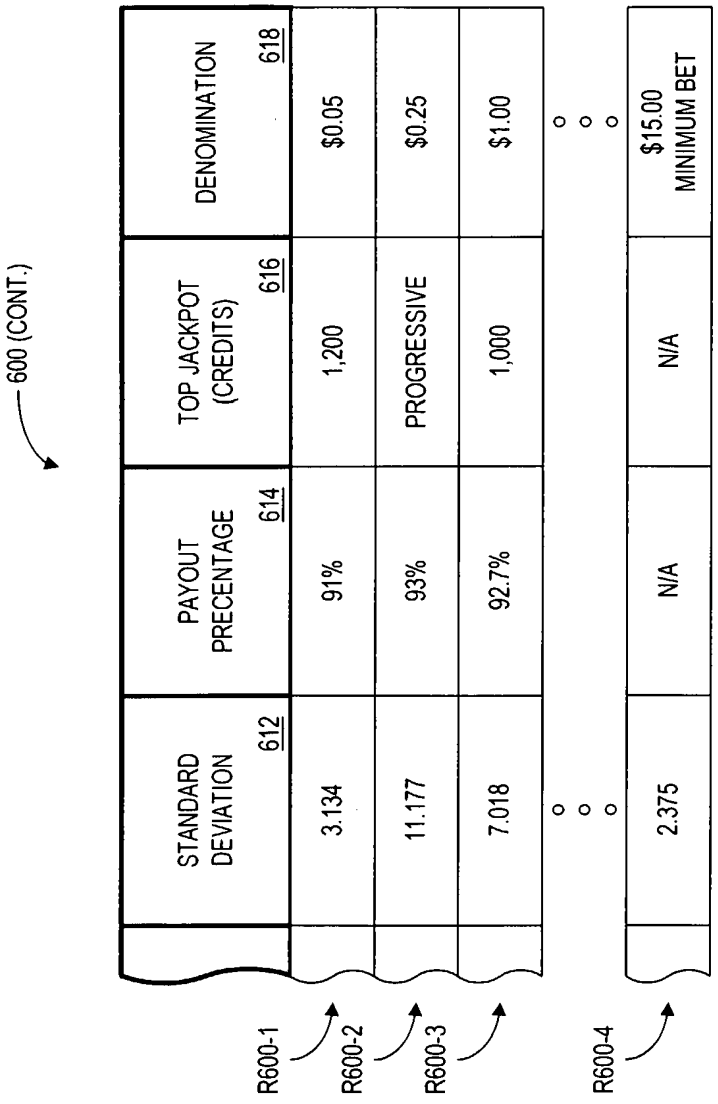
600 (CONT.)
STANDARD DEVIATION 612
PAYOUT PRECENTAGE 614
TOP JACKPOT (CREDITS) 616
DENOMINATION 618
3.134
91%
1,200
$0.05
11.177
93%
PROGRESSIVE
$0.25
7.018
92.7%
1,000
$1.00
2.375
N/A
N/A
$15.00 MINIMUM BET
R600-1
R600-2
R600-3
R600-4

FIG. 6B

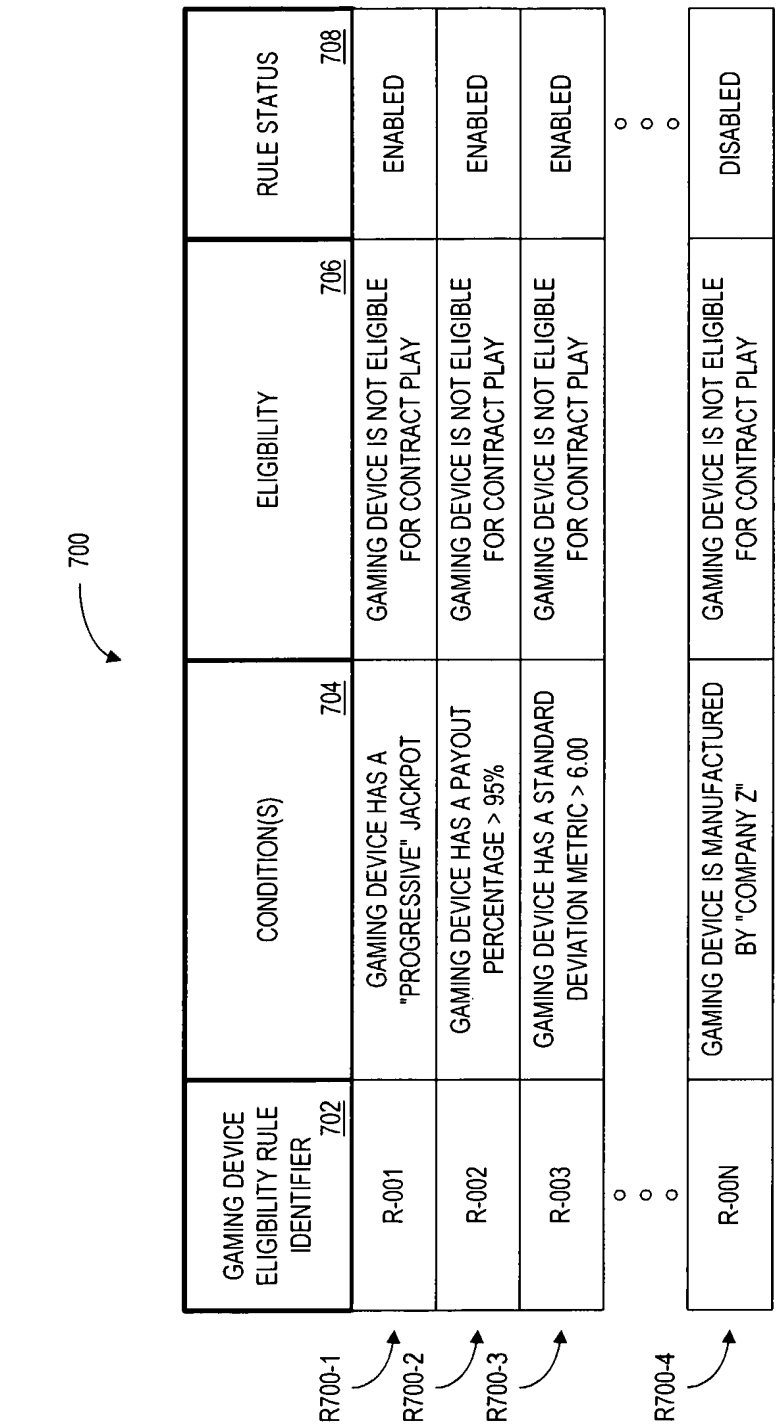
700
GAMING DEVICE ELIGIBILITY RULE IDENTIFIER 702
CONDITION(S) 704
ELIGIBILITY 706
RULE STATUS 708
R-001
GAMING DEVICE HAS A "PROGRESSIVE" JACKPOT
GAMING DEVICE IS NOT ELIGIBLE FOR CONTRACT PLAY
ENABLED
R-002
GAMING DEVICE HAS A PAYOUT PERCENTAGE > 95%
GAMING DEVICE IS NOT ELIGIBLE FOR CONTRACT PLAY
ENABLED
R-003
GAMING DEVICE HAS A STANDARD DEVIATION METRIC > 6.00
GAMING DEVICE IS NOT ELIGIBLE FOR CONTRACT PLAY
ENABLED
R-00N
GAMING DEVICE IS MANUFACTURED BY "COMPANY Z"
GAMING DEVICE IS NOT ELIGIBLE FOR CONTRACT PLAY
DISABLED
R700-1
R700-2
R700-3
R700-4

FIG. 7

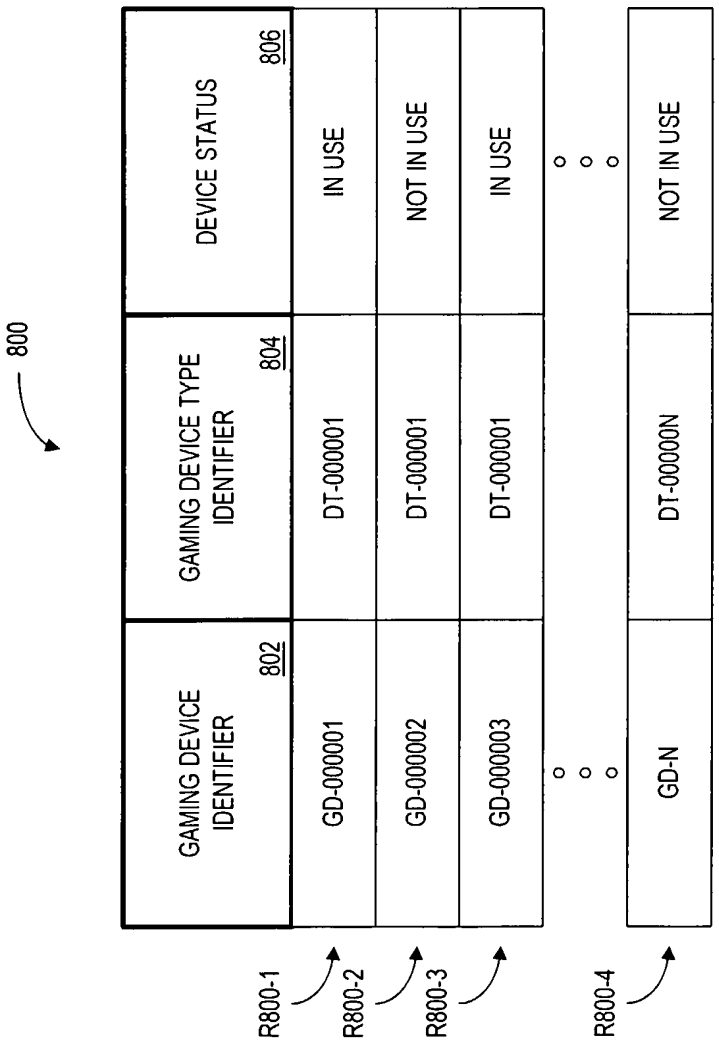
800
GAMING DEVICE IDENTIFIER 802
GAMING DEVICE TYPE IDENTIFIER 804
DEVICE STATUS 806
GD-000001
GD-000002
GD-000003
GD-N
DT-000001
DT-000001
DT-000001
DT-00000N
IN USE
NOT IN USE
IN USE
NOT IN USE
R800-1
R800-2
R800-3
R800-4

FIG. 8

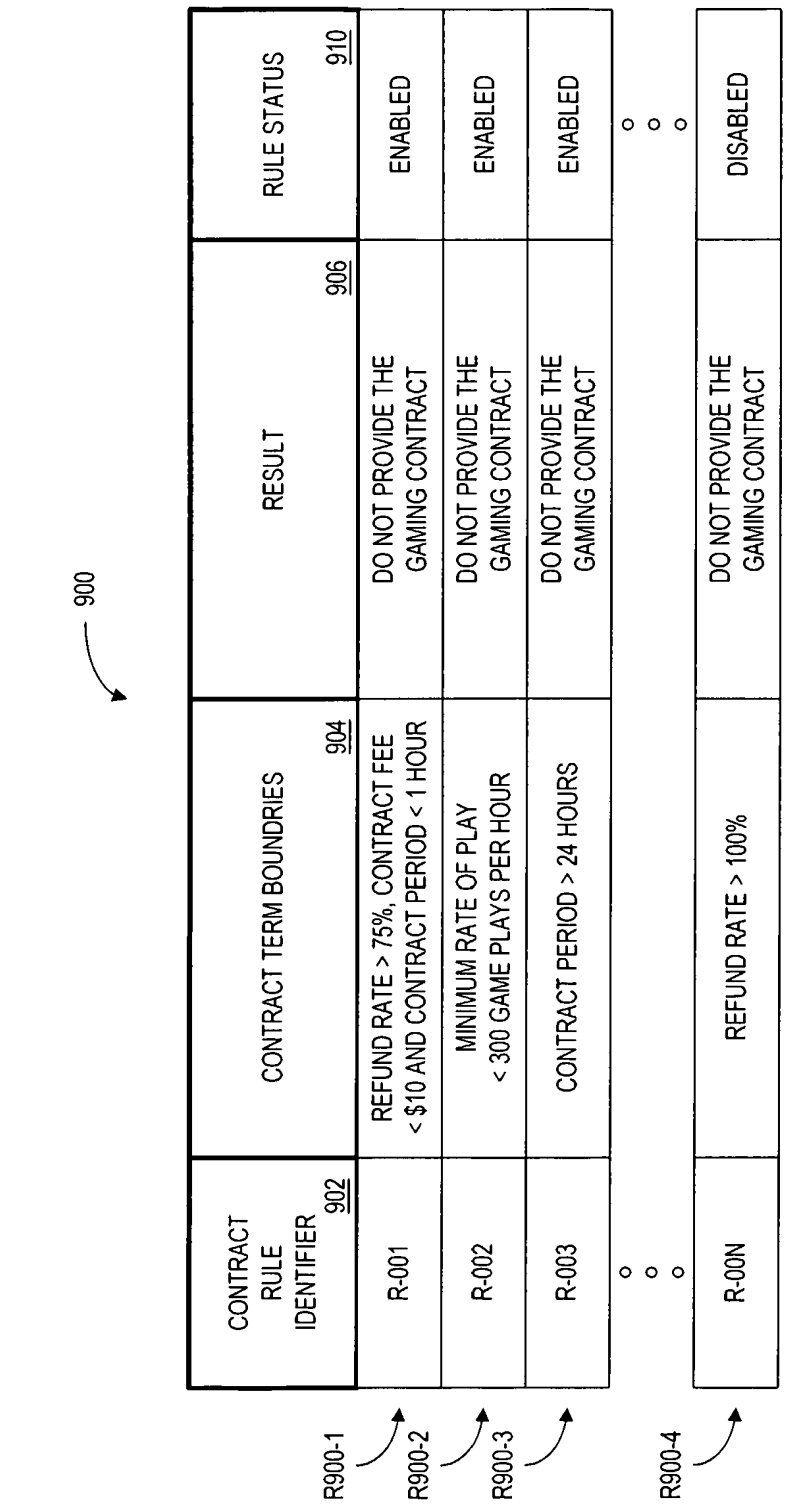
900
CONTRACT RULE IDENTIFIER 902
CONTRACT TERM BOUNDRIES 904
RESULT 906
RULE STATUS 910
R900-1
R-001
REFUND RATE > 75%, CONTRACT FEE < $10 AND CONTRACT PERIOD < 1 HOUR
DO NOT PROVIDE THE GAMING CONTRACT
ENABLED
R900-2
R-002
MINIMUM RATE OF PLAY < 300 GAME PLAYS PER HOUR
DO NOT PROVIDE THE GAMING CONTRACT
ENABLED
R900-3
R-003
CONTRACT PERIOD > 24 HOURS
DO NOT PROVIDE THE GAMING CONTRACT
ENABLED
R900-4
R-00N
REFUND RATE > 100%
DO NOT PROVIDE THE GAMING CONTRACT
DISABLED

FIG. 9

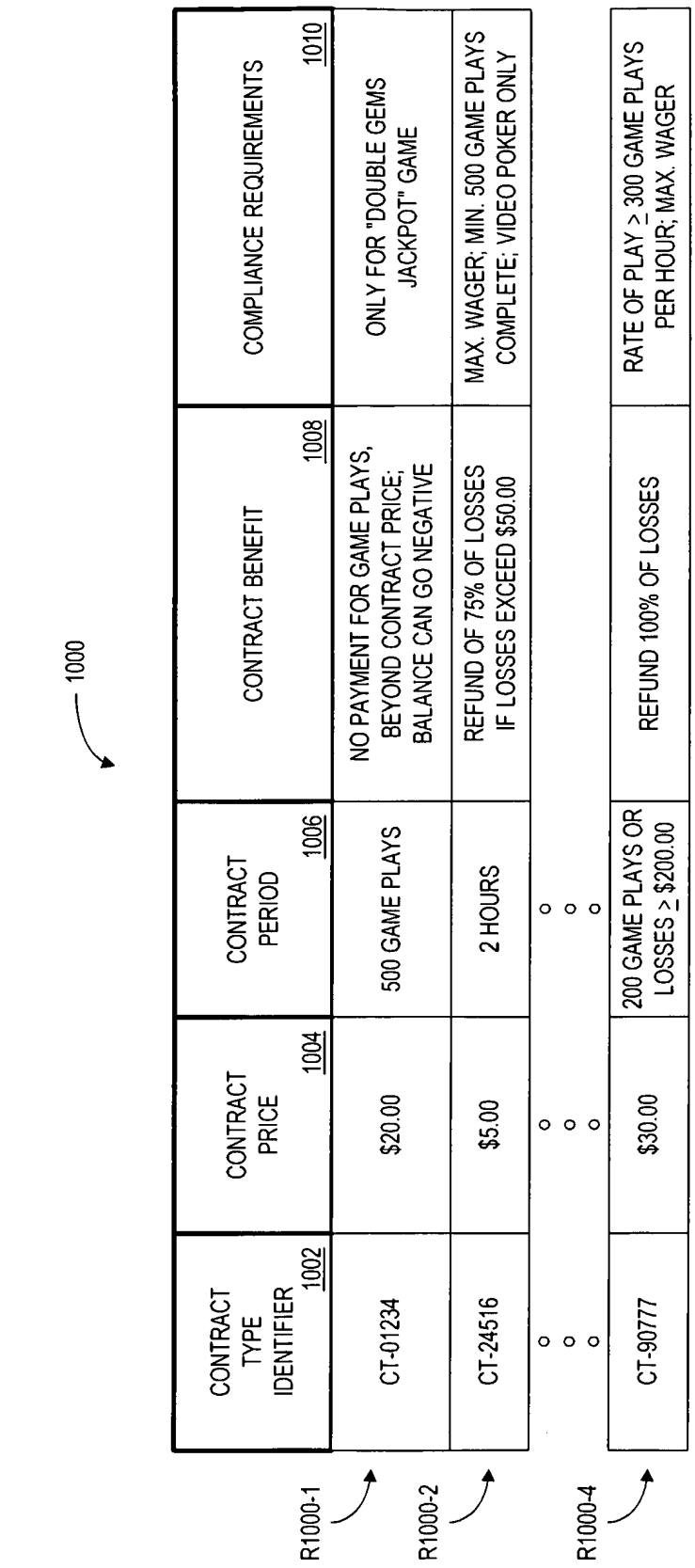
1000
CONTRACT TYPE IDENTIFIER 1002
CONTRACT PRICE 1004
CONTRACT PERIOD 1006
CONTRACT BENEFIT 1008
COMPLIANCE REQUIREMENTS 1010
CT-01234
$20.00
500 GAME PLAYS
NO PAYMENT FOR GAME PLAYS, BEYOND CONTRACT PRICE; BALANCE CAN GO NEGATIVE
ONLY FOR "DOUBLE GEMS JACKPOT" GAME
CT-24516
$5.00
2 HOURS
REFUND OF 75% OF LOSSES IF LOSSES EXCEED $50.00
MAX. WAGER; MIN. 500 GAME PLAYS COMPLETE; VIDEO POKER ONLY
CT-90777
$30.00
200 GAME PLAYS OR LOSSES ≥ $200.00
REFUND 100% OF LOSSES
RATE OF PLAY ≥ 300 GAME PLAYS PER HOUR; MAX. WAGER
R1000-1
R1000-2
R1000-4

FIG. 10

13 / 18

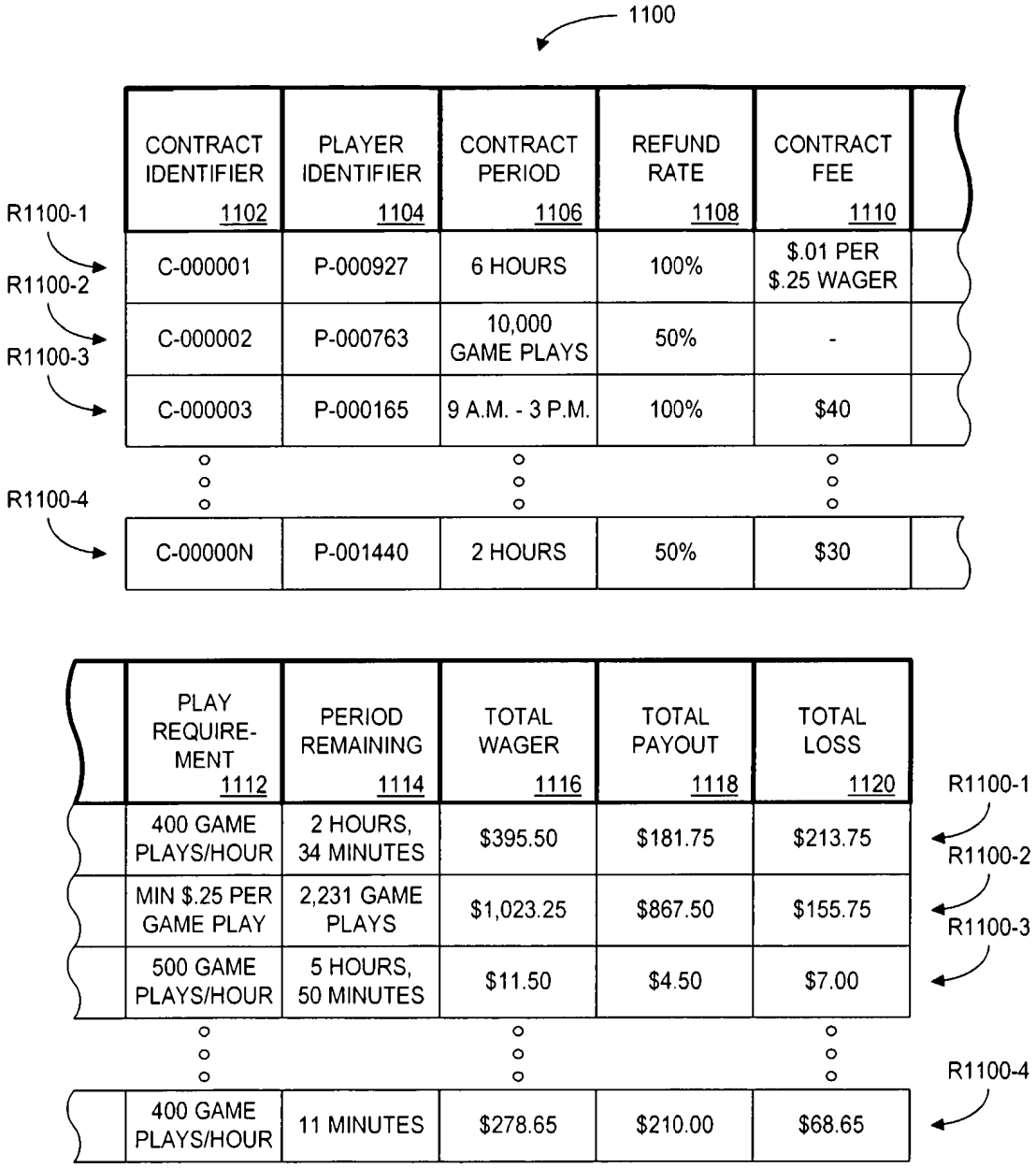
1100
CONTRACT IDENTIFIER 1102
PLAYER IDENTIFIER 1104
CONTRACT PERIOD 1106
REFUND RATE 1108
CONTRACT FEE 1110
R1100-1
R1100-2
R1100-3
R1100-4
C-000001
P-000927
6 HOURS
100%
$.01 PER $.25 WAGER
C-000002
P-000763
10,000 GAME PLAYS
50%
-
C-000003
P-000165
9 A.M. - 3 P.M.
100%
$40
C-00000N
P-001440
2 HOURS
50%
$30
PLAY REQUIRE-MENT 1112
PERIOD REMAINING 1114
TOTAL WAGER 1116
TOTAL PAYOUT 1118
TOTAL LOSS 1120
R1100-1
R1100-2
R1100-3
R1100-4
400 GAME PLAYS/HOUR
2 HOURS, 34 MINUTES
$395.50
$181.75
$213.75
MIN $.25 PER GAME PLAY
2,231 GAME PLAYS
$1,023.25
$867.50
$155.75
500 GAME PLAYS/HOUR
5 HOURS, 50 MINUTES
$11.50
$4.50
$7.00
400 GAME PLAYS/HOUR
11 MINUTES
$278.65
$210.00
$68.65

FIG. 11

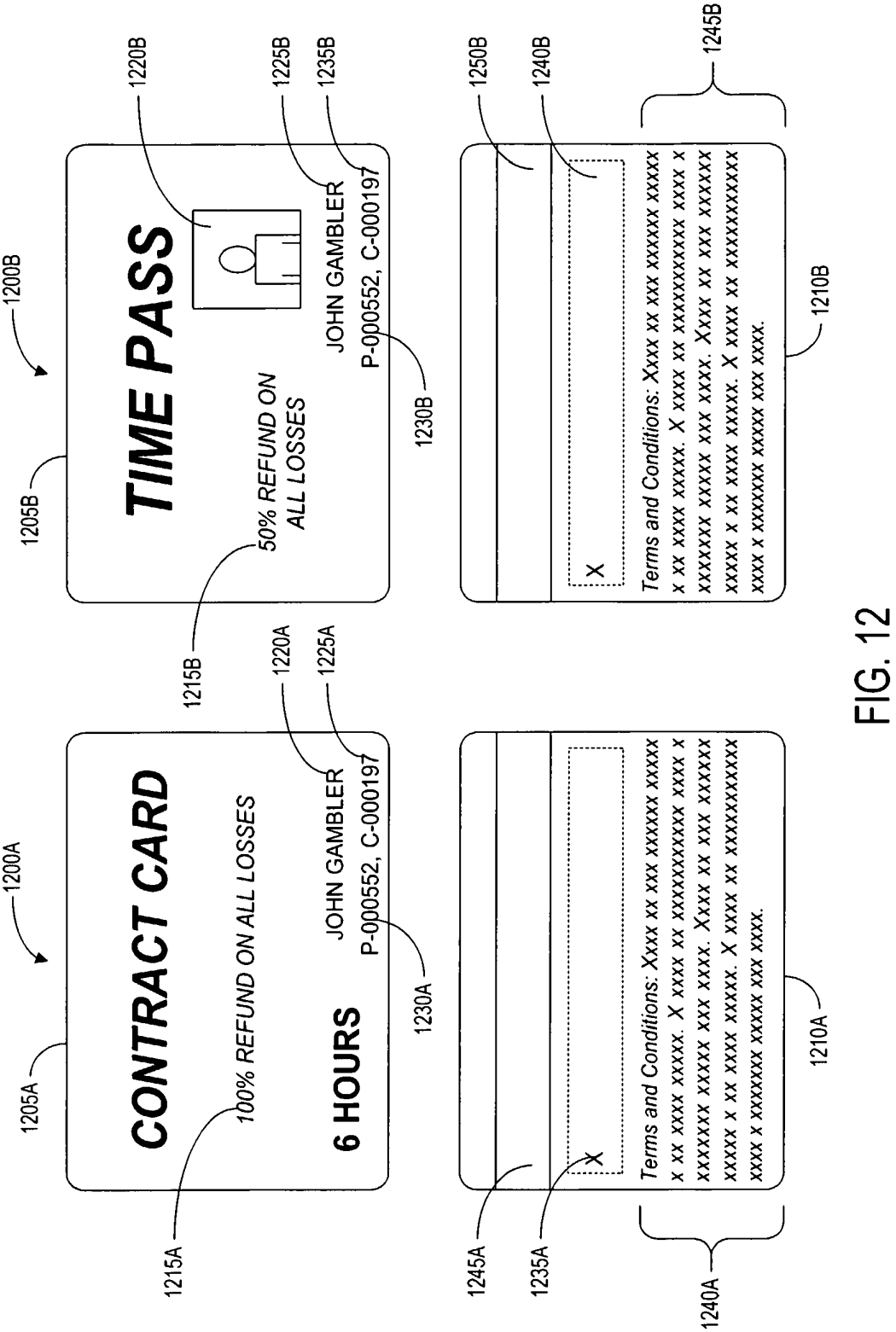
1200A
1205A
CONTRACT CARD
100% REFUND ON ALL LOSSES
6 HOURS
JOHN GAMBLER
P-000552, C-000197
1215A
1220A
1225A
1230A
1200B
1205B
TIME PASS
50% REFUND ON ALL LOSSES
JOHN GAMBLER
P-000552, C-000197
1215B
1220B
1225B
1235B
1230B
1245A
1235A
X
Terms and Conditions: Xxxx xx xxx xxxxx xxxxx x xx xxxx xxxxx. X xxxx xx xxxxxxxxxx xxxx x xxxxxxx xxxxx xxx xxxx. Xxxx xx xxx xxxxxx xxxxx x xx xxxx xxxxx. X xxxx xx xxxxxxxxxx xxxx x xxxxxxx xxxxx xxx xxxx.
1240A
1210A
1250B
1240B
X
Terms and Conditions: Xxxx xx xxx xxxxx xxxxx x xx xxxx xxxxx. X xxxx xx xxxxxxxxxx xxxx x xxxxxxx xxxxx xxx xxxx. Xxxx xx xxx xxxxxx xxxxx x xx xxxx xxxxx. X xxxx xx xxxxxxxxxx xxxx x xxxxxxx xxxxx xxx xxxx.
1245B
1210B

FIG. 12

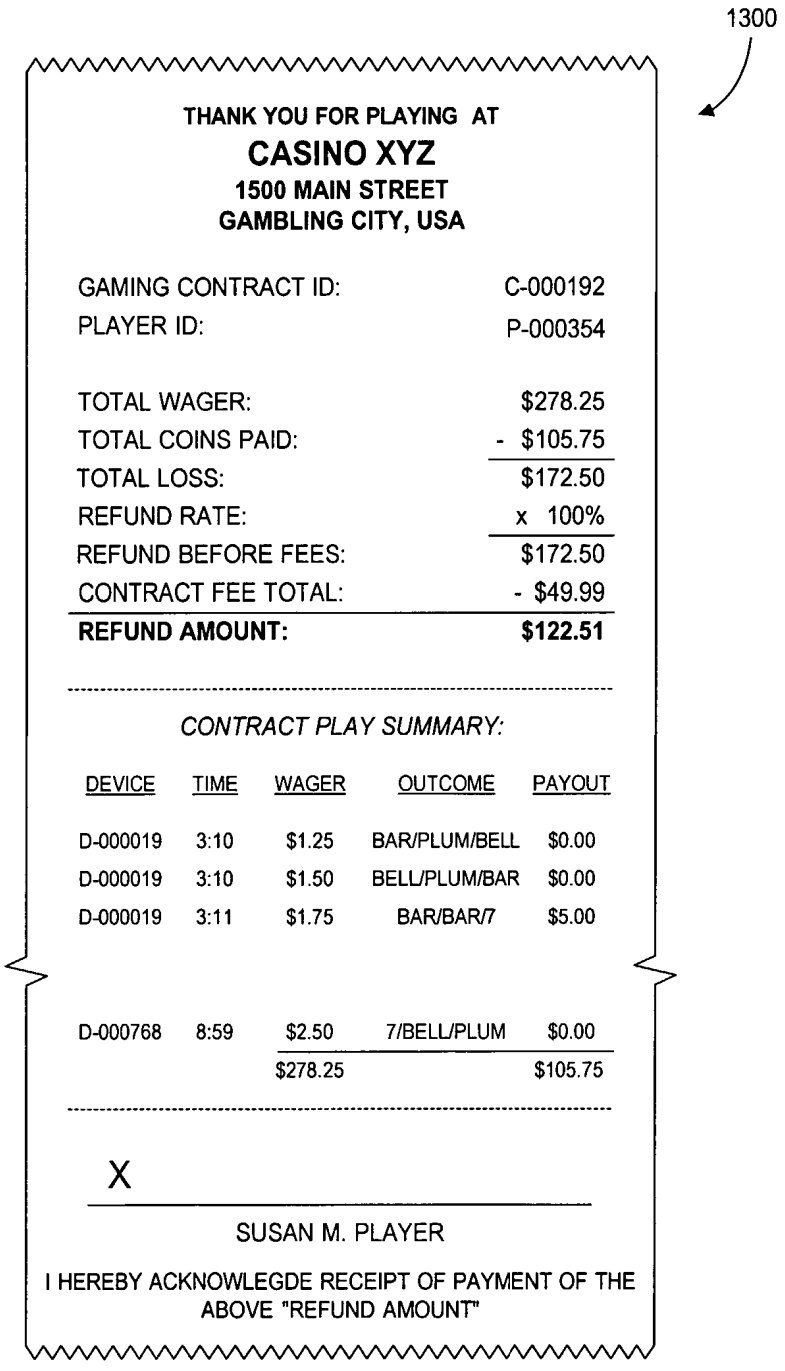
1300
THANK YOU FOR PLAYING AT
CASINO XYZ
1500 MAIN STREET
GAMBLING CITY, USA
GAMING CONTRACT ID: C-000192
PLAYER ID: P-000354
TOTAL WAGER: $278.25
TOTAL COINS PAID: - $105.75
TOTAL LOSS: $172.50
REFUND RATE: x 100%
REFUND BEFORE FEES: $172.50
CONTRACT FEE TOTAL: - $49.99
REFUND AMOUNT: $122.51
CONTRACT PLAY SUMMARY:
DEVICE TIME WAGER OUTCOME PAYOUT
D-000019 3:10 $1.25 BAR/PLUM/BELL $0.00
D-000019 3:10 $1.50 BELL/PLUM/BAR $0.00
D-000019 3:11 $1.75 BAR/BAR/7 $5.00
D-000768 8:59 $2.50 7/BELL/PLUM $0.00
$278.25 $105.75
X
SUSAN M. PLAYER
I HEREBY ACKNOWLEGDE RECEIPT OF PAYMENT OF THE ABOVE "REFUND AMOUNT"

FIG.13

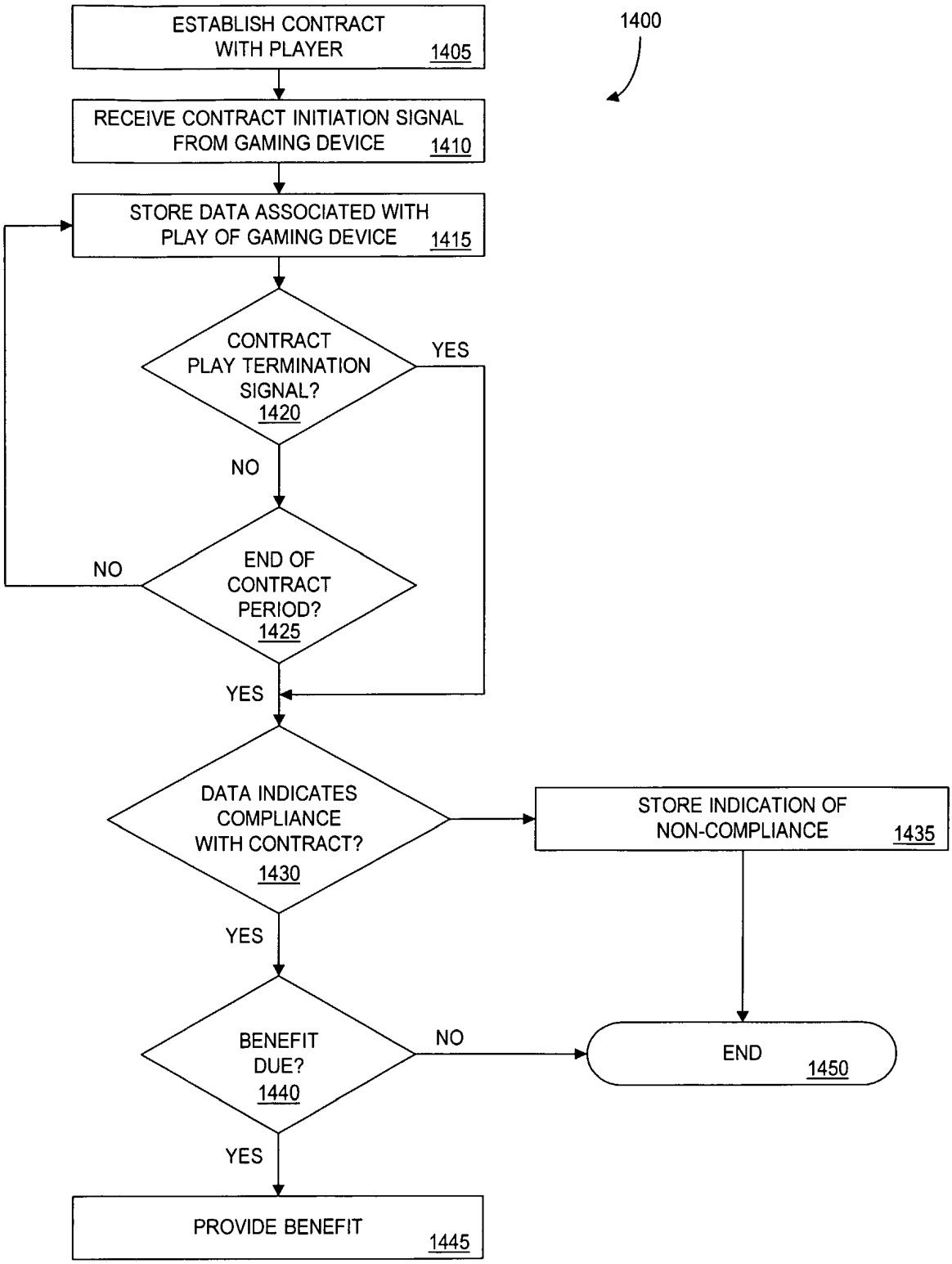
1400
ESTABLISH CONTRACT WITH PLAYER 1405
RECEIVE CONTRACT INITIATION SIGNAL FROM GAMING DEVICE 1410
STORE DATA ASSOCIATED WITH PLAY OF GAMING DEVICE 1415
CONTRACT PLAY TERMINATION SIGNAL? 1420
YES
NO
END OF CONTRACT PERIOD? 1425
NO
YES
DATA INDICATES COMPLIANCE WITH CONTRACT? 1430
STORE INDICATION OF NON-COMPLIANCE 1435
YES
BENEFIT DUE? 1440
NO
END 1450
YES
PROVIDE BENEFIT 1445

FIG. 14

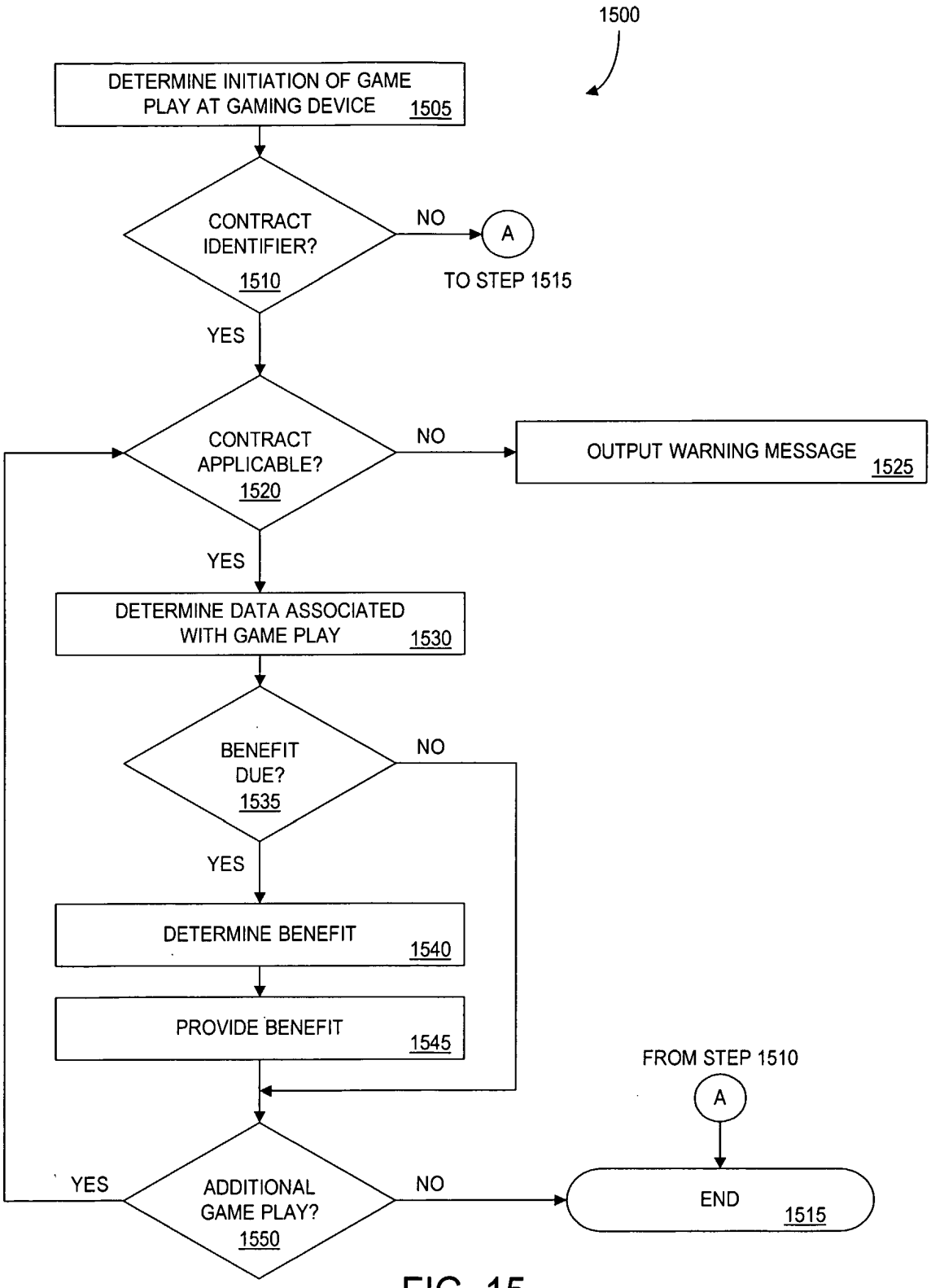
1500
DETERMINE INITIATION OF GAME PLAY AT GAMING DEVICE 1505
CONTRACT IDENTIFIER? 1510
NO
A
TO STEP 1515
YES
CONTRACT APPLICABLE? 1520
NO
OUTPUT WARNING MESSAGE 1525
YES
DETERMINE DATA ASSOCIATED WITH GAME PLAY 1530
BENEFIT DUE? 1535
NO
YES
DETERMINE BENEFIT 1540
PROVIDE BENEFIT 1545
FROM STEP 1510
A
YES
ADDITIONAL GAME PLAY? 1550
NO
END 1515

FIG. 15

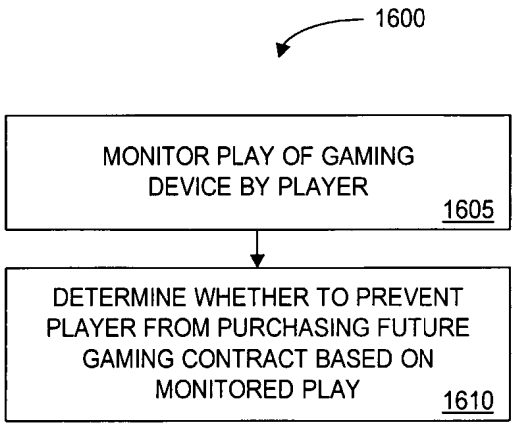
1600
MONITOR PLAY OF GAMING DEVICE BY PLAYER
1605
DETERMINE WHETHER TO PREVENT PLAYER FROM PURCHASING FUTURE GAMING CONTRACT BASED ON MONITORED PLAY
1610

FIG. 16

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

NOTICE OF ALLOWANCE AND FEE(S) DUE

24341 7590 07/12/2023

Morgan, Lewis & Bockius LLP (PA)
1400 Page Mill Road
Palo Alto, CA 94304-1124

EXAMINER
OUSSIR, EL MEHDI

ART UNIT	PAPER NUMBER
3685	

DATE MAILED: 07/12/2023

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/893,514	02/09/2018	Paresh K. Patel	104402-5026-US	4668

TITLE OF INVENTION: REFUND CENTERS FOR PROCESSING AND DISPENSING VENDING MACHINE REFUNDS VIA AN MDB ROUTER

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	$480	$0.00	$0.00	$480	10/12/2023

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.

HOW TO REPLY TO THIS NOTICE:

I. Review the ENTITY STATUS shown above. If the ENTITY STATUS is shown as SMALL or MICRO, verify whether entitlement to that entity status still applies.

If the ENTITY STATUS is the same as shown above, pay the TOTAL FEE(S) DUE shown above.

If the ENTITY STATUS is changed from that shown above, on PART B - FEE(S) TRANSMITTAL, complete section number 5 titled "Change in Entity Status (from status indicated above)".

For purposes of this notice, small entity fees are 40% the amount of undiscounted fees, and micro entity fees are 20% the amount of undiscounted fees.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Maintenance fees are due in utility patents issuing on applications filed on or after Dec. 12, 1980. It is patentee's responsibility to ensure timely payment of maintenance fees when due. More information is available at www.uspto.gov/PatentMaintenanceFees.

Petitioner Exhibit 1002-0505

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), by mail or fax, or via EFS-Web.

By mail, send to: Mail Stop ISSUE FEE
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

By fax, send to: (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications. **Because electronic patent issuance may occur shortly after issue fee payment, any desired continuing application should preferably be filed prior to payment of this issue fee in order not to jeopardize copendency.**

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

24341 7590 07/12/2023
Morgan, Lewis & Bockius LLP (PA)
1400 Page Mill Road
Palo Alto, CA 94304-1124

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being transmitted to the USPTO via EFS-Web or by facsimile to (571) 273-2885, on the date below.

(Typed or printed name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/893,514	02/09/2018	Paresh K. Patel	104402-5026-US	4668

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nonprovisional	SMALL	$480	$0.00	$0.00	$480	10/12/2023

EXAMINER	ART UNIT	CLASS-SUBCLASS
OUSSIR, EL MEHDI	3685	705-050000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

❑ Change of correspondence address (or Change of Correspondence Address form PTO/AIA/122 or PTO/SB/122) attached.

❑ "Fee Address" indication (or "Fee Address" Indication form PTO/AIA/47 or PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list
(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,
(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1 _____
2 _____
3 _____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document must have been previously recorded, or filed for recordation, as set forth in 37 CFR 3.11 and 37 CFR 3.81(a). Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE (B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent) : ❑ Individual ❑ Corporation or other private group entity ❑ Government

4a. Fees submitted: ❑ Issue Fee ❑ Publication Fee (if required)

4b. Method of Payment: *(Please first reapply any previously paid fee shown above)*

❑ Electronic Payment via Patent Center or EFS-Web ❑ Enclosed check ❑ Non-electronic payment by credit card (Attach form PTO-2038)

❑ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment to Deposit Account No. _____

5. **Change in Entity Status** (from status indicated above)

❑ Applicant certifying micro entity status. See 37 CFR 1.29

NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.

❑ Applicant asserting small entity status. See 37 CFR 1.27

NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.

❑ Applicant changing to regular undiscounted fee status.

NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature _____ Date _____

Typed or printed name _____ Registration No. _____

Petitioner Exhibit 1002-0506

UNITED STATES PATENT AND TRADEMARK OFFICE

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/893,514	02/09/2018	Paresh K. Patel	104402-5026-US	4668

24341 7590 07/12/2023

Morgan, Lewis & Bockius LLP (PA)
1400 Page Mill Road
Palo Alto, CA 94304-1124

EXAMINER	
OUSSIR, EL MEHDI	
ART UNIT	**PAPER NUMBER**
3685	

DATE MAILED: 07/12/2023

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
(Applications filed on or after May 29, 2000)

The Office has discontinued providing a Patent Term Adjustment (PTA) calculation with the Notice of Allowance.

Section 1(h)(2) of the AIA Technical Corrections Act amended 35 U.S.C. 154(b)(3)(B)(i) to eliminate the requirement that the Office provide a patent term adjustment determination with the notice of allowance. See Revisions to Patent Term Adjustment, 78 Fed. Reg. 19416, 19417 (Apr. 1, 2013). Therefore, the Office is no longer providing an initial patent term adjustment determination with the notice of allowance. The Office will continue to provide a patent term adjustment determination with the Issue Notification Letter that is mailed to applicant approximately three weeks prior to the issue date of the patent, and will include the patent term adjustment on the patent. Any request for reconsideration of the patent term adjustment determination (or reinstatement of patent term adjustment) should follow the process outlined in 37 CFR 1.705.

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

Petitioner Exhibit 1002-0507

OMB Clearance and PRA Burden Statement for PTOL-85 Part B

The Paperwork Reduction Act (PRA) of 1995 requires Federal agencies to obtain Office of Management and Budget approval before requesting most types of information from the public. When OMB approves an agency request to collect information from the public, OMB (i) provides a valid OMB Control Number and expiration date for the agency to display on the instrument that will be used to collect the information and (ii) requires the agency to inform the public about the OMB Control Number's legal significance in accordance with 5 CFR 1320.5(b).

The information collected by PTOL-85 Part B is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 30 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450. Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Petitioner Exhibit 1002-0508

Notice of Allowability	Application No. 15/893,514	Applicant(s) Patel et al.	
	Examiner EL MEHDI OUSSIR	Art Unit 3685	AIA (FITF) Status Yes

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☑ This communication is responsive to 06/082023.
   ☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

3. ☑ The allowed claim(s) is/are See Continuation Sheet . As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see **http://www.uspto.gov/patents/init_events/pph/index.jsp** or send an inquiry to **PPHfeedback@uspto.gov.**

4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

   Certified copies:

   a) ☐ All b) ☐ Some* c) ☐ None of the:

   1. ☐ Certified copies of the priority documents have been received.
   2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
   3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____ .

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____ .

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☑ Notice of References Cited (PTO-892)
2. ☑ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____.
3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material _____.
4. ☐ Interview Summary (PTO-413), Paper No./Mail Date. _____.
5. ☐ Examiner's Amendment/Comment
6. ☑ Examiner's Statement of Reasons for Allowance
7. ☐ Other _____.

/EL MEHDI OUSSIR/
Primary Examiner, Art Unit 3685

Petitioner Exhibit 1002-0509

Continuation of 3. The allowed claim(s) is/are: 11,16,18-19 and 21-28

Detailed Action

Notice of Pre-AIA or AIA Status

The present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA.

This communication is in response to Applicant's response filed on June 08, 2023 requesting continued examination in response to Examiner's Notice of Allowance filed on April 10, 2023.

The information disclosure statements filed on June 8, 2023 have been considered.

Claims 11, 16, 18-19, and 21-28 are pending. All other claims are cancelled.

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114.

Reasons for allowance

Claims 11, 16, 18-19, and 21-28 are allowed.

Applicant's submission an IDS on June 8, 2023 following the notice of allowance filed on April 10, 2023 has been considered. All references do not teach the claim limitations individually or as a whole.

All previous rejections and response to arguments are incorporated entirely herewith.

The claims overcome all objections and rejections.

The claims are novel over prior art because the claims are not obvious in light of the prior art. Although the claims capture different limitations that can be found in various references individually; the limitations as a whole would not be deemed obvious.

Some of the closest art related to the claims include U.S. Patent Application Publication 2015/0235202 to Zabala, U.S. Patent Application Publication 2015/0154579 to Teicher, U.S. Patent 9547859 to Patel et a., and U.S. Patent Application Publication 2016/0086145 to Tsutsui.

Zabala teaches a device in communication with a vending machine to perform cashless payments. A user can utilize a mobile device to establish a connection with the vending machine and purchase a product from the phone and have the vending machine dispense it.

Zabala teaches receiving a request for a cash payment; transmitting the request to an authorizing server distinct from the mobile device; receiving from the authorizing server an authorization message authorizing the cash payment; in response to receiving the authorization message, receiving a user selection of a payment accepting machine distinct from the mobile device; transmitting from the mobile device to the payment accepting machine an electronic command including one or more… payment accepting machine- dependent conditions, wherein a first of the one or more… payment accepting machine-dependent conditions comprises a… button or control at the payment accepting machine must be engaged; Abstract, at least Paragraphs 0004, 0042 and Figures 1, 8, 11, and 16.

Zabala does not explicitly disclose time dependent condition for the transaction; however, a transaction that is completed is understood that it is completed within a predetermined time otherwise the transaction is not processed. Zabala does not specifically disclose that the button must be activated within a predetermined time; however, because Zabala teaches a button is pressed in order to allow for the item to be dispensed, it is understood that said pressing is done within a predetermined time.

U.S. Patent 9,547,859 to Patel el al. is directed to a device with one or more processors, memory, and two or more communication capabilities obtains, from a payment module, an authorization request via a first communication capability (e.g., Bluetooth). The device sends, to a server, the authorization request via a second communication capability distinct from the first communication capability (e.g., cellular or WiFi technology). In response to sending the authorization request, the device obtains, from the server, authorization information via the second communication capability. After obtaining the authorization information, the device detects a trigger condition to perform a transaction with a payment accepting unit associated with the payment module. In response to detecting the trigger condition, the device sends, to the payment module, at least a portion of the authorization information via the first communication capability.

Patel does not teach transmitting from the mobile device to the payment accepting machine an electronic command including one or more time-dependent and payment accepting machine- dependent conditions, wherein a first of the one or more time-dependent and payment accepting machine-dependent conditions comprises a predefined time or time period by which a button or control at the payment accepting machine must be engaged; displaying the one or more

time-dependent and payment accepting machine- dependent conditions on a display of the mobile device; at the payment accepting machine: receiving the electronic command and the one or more time-dependent and payment accepting machine-dependent conditions from the mobile device.

U.S. Patent Application Publication 2016/0086145 to Tsutsui teaches a voucher ticket system and method of use employing a bill validator installed into any suitable automated machine, including an Automated Teller Machine (ATM), a gaming machine, etc. The bill validator is integrated with a bill reader, a voucher ticket reader, a reader for acquisition of electronic voucher ticket information from a portable computing device, a printer, and other supporting peripheral devices. The voucher ticket system includes a secured communication link with a host account manager serving a plurality of electronic money accounts. The method includes steps of receiving a value of electronic money or identification information associated with the electronic voucher ticket with account information associated with the electronic money account and sending the received value of the electronic money or the identification information of the voucher ticket to an upper control section of the one of the gaming machine and the ATM for completion of a financial transaction.

Further searches including non-patent literature and foreign references have been carried out. However, the references found and those cited fail to disclose the claim limitations of claim 11 as a whole. The combination of references to teach the claimed limitations would not have been obvious to one of ordinary skill in the art before the effective filing date of the Application.

The references relied upon throughout prosecution, cited, and the newly cited references fail to disclose:

A method, comprising: at a mobile device:

receiving a request for a cash payment; transmitting the request to an authorizing server distinct from the mobile device;

receiving from the authorizing server an authorization message authorizing the cash payment;

in response to receiving the authorization message, receiving a user selection of a payment accepting machine distinct from the mobile device;

transmitting from the mobile device to the payment accepting machine an electronic command including one or more time-dependent and payment accepting machine- dependent conditions, wherein a first of the one or more time-dependent and payment accepting machine-dependent conditions comprises a predefined time or time period by which a button or control at the payment accepting machine must be engaged;

displaying the one or more time-dependent and payment accepting machine- dependent conditions on a display of the mobile device;

at the payment accepting machine: receiving the electronic command and the one or more time-dependent and payment accepting machine-dependent conditions from the mobile device;

determining that the one or more time-dependent and payment accepting machine-dependent conditions are met, including determining that the button or control at the payment accepting machine has been engaged within the predefined time or time period; and

in response to the determination that the one or more time-dependent and payment accepting machine-dependent conditions are met, issuing the cash payment.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to EL MEHDI OUSSIR whose telephone number is (571)270-0191. The examiner can normally be reached on M-F 9AM - 5PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Neha W. Patel can be reached on 571-270-1492. The fax phone number for the organization where this application or proceeding is assigned is 571-270-1191.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Sincerely,

/EL MEHDI OUSSIR/
Primary Examiner, Art Unit 3685
07/01/2023

Notice of References Cited	Application/Control No. 15/893,514	Applicant(s)/Patent Under Reexamination Patel et al.	
	Examiner EL MEHDI OUSSIR	Art Unit 3685	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
*	A	US-20140143137-A1	05-2014	Carlson; Mark	G06Q20/18	705/39
*	B	US-20140032410-A1	01-2014	GEORGIEV; Christo	G06Q20/405	705/44
*	C	US-9098961-B1	08-2015	Block; James	G07F19/201	1/1
*	D	US-20160012465-A1	01-2016	Sharp; Jeffrey A.	G06Q20/321	705/14.17
	E					
	F					
	G					
	H					
	I					
	J					
	K					
	L					
	M					

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	CPC Classification
	N	CN-1561508-A	01-2005	CN	DONALD K W	G06Q20/02
	O	EP-3901880-A1	10-2021	EP	DOAN C	G06Q20/18
	P	WO-2017010936-A1	01-2017	WO	TAN T W	G06Q20/045
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	Baier et al.; Principles of Model Checking. https://vowi.fsinf.at/images/4/4a/TU_Wien-Formale_Methoden_der_Informatik_VU_(Egly)_-_Principles_of_Model_Checking_-_Christel_Baier.pdf (Year: 2007)
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

Petitioner Exhibit 1002-0517

Espacenet

Bibliographic data: JP2010528716 (A) — 2010-08-26

GAME WITH HAND MOTION CONTROL

Inventor(s):

Applicant(s):

Classification: **- international:** ***A63F13/00; A63F13/06***
- cooperative: **G06F3/011 (EP, US); G06V40/107 (EP, US); G07F17/32 (EP, US); G07F17/3209 (EP, US);** A63F2300/1093 (EP, US); A63F2300/201 (EP, US); A63F2300/204 (EP, US); A63F2300/6045 (EP, US)

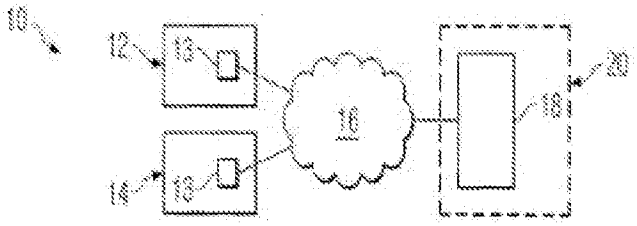
Application number: JP20100510470 20080528 Global Dossier

Priority number(s): US20070754944 20070529 ; WO2008US65000 20080528

Also published as: JP2015013183 (A) JP2018075449 (A) JP2020168385 (A) JP2022163127 (A) JP6741392 (B2) US10459518 (B2) US11169595 (B2) US2008300055 (A1) US2018018014 (A1) US2020033938 (A1) US2022107682 (A1) US9317110 (B2) WO2008150809 (A1) less

Abstract not available for JP2010528716 (A)
Abstract of corresponding document: US2008300055 (A1)

In various embodiments, the motion of a wristband is used to control games.



Petitioner Exhibit 1002-0518

Espacenet

Description: JP2010528716 (A) — 2010-08-26

GAME WITH HAND MOTION CONTROL

Description not available for JP2010528716 (A)
Description of corresponding document: US2008300055 (A1)

A high quality text as facsimile in your desired language may be available amongst the following family members:

US2008300055 (A1) WO2008150809 (A1) US2018018014 (A1) US2020033938 (A1) US2022107682 (A1)

The EPO does not accept any responsibility for the accuracy of data and information originating from other authorities than the EPO; in particular, the EPO does not guarantee that they are complete, up-to-date or fit for specific purposes.

BRIEF DESCRIPTION OF THE FIGURES

[0001] FIG. 1 shows a gaming system according to some embodiments.

[0002] FIG. 2 shows a communications network according to some embodiments.

[0003] FIG. 3 shows a gaming service provider in communication with a gaming communication device according to some embodiments.

[0004] FIG. 4 shows a communications network according to some embodiments.

[0005] FIG. 5 shows a gaming system according to some embodiments.

[0006] FIG. 6 shows a wireless gaming system according to some embodiments.

[0007] FIG. 7 shows a mobile gaming device with promotional content according to some embodiments.

[0008] FIG. 8 is a block diagram of a gaming system in accordance with some embodiments.

[0009] FIG. 9 is a block diagram of a payment system forming a part of the gaming system illustrated in FIG. 8, according to some embodiments.

[0010] FIG. 10 is a schematic diagram of a portable gaming device of the gaming system illustrated in FIG. 8, according to some embodiments.

[0011] FIG. 11(a) is a flow diagram of a method of use of a portable gaming device by a player, according to some embodiments.

[0012] FIG. 11(b) is a flow diagram of a particular method of using the portable gaming device by a player, according to some embodiments.

[0013] FIG. 12 is a flow diagram of a method of use of the portable gaming device by a gaming service operator, according to some embodiments.

[0014] FIG. 13 is a flow diagram of a method of use of the portable gaming device according to some embodiments.

[0015] FIG. 14a shows some single camera based embodiments.

[0016] FIG. 14b illustrates some 3-D (3 Dimensional) sensing embodiments.

[0017] FIG. 14c illustrates some embodiments with two camera "binocular" stereo cameras.

[0018] FIG. 14d illustrates some steps according to some embodiments.

[0019] FIG. 14e shows a process for color mapping, according to some embodiments.

[0020] FIG. 15 shows the hardware components of an implementation of the multicamera control system, and their physical layout, according to some embodiments.

[0021] FIG. 16A shows the geometric relationship between the cameras and various image regions of FIG. 15, according to some embodiments.

[0022] FIG. 16B shows an image captured by one of the cameras of FIG. 15, according to some embodiments.

[0023] FIG. 17 is a flow diagram showing the processes that are performed within a microcomputer program associated with the multicamera control system, according to some embodiments.

[0024] FIG. 18 is a flow diagram showing a portion of the process shown in FIG. 17 in greater detail, and in particular, the processes involved in detecting an object and extracting its position from the image signals captured by the cameras, according to some embodiments.

[0025] FIG. 19A shows sample image data, presented as a gray-scale bitmap image, acquired by a camera and generated by part of the process shown in FIG. 18, according to some embodiments.

[0026] FIG. 19B shows sample image data, presented as a gray-scale bitmap image, generated by part of the process shown in FIG. 18, according to some embodiments.

[0027] FIG. 19C shows sample image data, presented as a gray-scale bitmap image, generated by part of the process shown in FIG. 18, according to some embodiments.

[0028] FIG. 19D shows sample image data, presented as a gray-scale bitmap image,

generated by part of the process shown in FIG. 18, according to some embodiments.

[0029] FIG. 19E shows sample data, presented as a binary bitmap image, identifying those pixels that likely belong to the object that is being tracked in the sample, generated by part of the process shown in FIG. 18, according to some embodiments.

[0030] FIG. 20 is a flow diagram showing a portion of the process described in FIG. 18 in greater detail, and in particular, the processes involved in classifying and identifying the object given a map of pixels that have been identified as likely to belong to the object that is being tracked, for example given the data shown in FIG. 19E, according to some embodiments.

[0031] FIG. 21A shows the sample data presented in FIG. 19E, presented as a binary bitmap image, with the identification of those data samples that the processes shown in FIG. 20 have selected as belonging to the object in this sample, according to some embodiments.

[0032] FIG. 21B shows the sample data presented in FIG. 19E, presented as a bar graph, with the identification of those data samples that the processes outlined in FIG. 20 have selected as belonging to the object, with specific points in the graph being identified, according to some embodiments.

[0033] FIG. 21C shows a difference set of sample data, presented as a binary bitmap image, with the identification of those data samples that the processes shown in FIG. 20 have selected as belonging to the object and key parts of the object in this sample, according to some embodiments.

[0034] FIG. 22 is a flow diagram that shows a part of the process shown in FIG. 18 in greater detail, and in particular, the processes involved in generating and maintaining a description of the background region over which the object occludes, according to some embodiments.

[0035] FIG. 23A shows the geometry on which Eq. 3 is based, that is, an angle defining the position of the object within the camera's field of view, given the location on the image plane where the object has been sensed, according to some embodiments.

[0036] FIG. 23B shows the geometry on which Eq. 4, 5 and 6 are based, that is, the relationship between the positions of the cameras and the object that is being tracked, according to some embodiments.

[0037] FIG. 24 is a graph illustrating Eq. 8, that is, the amount of dampening that may be applied to coordinates given the change in position of the object to refine the positions, according to some embodiments.

[0038] FIG. 25A is an example of an application program that is controlled by the system, where the object of interest controls a screen pointer in two dimensions, according to some embodiments.

[0039] FIG. 25B shows the mapping between real-world coordinates and screen coordinates used by the application program in FIG. 25A, according to some embodiments.

[0040] FIGS. 26A and 26B are examples of an application program that is controlled by the multicamera control system, where the object of interest controls a screen pointer in

a three dimensional virtual reality environment, according to some embodiments.

[0041] FIG. 27A shows the division of the region of interest into detection planes used by a gesture detection method to identify a gesture that may be associated with the intention to activate, according to some embodiments.

[0042] FIG. 27B shows the division of the region of interest into detection boxes used by a gesture detection method to identify a gesture that may be associated with selecting a cursor direction, according to some embodiments.

[0043] FIG. 27C shows an alternate division of the region of interest into direction detection boxes used by a gesture detection method to identify a gesture that may be associated with selecting a cursor direction, according to some embodiments.

[0044] FIG. 27D illustrates in greater detail the relationship of neighboring divisions of FIG. 27C, according to some embodiments.

[0045] FIG. 28 depicts the exterior appearance of a device according to some embodiments, in a state where the device is in the neutral position.

[0046] FIG. 29 depicts an example of an internal architecture of the implementation of FIG. 28, according to some embodiments.

[0047] FIG. 30 is a flowchart illustrating a method in accordance with another exemplary implementation, according to some embodiments.

[0048] FIGS. 31A to 31D depict examples of tilt regions that are defined about a neutral axis, according to some embodiments.

[0049] FIG. 32 illustrates a top exterior view of an example device according to another exemplary implementation, according to some embodiments.

[0050] FIGS. 33A to 33E illustrate example indicators according to some embodiments.

[0051] FIGS. 34A and 34B illustrate front and side views, respectively, of the device of FIG. 32, shown in the neutral position, according to some embodiments.

[0052] FIGS. 35A and 35B illustrate front views of the device of FIG. 32, shown in a state where the FIG. 32 device is manipulated in a negative roll orientation and a positive roll orientation, respectively, according to some embodiments.

[0053] FIGS. 36A and 36B illustrate side views of the device of FIG. 32, shown in a state where the FIG. 32 device is manipulated in a positive pitch orientation and a negative pitch orientation, respectively, according to some embodiments.

[0054] FIG. 37 is a table showing one possible mapping of device orientations used to output signals corresponding to characters and cases that are output when a control is selected, according to some embodiments.

[0055] FIGS. 38A and 38B illustrate a menu of symbols that is displayed in accordance with another exemplary implementation, according to some embodiments.

[0056] FIG. 39 is an external view illustrating a game system F1 according to some embodiments.

[0057] FIG. 40 is a functional block diagram of a game apparatus F3 shown in FIG. 39.

[0058] FIG. 41 is a perspective view illustrating an outer appearance of a controller F7 shown in FIG. 39.

[0059] FIG. 42 is a perspective view illustrating a state of a connecting cable F79 of the controller F7 shown in FIG. 41 being connected to or disconnected from a core unit F70.

[0060] FIG. 43 is a perspective view of the core unit F70 shown in FIG. 41 as seen from the top rear side thereof.

[0061] FIG. 44 is a perspective view of the core unit F70 shown in FIG. 41 as seen from the bottom front side thereof.

[0062] FIG. 45 is a perspective view illustrating a state where an upper casing of the core unit F70 shown in FIG. 41 is removed.

[0063] FIG. 46 is a perspective view illustrating a state where a lower casing of the core unit F70 shown in FIG. 41 is removed.

[0064] FIG. 47 is a perspective view illustrating a first example of the subunit F76 shown in FIG. 41.

[0065] FIG. 48 is a perspective view of a state where an upper casing of the subunit F76 shown in FIG. 47 is removed.

[0066] FIGS. 49A, 49B, and 49C are a top view, a bottom view and a left side view of a second example of the subunit F76 shown in FIG. 41, respectively.

[0067] FIG. 50 is a perspective view of the subunit F76 shown in FIG. 41 as seen from the top front side thereof.

[0068] FIG. 51 is a top view illustrating an example of a first modification of the subunit F76 shown in FIG. 41.

[0069] FIG. 52 is a top view illustrating an example of a second modification of the subunit F76 shown in FIG. 41.

[0070] FIG. 53 is a top view illustrating an example of a third modification of the subunit F76 shown in FIG. 41.

[0071] FIG. 54 is a top view illustrating an example of a fourth modification of the subunit F76 shown in FIG. 41.

[0072] FIG. 55 is a block diagram illustrating a structure of the controller F7 shown in FIG. 41.

[0073] FIG. 56 is a diagram illustrating a state of a game being generally controlled with the controller F7 shown in FIG. 41.

[0074] FIG. 57 shows an exemplary state of a player holding the core unit F70 with a right hand as seen from the front surface side of the core unit F70.

[0075] FIG. 58 shows an exemplary state of a player holding the core unit F70 with a right hand as seen from the left side of the core unit F70.

[0076] FIG. 59 is a diagram illustrating a viewing angle of a LED module F8L, a viewing angle of a LED module F8R, and a viewing angle of an image pickup element F743.

[0077] FIG. 60 shows an exemplary state of a player holding the subunit F76 with a left hand as seen from the right side of the subunit F76.

[0078] FIG. 61 shows an exemplary game image displayed on the monitor F2 when the game apparatus F3 executes a shooting game.

DETAILED DESCRIPTION

[0079] In various embodiments, a player may use motion as an input to a game played on a mobile gaming device. The game may be a gambling game, such as a game of video poker, a slot machine game, a game of roulette, a game of craps, or any other gambling game. The player may make a bet on the game and may stand to win money depending on the outcome of the game. The player may have money at risk on the game.

[0080] The motion used as input may include motion of the mobile gaming device itself. Thus, the player may tilt, shake, move, rotate, or otherwise move the mobile gaming device. Such movements of the mobile gaming device may be interpreted by hardware sensors and/or by software as commands or instructions for the play of a game. A motion may thus be seen as an initiation signal for a game, or as a signal to cash out.

[0081] In various embodiments, a player may be provided with audio feedback. The audio feedback may be supplied following a motion made by the player, or following a motion that has been recognized by the mobile gaming device. The audio feedback may be supplied during a motion that is being made by the player. The audio feedback may enhance the gaming experience for the player by providing sounds a player might hear while playing a game at an actual gaming table or at a standalone gaming device, such as a slot machine. The audio feedback may provide information to the player. The audio feedback may tell the player that a motion he has made has been recognized as a command, or the motion he has made has not been recognized as a command.

[0082] In various embodiments, a player may be provided with force feedback or haptic feedback. The mobile gaming device may create haptic sensations using springs, motors, resistors, or other devices that may create motion, pressure, heat, or other tactile sensations or other sensations. Haptic feedback may allow the player to shake a mobile gaming device in his hand and have the feeling that he is shaking dice, for example.

[0083] In various embodiments, a player may have a wristband. The wristband may include motion sensors, such as accelerometers, for detecting motions. The player may move the hand wearing the wristband in particular ways in order to issue commands in a game. In various embodiments, a wristband may provide haptic feedback.

Wristband/Bracelet

[0084] In various embodiments, a player may wear a bracelet, wristwatch, wristband or other device around his wrist. The wristband may include one or more of: (a) a

processor (e.g., a semiconductor processor); (b) a power source (e.g., a battery); (c) a motion sensor (e.g., an accelerometer; e.g., a gyroscope; e.g., a camera for determining motion based on a changing visual image); (d) a transmitter (e.g., an antenna); (e) a receiver (e.g., an antenna); (f) a memory (e.g., a semiconductor memory); (g) a display device (e.g., a liquid crystal display screen); (h) a speaker (e.g., for transmitting audio outputs); (i) a haptic output device.

Wristband Logs Motions

[0085] In various embodiments, a wristband may track motions made by the player wearing the wristband. For example, the motion sensors within the wristband may detect accelerations, changes in position, changes in orientation, angular displacements, paths, trajectories, or any other components of motion. The wristband may track motions of the hand or wrist on which the wristband is worn. The wristband may store data representative of the motions. Such data may be stored, for example, in a memory of the wristband. The wristband may also transmit an indication of motions made to another device, such as to a mobile gaming device, to a stationary gaming device, or to a casino server.

[0086] In various embodiments, the wristband may store or forward raw data, such as data indicating every reading received from motion sensors. In various embodiments, the wristband may translate the raw data into more condensed or more higher level data. For example, a series of readings from motion sensors in the bracelet may be translated into command. That is, the player wearing the wristband may have made a motion to give a command. The wristband may then store the command rather than the exact position of the wristband as a function of time. The wristband may also transmit the command to another device, e.g., via a transmitter on the wristband.

Motions Constitute Commands in a Game

[0087] In various embodiments, a motion of the wristband may be interpreted as a command in a game. A player may move his hand up and down, for example, in order to initiate the spin of reels in a slot machine game. A player may also move his hand in such a way as to signify commands to: (a) cash out; (b) hold a card in video poker; (c) discard a card in video poker; (d) double down in blackjack; (e) choose one of several options in a bonus round; (f) make a bet of a certain size; (g) show a list of game instructions; (h) initiate a bonus round; (i) select a pay-line to play; or to make any other command in a game, or to make any other command. The wristband may store a table which associates particular motions with particular game commands. Upon receiving sensor readings that are indicative of a particular motion, the wristband may look up in the table the motion corresponding to the command. The wristband may then transmit the command to a mobile gaming device, a stationary gaming device, or to another device, such as to the casino server. The casino server may relay the command to another device, such as to a stationary gaming device or to a mobile gaming device. In various embodiments, the command may then be executed or followed in the game.
Wristband Communicates with Mobile Gaming Device

[0088] In various embodiments, a wristband may communicate with a mobile gaming device. The wristband may have an antenna and receiver for this purpose. The mobile gaming device may similarly have an antenna and receiver for communicating with other devices. The mobile gaming device and the wristband may communicate via various protocols, such as via Bluetooth, Wi-Fi, or via any other protocol.

The Wristband Controls Other Devices

[0089] The wristband may be in communication with a mobile gaming device, stationary gaming device, or with any other device. The wristband may detect motions of a player, such as motions of the player's hand. The wristband may interpret the motions as commands for a device with which the wristband is in communication. The wristband may transmit the commands to the device and the other device may thereupon follow the commands. In some embodiments, the wristband captures raw data, such as a series of positions of the player's wrist as a function of time. The raw data is transmitted to another device. The other device then interprets the raw data as a command.
Communication with Multiple Devices at Once

[0090] In various embodiments, a wristband may be in communication with two or more devices. The wristband may be in communication with two or more devices at once. The wristband may transmit a single signal which may be received at both a first device and a second device. For example, a command transmitted by the wristband may be received at a first slot machine and at a second slot machine. In some embodiments, a first device and a second device may emit signals nearly simultaneously. The wristband may receive both signals.

[0091] In some embodiments, a player may identify himself to two or more devices, such as to two or more stationary gaming devices. The player may provide some proof of identity, such as a player tracking card, biometric, or a device (such as a wristband) with an identifier (e.g., a unique identifier) that can be tied to the player. The player may authorize or enable communication between his wristband and the two or more devices. As part of the authorization, the player may agree to play games on each of the two or more devices. Thus, in some embodiments, the player may authorize the two or more devices to interpret signals coming from the player's wrist band as command signals to be used in a game. In some embodiments, the player may present his wristband to the two or more devices. For example, the player may bring his wristband to within a few inches of an RFID reader on a slot machine. The slot machine may pick up a signal from an RFID tag on the wristband. The devices may thereafter recognize commands received from the wristband presented, but not from other wristbands. Thus, the devices may accept commands from the wristband for some period of time. In various embodiments, commands may be accepted until some termination command is received, until no more commands are detected (e.g., the wristband has been switched off or has moved out of communication range of the devices), until a certain period of time has passed, or until some other termination circumstance has occurred. In order to resume providing motion-based commands to a device, the player may once again authorize the receipt and use of commands from his wristband. The player may present his wristband again, for example.

[0092] In various embodiments, a player may engage in play at two or more gaming devices at once. The player may make motions and an indication of such motions (e.g., a command that has been derived from such motions) may be transmitted to the two or more gaming devices. Each of the two or more gaming devices may execute the command. Thus, in some embodiments, a player may conveniently play two or more games simultaneously while avoiding repetition of commands for each individual game. For example, a player may use a single shake of the wrist to start games at each of two slot machines.

[0093] In some embodiments, a first device may receive data (e.g., motion data) from a wristband. The first device may interpret the data as commands and may conduct a game based on the commands. A second device may receive the same data from the wristband. The second device may transmit the data (or an interpretation of the data) to

friends of the player or to other parties, such that the other parties can follow what the player is doing. The second device may also transmit to friends of the player or to other parties an indication of game outcomes, payouts and other occurrences related to games played by the player. In some embodiments, a player may use the motions from his wristband to play several games at once. Data, such as outcomes, from the games may be transmitted to a casino server or to another device. Data may be made available for viewing by other parties, such as by the player's friends or by others who will play their own games using the random occurrences that happened in the player's game (e.g., others may bet on outcomes generated in the player's game).

[0094] In various embodiments, a player may play at two gaming devices at once. However, each command made by the player (e.g., through a motion) may apply to only one gaming device at a time. For example, a player may make a first command which applies only to a first game at a first gaming device. The player may then make a second command which applies only to a second game at a second gaming device. The player may then make a third command which applies only to the first game at the first gaming device. In various embodiments, two gaming devices may each be controllable by their own set of motion commands, where there is little or no overlap between the motions used for commands. Thus, for example, a motion made by a player may correspond to a valid command at one of the gaming devices but not at the other one. A different motion may not correspond to a valid command at the first gaming device, but it may at the second.

Times when a Data Stream from a Wristband is not Picked Up

[0095] In various embodiments, a device may be within communication range of a wristband that is transmitting data, yet the device may fail to receive the data, or the device may fail to interpret the data, or the device may fail to use the data. A device may be a mobile gaming device or stationary gaming device, such as a slot machine, for example. A device may fail to use data from a wristband if one or more of the following is true: (a) the player with the wristband has not identified himself to the device; (b) the player with the wristband has not provided proof of identification to the device; (c) the wristband is transmitting commands that do not make sense to the device; (d) the player with the wristband has not made at least some physical contact with the device (e.g., pressing a button on the device); (e) the player has not informed the device that it should be expecting motion commands from the wristband; (f) the device is currently accepting motion commands from a different wristband; (g) the player does not have a high enough credit balance to play games at the device (e.g., the player has a credit balance of zero); (h) the player has not made physical contact with the device in a predetermined period of time (e.g., the player has not physically pressed a button on the gaming device in the last 10 minutes); or if any other circumstance is true.

Biometric as Game Input

[0096] In various embodiments, the wristband may sense a pulse, a temperature, a skin conductivity level, a moisture level, an electric field (e.g., from nerve impulses), a degree of muscle tension, or any other biometric signal from the player. The signal may be translated into a number. For example, a numerical temperature reading in degrees Fahrenheit may be used as a seed for a random number generator, which is in turn used to generate an outcome in a game.

[0097] In various embodiments, a biometric reading received at a wristband may indicate that the wristband is still being worn. If the wristband detects a pulse, for example, the wristband or another device may infer that the wristband is being worn by

a player and hasn't been taken off. In various embodiments, a mobile gaming device, a stationary gaming device, or another device may take actions based on signals received from a wristband only if the wristband is currently being worn (or appears to be worn based on biometric signals received from the wristband). In some embodiments, if there is a break in biometric signals received at the wristband (e.g., the wristband no longer detects a pulse), then the wristband may transmit a signal to the casino server or to some other device. The signal may indicate that there has been a break in the biometric signal detected at the wristband. The casino server may, accordingly, instruct other devices not to follow commands or signals received from the wristband until the wristband has been reestablished on a player. In some embodiments, the wristband must be reestablished on the player in the presence of, or with the help of a casino representative before signals from the wristband will be honored by another device. In some embodiments, if there is a break in a biometric signal detected at a wristband, the wristband may send a signal summoning medical personnel. For example, the wristband may send a signal to the casino server indicating that a pulse is no longer detected.

Wristband Broadcasts Data that Identifies the User

[0098] In various embodiments, the wristband may transmit or broadcast data that identifies the player wearing the wristband. The wristband may broadcast a player tracking card number, a player name, a player alias, a player room number, a player credit card number, or any other information about a player that may be used to identify the player. In some embodiments, the wristband may transmit a signal derived from a biometric reading. For example, the wristband may broadcast a signal derived from a pulse or electro-cardiogram reading taken from the player. The biometric reading may serve to uniquely identify the player.

[0099] In various embodiments, a signal which is broadcast from a wristband and which identifies a player may allow the player wearing the wristband certain privileges. A player's hotel room door may be unlocked remotely (e.g., the door may unlock without requiring physical contact from a key or other device). The hotel room door may unlock once it receives the signal from the player's wristband identifying the player. The player may also be allowed to gamble at a particular gaming device. The player may be allowed to enter certain areas of the casino based on the identity provided from his wristband. In various embodiments, the wristband may provide a player identifier to allow a player to receive access to a balance of funds or to another financial account. The player may use the funds, for example, to gamble or to make purchases. For example, a player may approach a gaming device. The player may have an account with a positive balance of funds stored with the casino server. When the player's wristband transmits a player identifier to the slot machine, the slot machine may receive the identifier and transmit an indication of the identifier to the casino server. The casino server may then authorize the player to gain access to his funds. Some or all of the player's funds may then be made available for use on the gaming device (e.g., in the form of a credit balance). The player may then use the funds for gaming.

[0100] In various embodiments, a wristband may be power constrained due to the small available volume within the wristband within which to include a battery or other power source. The wristband may take various steps to conserve power. In some embodiments, the wristband may periodically transmit signals to another device, such as to a mobile gaming device or such as to a stationary gaming device. For example the wristband may transmit a signal to a mobile gaming device every 50 milliseconds, where the signal consists of a string of bits. The signal may include data or information descriptive of motions made by the wristband since the last signal transmission. In various embodiments, the time between signal transmissions may vary based on what

data or information needs to be transmitted by the wristband. For example, if the wristband has been motionless, the time between signal transmissions may be extended to 200 milliseconds. If the wristband starts moving again, the time between signal transmissions may be reduced back to 50 milliseconds. Thus, in various embodiments, the time between when signals are transmitted by the wristband may vary based on the motion of the wristband and/or based on motion detected by the wristband. In various embodiments, the time between when signals are transmitted by the wristband may vary based on the amount of information the wristband has to communicate to another device. For example, if the player is actively involved in a game, the wristband may transmit signals frequently. If the player is not actively involved in a game (e.g., if the player has not initiated game play at a stationary gaming device or mobile gaming device, e.g., if the player is not in an area where gaming is permitted), then the wristband may transmit signals relatively less frequently. In various embodiments, when the wristband is not moving, the wristband may periodically send a short or concise signal indicating that the wristband is still operational or still available for use. However, the signal may indicate that the wristband is currently not in use or not being used for a game.

[0101] In various embodiments, the wristband may derive power or energy from motions of the wearer's arm, or from other motions of the wearer. The wristband may derive energy from its own motion, which may be caused by the motion of the arm to which it is attached. Devices for harnessing electrical energy from motion may include piezoelectric devices or mechanical rotary magnetic generators. Power sources such as those used in the Fossil kinetic watch or in the Ventura kinetic watch may also be used.

[0102] In various embodiments, the wristband may detect relative motion between it and another device. For example, a player may wear two wristbands. One wristband may transmit signals of a fixed strength to the other wristband. Based on the distance between the wristbands, the signal will appear relatively strong (e.g., if the wristbands are close) or relatively weak (e.g., if the wristbands are far) at the receiving wristband. In this way, it may be determined how close the wristbands are to one another. The relative motion of a wristband may be determined relative to any suitable device. A player may wear a device elsewhere on his body, such as a belt buckle which can transmit or receive signals. A wristband may transmit or receive signals to any fixed device external to the person, such as to a receiver attached to a wall, ceiling, floor, or gaming device.

[0103] In various embodiments, a wristband may detect a drinking motion. The wristband may detect a rotation in a wrist via orientation sensors in the wristband. If there is significant rotation of the wrist, it may be inferred that the player has almost finished a drink, thus requiring the player to tilt the drink significantly. Accordingly, a casino representative may be instructed to provide the player with a new drink, and/or the player may be asked if he would like another drink.

Technologies for Harvesting Energy for a Wristband

[0104] Various technologies for harvesting energy from the environment or from ambient conditions are described in the paper, "Energy Scavenging for Mobile and Wireless Electronics" by Joseph A. Paradiso and Thad Starner. As of May 11, 2007, the paper was available at http://www.media.mit.edu/resenv/pubs/papers/2005-02-E-HarvestingPervasivePprnt.pdf.

[0105] Radio frequency identification systems allow a tag to derive energy from a

remote or non-contiguous source (e.g., the tag reader). The tag receives radio frequency energy from the tag reader inductively, capacitively, or radiatively.

[0106] Solar cells may allow a mobile device, such as a wristband, to derive energy from ambient light. An example technology includes crystalline silicon solar cells.

[0107] Thermoelectric generators may allow the derivation of energy from heat transfer. These generators may take advantage of temperature gradients, such as differences between human body temperature and the surrounding air temperature. The Seiko Thermic wristwatch uses thermoelectric generators to power its mechanical clock components. One thermoelectric technology is Applied Digital Solutions' Thermo Life.

[0108] Various technologies allow energy harvesting from vibration or motion. Motion may be used to move a mass in a preferred or biased direction. The movement of the mass may wind a spring. The energy in the spring may then be used to create direct mechanical energy (e.g., to move the hands of a watch), or may move a magnet, coil, or other component of a generator to create electricity. Exemplary technologies for harvesting energy from mechanical motion include the ETA Autoquartz, the Seiko AGS (automatic generating system), and Ferro Solutions' Harvester. Piezoelectric materials may deform in the presence of motion or vibration to produce electricity. Ocean Power Technologies, for example, has developed harvesters that are immersed in turbulent water and deform from the water currents to generate electricity. Some generators comprise capacitors with moving plates. On a charged capacitor, the induced motion of one of the plates can generate an electric current. Piezoelectric generators and capacitive generators may be used to harvest energy from shoes during walking, for example.

[0109] Some generators comprise turbines that may be driven by ambient airflows.

Gaming Devices as Antenna Array

[0110] In various embodiments, each of two or more stationary gaming devices may include a component of an antenna array. Acting in conjunction, the gaming devices may detect and interpret signals from mobile gaming devices or from wristbands. For example, each of two or more stationary gaming devices may have an antenna. The gaming devices may each pick up the signal emitted by a mobile gaming device or by a wristband. The signal picked up at each of the antennas at the two or more gaming devices may then be added up, perhaps with some time delay or phase shift added at one or more of the gaming devices. Adding up signals received at two or more antennas may reduce the signal to noise ratio, thus potentially allowing a signal from the mobile gaming device or wristband to be read with greater accuracy or at a greater distance, or thus allowing the mobile gaming device or wristband to transmit with less power and thus benefit from extended battery life.

New Batteries at the End of Every Shift

[0111] In various embodiments, the batteries or power sources in a wristband may be routinely replaced on a periodic basis. Batteries may be replaced: (a) once a day (e.g., at the end of the day); (b) once per shift (e.g., at the end of a casino attendant's shift; e.g., at the beginning of a casino attendant's shift); (c) once per hour; or on any other basis. In various embodiments, a wristband may include an indicator light or some other output device to indicate a low power level in its battery or power source. The battery may be changed or recharged when the indicator light comes on.

Wristband Gives Player Location Information

[0112] In various embodiments, a wristband may broadcast a signal. The signal may include a player identifier, such as a name or player tracking card number. The signal may include information about the player's location. For example, the wristband may gather positioning information from beacons or satellites, calculate its own position, and then transmit the position information to gaming devices or to any receivers.

[0113] In some embodiments, a wristband determines a change in its own position, but not an absolute position. A receiver that picks up the signal from the wristband may be able to determine the direction of the wristband from the receiver, but not the distance of the wristband. The player wearing the wristband may then walk some distance, and the position of the wristband may thereby change. The wristband may include accelerometers or other motion detectors which can be used to determine a change in a position, but not necessarily an absolute position. The wristband may also include sensors for determining an orientation, such as a compass. The wristband may thus determine a change in position in (e.g., measured in feet or meters) and broadcast this change to the receiver. The wristband may further determine the direction in which that change in position occurred and broadcast this direction to the receiver. Once again, the receiver may be able to determine the direction of the wristband from the receiver at the new location of the wristband, but not its distance from the receiver. Based on the two measurements of the wristband's direction from the receiver, and based on the distance moved by the wristband and based on the direction in which the wristband moved, the absolute position of the wristband may be determined. This is because in a triangle formed by the receiver, the wristband's initial position, and the wristband's final position, one side and the two adjacent angles will be known. The side is the path traveled by the wristband (assuming it took the shortest path), and the angles can be found based on the directions from which the receiver detected the wristband at its first and final positions, and based on the direction in which the wristband itself traveled.
Wristband used to Control a Mobile Gaming Device

[0114] In various embodiments, a wristband may be used to control a mobile gaming device. A wristband may transmit signals to a mobile gaming device where such signals provide instructions or commands as to how to proceed in a game. Such instructions may include instructions to initiate game play, instructions to hold a particular card, instructions to hit or stand (e.g., in blackjack), instructions to bet a particular pay-line, or any other instructions. A wristband may also transmit signals to a stationary gaming device, where such signals provide instructions to the stationary gaming device as to how to proceed in a game.

[0115] A wristband may determine its own motions through motion sensors, such as through accelerometers. The wristband may interpret such motion as commands to be used in a game. The wristband may transmit such commands to a mobile gaming device or to a stationary gaming device in order to control such devices. In some embodiments, the wristband records motion data, such as distances moved, accelerations, trajectories, velocities, or any other motion data. The motion data may be transmitted to a mobile gaming device or to a stationary gaming device. At the mobile gaming device or at the stationary gaming device, the motions may be translated into game commands. In various embodiments, the wristband may transmit either motion data or game commands to a casino server. The casino server may then transmit motion data or game commands to a mobile gaming device or to a stationary gaming device in order to control such devices.

[0116] In various embodiments, a wristband may be used to control or to issue

commands to any device. Such devices may include point of sale terminals, vending machines, kiosks, automated teller machines (ATM), or any other devices. For example, a player may make a series of motions with his hand. The motions may be picked up by his wristband. The wristband may interpret the motions as instructions for an ATM. The wristband may transmit the instructions to the ATM. The ATM may then act in accordance with the instructions, e.g., by dispensing cash for the player.

Wristband for 2D Control

[0117] In various embodiments, a player may move his hand or arm in a plane. Such motions may direct a cursor on a screen to move in an analogous fashion. For example, if the player moves his hand first in one direction and then in the opposite direction, the cursor would also first move in one direction and then in the opposite direction. A player may rest his arm on a flat surface, such as on a table surface. The player may move his hand around on the table surface, thereby moving his hand in two dimensions. The wristband may thus be used to control the position of a cursor on a screen, such as the screen of a stationary gaming device, mobile gaming device, or other device.

String Provides Force Feedback

[0118] In various embodiments, a stationary gaming device may include a string, cable, wire, or other similar component. The string may be wound around a wheel, axle, spindle, shaft, or other device. The gaming device may include motors for rotating the wheel. The rotation of the wheel in one direction may release more string, while the rotation of the wheel in the other direction may pull string in.

[0119] In various embodiments, the player may attach one end of the string to the wristband. Depending on events in the game, the gaming device may either pull in on the string or let loose more string. This may have the effect of pulling and releasing the player's wrist. This may provide tactile feedback to the player. In some embodiments, the player may also purposefully pull on the string in order to make commands in the game. For example, the player may pull outwards on the string in order to cause reels of a slot machine game to spin. The faster or harder the player pulls the string, the faster the reels may spin.

Distinguishing Signals from Multiple Wristbands

[0120] In various embodiments, a gaming device may detect a signal from a wristband. The wristband may transmit a player identifier, so that the gaming device would be able to recognize the identity of the player. In various embodiments, when one gaming device detects a signal from a wristband, other gaming devices might also detect the same signal. Therefore, in various embodiments, a gaming device may determine whether it was the player's intention to communicate with it, or whether it was the player's intention to communicate with a different gaming device.

[0121] In various embodiments, a gaming device may recognize that someone is playing the gaming device. For example, the gaming device may detect actual button presses, a player tracking card may be inserted, currency may be inserted, and so on. At the same time, the gaming device may detect signals from a wristband. The gaming device may then display a message or otherwise ask the player currently playing the machine whether that player is the one whose wristband signal has been received. The gaming device may recognize a player identity from the wristband signal and may thus display the name of the player to the player physically present at the gaming device. If the player who is physically present recognizes his own name, then the player may

confirm that in fact the gaming device is receiving wristband signals from him. The gaming device may then allow the player to use motion controls to proceed with play of the game.

[0122] In various embodiments, a gaming device may recognize that there is a wristband in the vicinity and also that the gaming device is being played by a player who is physically present. Thus, a game may be conventionally started, e.g., through the physical press of a button. The gaming device may then ask the player physically present if he is the same player indicated in a received signal from a wristband. If the player who is physically present answers in the affirmative, then the gaming device may ask the player whether he would like to proceed with play using motion control.

[0123] In various embodiments, a gaming device may differentiate between multiple signals coming from different wristbands as follows. Each wristband may be associated with a unique identifier. Each wristband may broadcast its own unique identifier. A gaming device may ask a player who is physically present which identifier corresponds to his wristband. In some embodiments, the gaming device may ask the player to enter the identifier of his wristband. If the identifier matches an identifier of a signal received from one of the wristbands, then the gaming device may thereupon react only to signals received from that wristband.

[0124] In various embodiments, a gaming device may ask a player to bring a wristband near a reader. The reader may be an optical reader, an RFID reader, a magnetic stripe reader, or any other reader. In this way the signal belonging to the player physically at the gaming device may become clearly the strongest signal received at the gaming device. The gaming device may then allow the player physically at the gaming device to proceed with play using his wristband. The player may then use some motion control or he may use motion control for every command at the gaming device.

Reference Lights at a Stationary Gaming Device

[0125] In various embodiments, a stationary gaming device may include one or more lights, beacons, transmitters, audio speakers, or other emitters. For example, a stationary gaming device may include two bright lights situated on top of the gaming device. The emitters may serve as reference points for a mobile gaming device and/or for a wristband. A wristband may, for example, detect the light or other signal from two emitters on a gaming device. The bracelet may use the two emitters as a fixed reference frame based on which to determine its own orientation. For example, if the two emitters appear side by side from the vantage point of the wristband, the wristband may determine that its orientation is normal. If, however, the two emitters appear one on top of the other, then the wristband may assume it has been rotated 90 degrees. In various embodiments, the emitters may output the same type signal, e.g., light of the same wavelength and amplitude. In some embodiments, different emitters may output different signals. This may allow a wristband or mobile gaming device to distinguish one emitter from the other in all orientations and to thereby make an even more accurate determination of its own orientation. In various embodiments, a stationary gaming device may have more than two emitters. For example, a stationary gaming device may have three, four, or five emitters. In various embodiments, emitters may be located in other places than just on a stationary gaming device. For example, emitters may be located on the ceiling, or on a wall.

[0126] In various embodiments, an emitter may emit light of a particular frequency. An emitter may emit red light, green light, infrared light, or light of some other frequency. An emitter may emit light at multiple frequencies. For example, an emitter may emit

white light. An emitter may emit sound.

[0127] A wristband and/or a mobile gaming device may include sensors, cameras, microphones, or other detectors for detecting the output of the emitters. For example, a wristband may include a camera. The camera may detect light from emitters on a gaming device. Based on the position of the emitters in an image captured by the camera of the wristband, the wristband may determine its own orientation.

[0128] In various embodiments, a gaming device may not necessarily have dedicated emitters for detection by wristbands or mobile gaming devices. However, a wristband or mobile gaming device may detect particular features of the gaming device. For example, the gaming device may have a candle on top which is meant to light up when a casino attendant is summoned to the gaming device (e.g., when a player at the gaming device has won a jackpot). A sensor in a wristband or mobile gaming device may recognize the image of the candle. For example, the wristband may include a camera. The camera may capture images and attempt to match portions of the image to a pre-stored image of a candle on a gaming device. Based on the orientation of the candle from the captured image relative to the orientation of the candle in a stored, reference image, the wristband may determine its own orientation. E.g., if the captured image appears to be a version of the reference image that has been rotated 90 degrees, then the wristband may assume that it has been rotated 90 degrees.

[0129] In various embodiments, sensors in a mobile gaming device or wristband may detect other features of a stationary gaming device. Sensors may detect a pay table, a screen, a handle, betting buttons, a coin tray, graphics on the housing of the gaming device, a jackpot meter, or any other features of the gaming device. For any feature, the wristband or mobile gaming device may have stored reference images or reference signals. In order to detect or interpret a feature, the wristband or mobile gaming device may capture an image and attempt to match portions of the image to one or more reference images. In the matching process, the wristband or mobile gaming device may manipulate the captured image, adjusting the size or orientation of the captured image in an attempt to better match a reference image. When there is a match (e.g., a portion of the captured image matches a reference image of a coin tray), the wristband or mobile gaming device may determine the degree of rotation of the captured image that was required to make the match. The degree of rotation may then indicate the amount by which the wristband or mobile gaming device has been rotated.

[0130] In various embodiments, a gaming device may track the motion of a wristband or of a mobile gaming device. The wristband may include beacons or emitters, such as infrared emitters, light emitting diodes, or audio speakers. The wristband may include two or more emitters. The gaming device may include detectors, such as cameras, microphones, or antennas. The gaming device may determine the positions or relative positions of emitters on a wristband. For example, in a normal upright position, two emitters on a wristband may appear side by side. When the wristband is rotated 90 degrees, one emitter may appear above the other. Thus, based on the relative positions of two emitters on a wristband, the gaming device may be able to ascertain the orientation of the wristband. Also, the apparent distance between two emitters on a wristband may provide an indication of distance of the wristband itself from the gaming device. For example, if two emitters on a wristband appear close to one another, then it may be assumed that the wristband is far away. On the other hand, if two emitters on a wristband appear far from one another (at least relatively speaking), then the wristband may be assumed to be near. Through tracking the motion of the wristband or the mobile gaming device, a gaming device (e.g., a slot machine; e.g., a video poker machine) may ascertain commands that are intended by the player. The gaming device

may execute those commands in a game that it conducts. The gaming device may also transmit those commands to another device, such as to another stationary gaming device or such as to a mobile gaming device.

Screen Direction for Motion Control

[0131] In various embodiments, a gaming device, such as a stationary gaming device, may provide instructions to a player as to how to use motion control. Instructions may indicate one or more available commands that the player can give. For example, the gaming device may list commands to: (a) start a game; (b) make a selection in a bonus round; (c) select a card to discard in a game of video poker; (d) select whether to hit or stand in a game of blackjack; (e) select a pay line to bet on; or to take any other action in a game or otherwise. The gaming device may also provide instructions as to how to issue commands. The gaming device may indicate which motions are necessary to issue commands. The gaming device may show small videos or animations of people motioning with their hand. Thus, a player may see next to a potential command a small video clip of a person moving his arm in a particular way. The video clip may repeat constantly or it may play on demand (e.g., upon touch by the player). The motions to be made in order to issue the command may also be spelled out in text form, such as "move your hand to the right twice and then up once". Instructions as to how to use motion control may be shown in many different forms.

[0132] In some embodiments, a person may be walked through tutorial or may have the opportunity to practice making motions. For example, instructions for making the motion corresponding to the "start game" command may be played in the form of a video clip. In other words, an animation of a person making a particular motion may be shown on the display screen of a gaming device. The player may be instructed to repeat the motion with his own wristband. The player may be instructed to follow along with the video of the motion being performed. If the gaming device recognizes the motion, the gaming device may ask the player to following along in making the motion for the next instruction. If the gaming device does not recognize the motion made by the player (e.g., if the player has made wrong motion), then the gaming device may ask the player to repeat making the motion until he gets it right.

[0133] In various embodiments, when a player is playing a game at a gaming device (e.g., at a slot machine), and when the player makes a motion to issue a command, the gaming device may provide feedback as to how the gaming device interpreted the player's motion. For example, the gaming device may display a text message, "you have motioned to start a new game".

Window of Time to Make a Motion

[0134] In various embodiments, there may be finite windows of time when a gaming device (e.g., a stationary gaming device) will accept motion commands. For example, there may be a 10 second window during which a gaming device will accept motion commands. During other times, the player may make motions, but they will not necessarily register as commands. This may allow the player some freedom to make motions unrelated to a game (e.g., hand gestures in a conversation) during times other than the window in which commands may register. A window of time for making motion commands may open and close periodically. For example, a window may open up for ten seconds, then close for twenty seconds, then open for another ten seconds, and so on. If a person makes a first motion command during the window of time, then the window of time may be extended. For example, the extension of the window of time may allow the person to complete a full game before the window for making motion

commands closes. In some embodiments, a window of time for making motion commands may persist so long as a game is in progress. In some embodiments, a window of time for making motion commands may persist for a predetermined period of time after the last motion command made by a player. This may allow the player to continue making motion commands for as long as he wants to. In some embodiments, there may be an alert or other indicator that a gaming device (e.g., a stationary gaming device; e.g., a mobile gaming device) is receptive to motion commands. For example, an indicator light on the gaming device may come on, or the indicator light may change from one color to another. Thus, for example, a light may be blue when a gaming device is receptive to motion commands, and may be red when a gaming device is not receptive to motion commands. In some embodiments, a player may turn motion control on or off. For example, the player may instruct a gaming device to be receptive to motion commands, or may instruct the gaming device to ignore motion commands. A player may have to physically touch a gaming device in order to switch motion commands either on or off. In some embodiments, when a gaming device is not receptive to motion commands, the gaming device may still respond to a motion command which commands the gaming device to become receptive to other motion commands again. For example, the gaming device may then become receptive to motion commands again.

[0135] In various embodiments, a first set of motions may correspond to moving a cursor, mouse pointer, or other indicator. A second set of motions may correspond to making a selection. For example, once a cursor is resting over a card or an image of a button, making a motion of the second set of motions may correspond to selecting the card (e.g., selecting the card to be discarded), or to pressing the button. Motions from the second set of motions may be used, for example, to select an amount to bet, to select a pay line, to select a decision from a menu of decisions, or to make any other selection. Motions from the first set of motions may position a cursor for later selection, but may not yet commit a player to a course of action. In some embodiments, motions in the forward and back directions (e.g., from the player's perspective) may correspond to the second set of motions, e.g., to making a selection. Motions in other direction (e.g., up, down, left, right) may correspond to motions from the first set of motions, e.g., to positioning a cursor.

[0136] In various embodiments, a player may receive visual feedback as he makes a motion. A cursor may trace out on the screen of a gaming device (e.g., a stationary gaming device; e.g., a mobile gaming device) a trajectory made by the player's wristband as he moves his hand. To make a particular command, the player may have to keep the cursor within certain boundaries. For example, boundaries consisting of two concentric circles may be displayed on the display screen of the gaming device. The player may have to make a circle with the cursor while keeping the cursor outside of the inner circle but inside of the outer circle (i.e., between the two circles). In some embodiments, there are points or dots on the screen. The player may need to make a motion so that a cursor on the screen is moved between the two dots. In some embodiments, there may be several pairs of dots. The player must move the cursor between various pairs of dots in some particular order in order to issue a command. Different commands may require the cursor be moved between different pairs of dots, or between pairs of dots in different orders.

[0137] In various embodiments, a player may make motion commands to position a cursor over a button. The player may make further motion commands to select the button. Various buttons may correspond to different commands or actions in a game. Thus, by making motions to position a cursor over an appropriate button, the player may make a desired command in a game.

Wristband Senses Muscle Strain on Wrist Muscles in the Form of a Grabbing Motion

[0138] In various embodiments, a player wristband may include a strain gauge. The wristband may be made of a pliant material, such as rubber. The wristband may fit snugly to the player's wrist. When the player closes his fist, the player may tense certain wrist muscles. This may put additional strain on the wristband as the girth of the player's wrist may expand. The strain gauge may sense this extra strain on the wristband. The strain gauge may send a signal to the processor of the wristband indicating the strain that has been detected. The strain gauge may also send a signal via an antenna or other transmitter to another device, such as to a mobile gaming device, to a stationary gaming device, or to the casino server.

[0139] In various embodiments, a wristband may have one or more pressure sensors on the inside surface, e.g., the surface in contact with the wrist of the player. The pressure sensors may sense pressure from the player's wrist, indicating the possible tensing of the wrist or flexing of the wrist muscles.

[0140] In various embodiments, a wristband may have temperature sensors. The sensors may detect an increase in temperature at the wrist stemming from increased blood flow and/or from the more rapid burning of energy in wrist muscles. These sensor readings may correspond to a player's tensing of his wrist, such as when the player performs a grabbing motion.

[0141] In various embodiments, electrical activity of the nerves or muscles in the wrist may vary depending on whether the muscles are in a tensed or relaxed state. Sensors in the wristband, such as antennae, may pick up the electrical activity in the wrist and may interpret the electrical activity as an indication that the wrist muscles are tensed or not.

[0142] In various embodiments, a tensing of the wrist muscles may be interpreted as a command in a game. In various embodiments, a tensing of the wrist muscles may be interpreted as a selection of a button or a choice from among multiple options. In various embodiments, a tensing of the wrist muscles may correspond to virtually grabbing something in a game. For example, in a bonus round, a game character may grab the knob on one of three doors in order to open the knob. Since the tensing of wrist muscles may be caused by a player actually making a grabbing motion (e.g., in the real world), the player may use the grabbing motion as an intuitive way to select something or to grab something in a game. Thus, for example, the player may move a cursor through linear displacements of the hand, and may select something a cursor is on by making a grabbing motion.

[0143] In various embodiments, sensors or detectors could detect a grabbing motion or other hand or wrist motions even when such sensors do not lie within a wristband. For example, a camera may film the motions of a player's hand. Image processing algorithms may be used to recognize which motions have been made by the player's hand. These motions may be translated into commands in a game.

[0144] Thad Starner, Joshua Weaver, and Alex Pentland of the Massachusetts Institute of Technology have developed a camera-based system for recognizing American Sign Language. The system is describe in a paper entitled, "Real-Time American Sign Language Recognition Using Desk and Wearable Computer Based Video".

Receiver on Slot Machine

[0145] In various embodiments, a gaming device such as a slot machine may include a Bluetooth transceiver. The transceiver may be built into the device. The transceiver may also take the form of a Bluetooth dongle, which may be plugged into a universal serial bus (USB) port of the gaming device. In various embodiments, a gaming device may include a Wi-Fi transceiver. A gaming device may send and receive messages to and from a wristband or mobile gaming device using Bluetooth, Wi-Fi, or using any other communication protocols.

Components of a Message from a Wristband

[0146] The data content of a signal from a wristband may include one or more components. The signal may be understood to always include these components in a particular order, for example. For example, the first 3 bits of the signal may indicate the start of a new message. The next 4 bits may indicate the type of device providing the transmission (e.g., a wristband; e.g., a mobile gaming device). The next 30 bits may provide an identifier for the wristband. The next 100 bits of the signal may provide a player name. The next 20 bits may provide a command. The next 10 bits may indicate that the signal has ended. In some embodiments, a signal may include one or more of the following portions or regions: (a) a region indicating the start of the signal; (b) a region indicating a type of device transmitting a signal; (c) a region indicating the intended recipient of the signal (e.g., a unique identifier for a gaming device; e.g., an identifier for the casino server); (d) a region indicating a player identifier; (e) a region indicating a device identifier (e.g., a unique identifier for the particular device transmitting the signal); (f) a region indicating the end of the signal; (g) a region indicating a player name; (h) a region indicating a command to be used in a game; (i) a region indicating a game identifier (e.g., an identifier for a game to which a command will apply); (j) a region containing one or more error-checks; and any other region.

Confirmation of Player Presence and Identity at a Stationary Gaming Device

[0147] In various embodiments, a wristband may transmit a signal. The signal may be received by a stationary gaming device. The signal may include an identifier for the wristband. The gaming device may transmit the identifier of the wristband to the casino server. The casino server may look up the name of the player who has signed out the wristband (e.g., the player who is currently using the wristband). The casino server may transmit the name of that player to the gaming device. In some embodiments, the signal from the wristband may include a player identifier. The gaming device may transmit the player identifier to the casino server. The casino server may in turn transmit the name of the player back to the gaming device. In any event, the gaming device may determine the name of the player. The gaming device may display a message which indicates the name of the player. The message may be a greeting. For example, the message may say, "Hello, Sarah Jones!" The message may also ask a player to confirm his or her identity. A player may confirm his or her identity by answering a secret question, by providing a biometric (e.g., a fingerprint), by inserting a player tracking card, by inserting a credit card, by inserting a bank card, by inserting a driver's license, by flashing any of the aforementioned cards in front of a camera, or in any other fashion. In various embodiments, the player may confirm his identity through physical contact with the gaming device. For example, the player may answer a secret question by physically touching letters on a touch screen of the gaming device and spelling out the answer that way. When a player confirms his identity through physical contact with a gaming device, the gaming device can be more assured that a gaming device is not being controlled by motion-based or other wireless commands from a person other than the person sitting at the gaming device.

Prominent Screen for Playing with Motion Control Only

[0148] In various embodiments, a casino or other venue may include a large display screen. The screen may display a game. The screen may show the progress and the action in a game, such as a game of slot machine or a game of video poker. Electronics or other devices associated with the screen may allow the screen to receive motion inputs for play of a game. For example, there may be antennae for receiving signals from a player's wristband, or a camera for reading a player's motion commands. A processor or other device may compute or determine game events or game outcomes. A player may provide value or currency for gambling by inserting a cashless gaming ticket. Thus, associated with the screen may be a ticket-in-ticket-out device for accepting and dispensing cashless gaming slips.

[0149] A player may play games at the large display screen. The player may make commands in the game using motion control. For example, a wristband on the player may detect motions made by the player's hand. An indication of the motions made may be transmitted to the large display screen. The large display screen may then steer the course of the game as dictated by the player's commands.

[0150] In various embodiments, a game with a large display screen and controlled by motions may be located at the end of each of two or more rows of slot machines. For example, at the end of each row of slot machines or other gaming devices may be a large display screen which features games with motion control. Such games may be visible to everyone in the row of slot machines. In this way, people playing slot machines may watch the games played at the large screen and may be tempted to try motion control themselves.

Toggle Button on Wrist Watch to Turn Functions On or Off

[0151] In various embodiments, a wristband may include a switch, button, toggle, or other device for selecting among two or more states. A switch may be used to enable or disable motion control. Thus, when the switch is in one location, the player wearing the wristband may be able to use motion control to control the action in a game. When the switch is in another location, the player may be unable to use motion control to control the action in a game. When the player does not desire to play a game at the moment, the player may flip the switch so that motion is disabled. The player will then be able to make wrist gestures without worry that such gestures would effect a game outcome. When a player wishes to play a game again and to use motion control in the game, the player may flip the switch to enable motion control once more.

[0152] In various embodiments, a player may use a switch or other device to switch on or off other features of a wristband. A player may switch haptic feedback on or off. For example, with a switch in one position, the wristband may provide force feedback or haptic feedback to a player. When the switch is in another position, the wristband may not provide such feedback. A player may wish to turn off haptic feedback in order to conserve battery power in the wristband, for example. In some embodiments, a player may switch sound on or off. For example, at least in one state, a wristband may emit audio signals. The audio signals may relate to a game (e.g., triumphant music may be emitted from a wristband when the player wins). The audio signals may relate to a player location. For example, the wristband may emit audio signals when a player enters a restricted area where gaming is not permitted. The audio signals may relate to an account balance. For example, the wristband may emit an audio signal when a player account balance reaches zero. There may be other reasons for audio signals to be emitted by wristbands.

[0153] In various embodiments, a wristband may include one or more buttons, one or more sensors, one or more piezoelectric sensors, a batter, a transmitter, a receiver, and an onboard processor. The buttons may allow a player to change a setting or state of the wristband (e.g., to turn sound on or off). The buttons may allow a player to provide commands for a game, where such commands are not motion based. Sensors may include motion sensors, such as accelerometers or gyroscopes. Sensors may include position sensors, such as GPS sensors. Sensors may include temperature sensors, pressure sensors, strain gauges, microphones, light sensors, or any other sensors. Sensors may perform various functions. Sensors may detect motions so that such motions can be translated into commands. Sensors may sense a player's position so that the player can be told if he is in a permitted gaming area or not. Sensors may be used to sense a tension or electrical activity in a player's muscles, e.g., to derive motion commands. The transmitter may be used to communicate with another device, such as a stationary gaming device, mobile gaming device, or casino server. The receiver may receive communications from another device, such as a mobile gaming device, a stationary gaming device, or a casino server. Communications received at the wristband may reprogram the wristband. Such communications may provide the wristband with commands, for example. For example, a communication received by the wristband may instruct the wristband to shut off, due to a player's account balance reaching zero.

Shaking Hands

[0154] In various embodiments, the wristbands of two players may interact. The interaction may occur when the wristbands are brought close to one another. For example, when two players shake hands with the hands wearing the wristbands, the two wristbands may interact.

[0155] In various embodiments, during an interaction, a wristband of a first player may receive information from the wristband of a second player. The wristband of the second player may receive information from the wristband of the first player.

[0156] In various embodiments, a mobile gaming device of a second player may receive information from the wristband of a first player. In various embodiments, a mobile gaming device of the first player may receive information from the wristband of the second player.

[0157] In various embodiments, shaking hands may cause a bet to be made or sealed between the two players shaking hands. Technically, in some embodiments, the bet may be made when the wristbands of the two players are within a predetermined distance (e.g., 5 inches) of one another for a predetermined amount of time (e.g., 5 seconds). In some embodiments, the bet may be made when the wristbands are within a predetermined distance of one another for a predetermined time and when there is a shaking motion of one or both wristbands. The shaking motion may correspond to the shaking of hands. The wristbands may even transmit to one another information about the timing of the shaking motion to ensure that the wristbands are shaking in sync, as would happen with a hand shake. In various embodiments, a first player may prearrange the terms of a bet using a stationary gaming device or other device. For example, the first player may arrange a bet such that the first player will win $1 from the second player if the a spin of a roulette wheel ends up black, while the second player will win $1 from the first player if the spin of the roulette wheel ends up red. Once the bet has been specified, the first player need only find a second player to shake hands with in order to seal the bet. In various embodiments, it is possible that the first player would mischaracterize the terms of the bet to the second player. Thus, in various

embodiments, a first player may be allowed to prearrange only fair bets (e.g., bets where both sides have equal probabilities of winning and/or where both sides have equal expected winnings and/or where both sides have zero expected winnings and losses). In various embodiments, when players shake hands to make a bet, the terms of the bet may be displayed on one or both of the players' mobile gaming devices. Each player may have a window of time (e.g., thirty seconds) to cancel the bet. To cancel a bet, a player may press a "cancel" button on his mobile gaming device, for example. If neither player cancels the bet, an outcome may be generated and the bet may be resolved one way or the other.

[0158] In various embodiments, a first wristband may detect the proximity of another wristband. A wristband may be Bluetooth enabled so that the wristband can detect the proximity of another wristband transmitting with the Bluetooth protocol. In various embodiments, a wristband may be programmed or configured to send and receive signals of other protocols, such as Wi-Fi.

[0159] In various embodiments, two or more players may shake hands in order to make a bet with one another. The player who wins may depend on the outcome of some game, such as a game conducted or simulated by a gaming device. In some embodiments, in order for the bet to be resolved, the two players must be in proximity of a gaming device, such as a stationary gaming device. For example, in order for a bet to proceed, the two players may have to be standing in front of a slot machine. The players may be required to be within a predetermined distance of a particular gaming device, such as within two feet. The wristbands of one or both players may communicate with the gaming device indicating that the players have agreed to a bet. One or both wristbands may communicate to the gaming device the terms of the bet, such as which game the bet depends on. The gaming device may then conduct the appropriate game to satisfy the bet. For example, if the bet is on a game of video poker, then the gaming device may conduct a game of video poker. If the bet is on a game of blackjack, the gaming device may conduct a game of blackjack. In various embodiments, the wristbands may communicate to the gaming device which player will win under which circumstances. For example, the wristbands may communicate to the gaming device that "Joe Smith" will win if the house wins in a game of blackjack, while "Jane Smith" will win if the player wins in the game of blackjack. The player, in this case, may refer to a hypothetical player that is being simulated by a gaming device. The gaming device may play basic strategy or optimal strategy on behalf of the hypothetical player. In some embodiments, two players who make a bet on a game may play the game against one another using one or more gaming devices. The players may indicate strategic decisions at the gaming device(s). For example, if two players make a bet on a game of blackjack, the players may be effectively agreeing to play a game of blackjack against one another. The two players may play at a particular gaming device. During the course of the game, the players may provide decisions for the game. The players may provide decisions by physically pressing buttons on the gaming device or otherwise physically interacting with the gaming device. The players may also provide decisions by using motion controls, e.g., using their wristbands.

Incentives for Shaking Hands

[0160] In various embodiments, there may be incentives to shaking hands with people. A person's wristband may track the number of times a person has shaken hands with someone else, and/or the number of people with which the person has shaken hands. In some embodiments, after each handshake, a player's wristband may transmit a record or other indication of the handshake to the casino server. A wristband may transmit an identifier for the other player or the other wristband with which the player

made contact. The casino server and/or a player's wristband may track the number of other players with which a player shook hands. The casino server and/or the player's wristband may also track the names or identifies of other players with whom a player shook hands. In various embodiments, the player who shook hands with the most other players in some period of time (e.g., in one day) may win a prize, such as $1000.

[0161] In some embodiments, a mixer may be held in a casino or related property or in any other venue. The mixer may be an opportunity for singles to meet, an opportunity for business people to make contacts, an opportunity for scientists to exchange ideas with colleagues, or any other type of mixer. During the mixer, people may shake hands with one another. The wristbands of the people may automatically exchange information, include names, contact information, email addresses, phone numbers, biographical information, pictures, credentials, place of residence, age, gender, marital status, or any other information which may be appropriate to the circumstances, or any other information.

[0162] The wristbands of people who have participated in a mixer may transmit to a casino server or other device information about people with whom they have shaken hands or otherwise made contact. A person who has been at a mixer may later log onto a web site to see a summary list of people he has met. The web site may include contact information for the people. In some embodiments, no contact information is provided. Rather, a person must select who he/she would like to make contact with. If the person selects another person, and that other person selects him/her, then the website may later provide both of them with each other's contact information.

[0163] In some embodiments, during a handshake, the wristband of one person may transmit information about that person (e.g., contact information) to a mobile device (e.g., a mobile gaming device; e.g., a personal digital assistant; e.g., a cellular phone) to the other person. In this way, at the end of a mixer, a person may have stored on a mobile device information about other people he has met during the mixer.

[0164] In various embodiments, at the end of a mixer, a person may view images of people he/she had met at the mixer. Viewing the images may jog the person's memory about people he/she has met. The person may select people he/she is interested in having further contact with. The person may then be given their contact information. In some embodiments, the person may be given their contact information only if they have also expressed interest in having further contact with the person.

[0165] In various embodiments, a mixer may be held at a bar, restaurant, lounge, gym, swimming pool, gambling floor, shop, or at any other lounge.

Make Payments by Shaking Hands

[0166] In various embodiments a player may make a payment through shaking hands. A player may pay for a drink, a foot item, a product at a retail establishment, or any other item through a handshake. In some embodiments, a casino employee or employee of a retail establishment may possess a wristband. When the employee shakes hands with a person (e.g., a customer; e.g., a player), the employee wristband may receive a communication from the player's wristband. The communication may include information about the player, such as a name, identifier, credit card identifier, financial account identifier, or any other information about the player. The employee's wristband may communicate the player's financial account identifier as well as other identifying information about the player to a point of sale terminal, to a retail server, to a casino server, or to any other device. The player may then be charged for a purchase

through a credit card network or other financial network.

[0167] Having shaken hands with a casino employee, retail employee, salesperson, or other person, a player may have a limited period of time in order to review a transaction and cancel it. For example, a player's wristband may also store the details of a transaction following a handshake with a salesperson. The details of the transaction may include a purchase price, a product, a mode of delivery, and so on. The player may bring his wristband close to a mobile gaming device or to a stationary gaming device. The wristband may transfer transaction details to the mobile gaming device or to the stationary gaming device. The mobile or stationary gaming device may then display the transaction details for the player. The player may review them and decide whether or not to cancel. If the player wishes to cancel, the player may, in some embodiments, press a button or screen region on a mobile gaming device or on a stationary gaming device. The player may also be required to return to the place he bought the product and to return the product.

[0168] In various embodiments, a player may bring his wristband near to a reader as a way to pay for a transaction. The player may touch a pad with the wristband. For example, the player may put his hand on a pad to pay for a drink. The pad may contain an antenna or other type receiver to detect signals from the wristband. The signal detected may include a financial account identifier.

[0169] In various embodiments, a player may pay for a purchase or other transaction using a balance of gaming credits. The player may have an account with gaming credits that is stored and tracked with a casino server. When a player holds his wristband near a pad or reader in order to make a purchase, the reader may verify with the casino server whether the player has a sufficient account balance to complete the purchase. In various embodiments, a pad or reader may provide a first indicator if the player does have a sufficient account balance, and may provide a second indicator if the player does not have a sufficient account balance. The first indicator may be a green light, for example. The second indicator may be a red light, for example.

Wristband Becomes Unclasped

[0170] In various embodiments, if the wristband comes off the player (e.g., if the wristband becomes unclasped) then an alert may be sent to the casino server. The alert may indicate to the casino server that the wristband is no longer around the player's wrist. In various embodiments, once the wristband has been taken off, the wristband may cease to function for gaming purposes. For example, the wristband may no longer allow motion control. The wristband may also stop communicating a player identifier to a mobile gaming device. Thus, a mobile gaming device of the player may no longer allow the player to engage in gambling activities. Various other functions of the wristband may also cease once the wristband has been taken off.

[0171] In various embodiments, if a player wants to restore various functions of the wristband, the player may visit a special servicing area of a casino, such as a casino desk. There, a casino employee may put the wristband back on the player. The casino employee may transmit a special code to the wristband to activate it again. The casino employee may also check the identity of the player, such as by asking for a fingerprint or a driver's license, before reapplying the wristband.

[0172] In various embodiments, a wristband include one or more sensors for determining whether the wristband has come off the player, is unclasped, or has otherwise been tampered with or removed. For example a sensor may comprise an

electrical circuit encircling the wristband. If the wristband comes off the circuit may be broken.

[0173] In various embodiments, a wristband or mobile gaming device may rely upon continuous or periodic contact with a casino server in order to function. If the wristband or mobile gaming device loses contact with the casino server then they may cease to function. In various embodiments, the wristband may communicate with the server on a periodic basis. Inputs that the wristband receives from the player may not be carried out until the next communication is received from the server. For example, if the player moves his hand to make a command, the wristband may store a record of the motion and/or may store a command which corresponds to the motion. However, the wristband may not transmit the command to another device, such as to a mobile gaming device or a gaming device that the player may be playing. Rather, the wristband may store the command until it again receives a communication signal from the server. In this way, the wristband may ensure that no commands or no gaming commands are performed while the wristband may not be in contact with the casino server. In some embodiments, a wristband may store up inputs received from a player. However, if the wristband does not receive a communication from the casino server within a predetermined period of time of receiving the inputs, then the wristband may discard the inputs. In this way, the player may not later be surprised when a large number of stored or saved commands are executed at once. In various embodiments, player who enters an elevator may not be able to play for some time as communication between his bracelet and the casino server may be cut off.

[0174] In various embodiments, instead of a wristband ceasing to function when it is opened or unclasped, the wristband could continue broadcasting "I've been opened up" to the server until the server confirms it. There may be a period of time after the wristband has been opened that it is trying to tell the server it has been opened. Then there may be a period of time when it stops broadcasting after receiving confirmation from the server. After the wristband has been opened, it may no longer allow some functions (e.g., payments to be made using the wristband), but may still allow other functions (e.g., motion control). So, in various embodiments, some functions are disabled upon the opening of the clasp or otherwise taking off of the wrist band.

Wristband and Mobile Gaming Device can Replicate Each Other's Functions

[0175] In various embodiments, any motion commands that can be made with a wristband may also be made with a mobile gaming device. For example, just as a wristband may include sensors to detect accelerations, changes in orientation, displacements, and any other motions, so may a mobile gaming device. Just as with a wristband, a mobile gaming device may include a processor for reading signals from motion sensors in a mobile gaming device and interpreting such motions as commands to be used in a game or as any other commands. In various embodiments, any commands that can be made through a mobile gaming device may also be made using a wristband. In various embodiments, a wristband may detect motions made by a player and transmit an indication of such motions to a mobile gaming device. The mobile gaming device may interpret the motions as a command in a game or as any other command. In various embodiments, the mobile gaming device may detect motions and transmit such motions to the wristband. The wristband may interpret the motions as commands in a game, for example. The wristband may then transmit an indication of the commands to a stationary gaming device. In various embodiments, any signals or alerts broadcast by a mobile gaming device based on the location of the mobile gaming device may just as well be broadcast by a wristband based on the location of the wristband. For example, if a player wanders out of a legal gaming zone,

a mobile gaming device or a wristband could detect the position of the player and emit an audio alert for the player. In various embodiments, any haptic feedback that may be provided by a wristband may also be provided by a mobile gaming device. In various embodiments, any haptic feedback that may be provided by a mobile gaming device may also be provided by a wristband. In various embodiments, any information received, determined, or detected by a wristband may be communicated to a mobile gaming device, e.g., via wireless communication.

[0176] The following are embodiments, not claims. Various embodiments include:
A. A method comprising:

[0178] receiving a first wireless signal from a first device;

[0179] receiving a second wireless signal from a second device;

[0180] determining from the first wireless signal a first player identifier;

[0181] determining from the second wireless signal a second player identifier;

[0182] displaying a message that asks a player to identify himself;

[0183] receiving via tactile input an indication of a third player identifier;

[0184] determining that the third player identifier matches the first player identifier;

[0185] receiving a third wireless signal from the first device;

[0186] interpreting the third wireless signal as a command in a gambling game; and

[0187] carrying out the command in the gambling game.
Carrying out the command may include executing the command, following the command, acting in response to the command, and/or acting in accordance with the command.
B. The method of embodiment A in which the first device is one of: (a) a wristband; (b) a watch; (c) a bracelet; (d) an armband; and (e) a mobile gaming device.
C. The method of embodiment A in which determining from the first wireless signal a first player identifier includes determining from the first wireless signal a name of a first player. For example, the first wireless signal may encode a player name. In some embodiments, a player name may be found from a database which associates player other player identifiers (e.g., player tracking card numbers) with player names.
D. The method of embodiment A in which the first player identifier and the second player identifier correspond to different players.
E. The method of embodiment A in which receiving via tactile input an indication of a third player identifier includes receiving an indication of a third player identifier, in which the third player identifier has been inputted using buttons. For example, the someone may enter the third player identifier by physically pressing buttons (e.g., letter keys) on a gaming device.
F. The method of embodiment A in which receiving via tactile input an indication of a third player identifier includes receiving an indication of a third player identifier, in which the third player identifier has been inputted using a joystick.
G. The method of embodiment A in which receiving via tactile input an indication of a third player identifier includes receiving an indication of a third player identifier, in which the third player identifier has been inputted using a touch screen.
H. The method of embodiment A in which receiving via tactile input an indication of a

third player identifier includes receiving an indication of a third player identifier, in which the third player identifier has been inputted using a track ball.

I. The method of embodiment A in which the third wireless signal encodes a set of motions made by the first device. For example, the third wireless signal may include a set of numbers representing positions, velocities, accelerations, displacements, angular displacements, or other components of motion. The numbers may be understood to represent degrees, centimeters, or other units of measurement. In some embodiments, the third wireless signal may include an identifier for one of a set of recognized motions (e.g., "Motion F"; e.g., "Zigzag motion").

J. The method of embodiment A in which interpreting the third wireless signal includes interpreting the third wireless signal as a command to discard a card in a game of video poker.

K. The method of embodiment A in which interpreting the third wireless signal includes interpreting the third wireless signal as a command to initiate a slot machine game.

L. An apparatus comprising:

[0199] a band formed into a loop;

[0200] a power source attached to the band;

[0201] a motion sensor attached to the band;

[0202] an electromagnetic transmitter attached to the band;

[0203] an audio speaker attached to the band;

[0204] a haptics transducer attached to the band;

[0205] a processor attached to the band; and

[0206] an electromagnetic receiver attached to the band.

The band may be a metal band, elastic band, chain link band, cloth band, leather band, or any other type of band. In some embodiments, the band can be made into a loop by clasping its two ends together. In some embodiments, the band is always in loop form, save for unintended tearing or ripping.

M. The apparatus of embodiment L in which the haptics transducer is operable to generate vibrations in response to an electric signal from the processor. For example, the processor may direct the haptics transducer to vibrate when a jackpot has been won in a game being played by the wearer of the apparatus.

N. The apparatus of embodiment L in which the motion sensor is an accelerometer.

O. The apparatus of embodiment L in which the processor is operable to:

[0210] receive a first electronic signal from the motion sensor;

[0211] determine a first command for a first gambling game based on the first electronic signal;

[0212] transmit the first command to the electromagnetic transmitter; and

[0213] direct the electromagnetic transmitter to transmit the first command to a first gaming device.

Thus, in various embodiments, the apparatus may detect a player's motions and interpret the motions as commands in gambling game, such as a slot machine game, video poker game, blackjack game, or any other game. The apparatus may then

transmit the command via to a gaming device, such as to a slot machine or to a mobile gaming device, so that the command may be executed in a game.
P. The apparatus of embodiment L in which the processor is operable to:

[0215] receive from the electromagnetic receiver instructions that have been received wirelessly by the electromagnetic receiver;

[0216] receive a second electronic signal from the motion sensor;

[0217] follow the instructions in order to determine a second command for a second gambling game based on the second electronic signal;

[0218] transmit the second command to the electromagnetic transmitter; and

[0219] direct the electromagnetic transmitter to transmit the second command to the gaming device.
Q. The apparatus of embodiment L further including a switch attached to the band,

[0221] in which the switch has two stable positions, and in which the processor is operable to detect the position of the switch and to direct the electromagnetic transmitter to transmit signals only if the switch is in a first of the two stable positions. In various embodiments, a player may turn some or all aspects of a wristband on or off. The player may do this by means of a switch, button, or other toggling device, or other device. With one state of the switch, the wristband may transmit motions or commands to be used in a game. With another state of the switch, no such motions or commands may be transmitted. For example, the player may wish to make motions without worry that such motions would be counted in a game.
R. The apparatus of embodiment L further including a piezoelectric sensor attached to the band. The piezoelectric sensor may detect flexing of a player's wrist muscles through the pressure they place on the wristband, for example.
S. An apparatus comprising:

[0224] a housing, the housing including a top surface that is parallel to the ground;

[0225] a coin hopper disposed within the housing;

[0226] a bill validator attached to the housing;

[0227] a display screen attached to the housing;

[0228] a processor disposed within the housing;

[0229] a wireless receiver attached to the housing;

[0230] a wireless transmitter attached to the housing;

[0231] a first light source attached to the top surface of the housing, in which the first light source is operable to emit light of a first frequency; and

[0232] a second light source attached to the top surface of the housing at least one foot from the first light source, in which the second light source is configured to emit light of a second frequency which is different from the first frequency.
The apparatus may represent a gaming device. The two light sources may provide fixed reference points relative to which a wristband or mobile gaming device may

determine its own position or orientation. For example, the first light source may be a green light and the second light source may be a red light. A wristband may detect the two lights sources by e.g., capturing an image which includes the light sources, determining the apparent distance of the light sources in the image, and determining its own distance from the light sources based on the known distance between the two light sources.
T. The apparatus of embodiment S in which the processor is operable to:

[0234] conduct gambling games; and

[0235] alter the course of a gambling game based on wireless signals received at the wireless receiver.
In various embodiments, altering the course of a gambling game may include taking one of two or more possible actions in a gambling game, such as choosing one or two possible cards to keep, or such as choosing one of two or more possible bets.

Sone Haptics Technology

[0236] The Impulse stick from Immersion is a joystick which provides force feedback and is marketed to be used in challenging environments, such as video arcades.

[0237] The VibeTonz(R) system by Immersion is a system that can endow mobile phones with haptic sensations. Such sensations may provide the feel from a repetition of a machine gun, from the shock and decay of an explosion, or from the thump of a foot kicking a ball.

[0238] A "haptic interface device" provides a haptic sensation (haptic display) to a user of the haptic interface device in response to the user's interaction with an environment with which the haptic interface device is associated. "Haptic" refers to the sense of touch: haptic interface display devices thus produce sensations associated with the sense of touch, such as texture, force (e.g., frictional force, magnetic repulsion or attraction), vibration, mass, density, viscosity, temperature, moisture, or some combination of such sensations. Haptic interface devices can be embodied in a variety of different apparatus, such as, for example, apparatus for conveying force and/or vibrotactile sensation (e.g., a stylus, a movable arm, a wheel, a dial, a roller, a slider or a vibratory surface), apparatus for conveying thermal sensation (e.g., a thermally-controlled surface or air volume), and apparatus for conveying the sensation of moisture (e.g., a moisture-controlled surface or air volume). Haptic interface devices can be used in a wide variety of applications. For example, some joysticks and mice used with computers incorporate force feedback to provide a haptic display to a user of the joystick or mouse. Some paging devices are adapted to vibrate when a paging signal is received. Some toys produce vibrations as part of the interaction with the toy. These examples give an indication of the range of applications for which a haptic interface device can be used.

[0239] In a conventional haptic interface device, the character of the haptic display experienced by a user is determined by a haptic model that links the state of one or more aspects of the environment to the haptic sensation provided to the user. A user uses an environment interaction control apparatus to interact with an environment via an environment interaction model (either directly or via a haptic model). The haptic model "interprets" the user interaction with the environment (based on information concerning the user interaction obtained either from the environment interaction model or the environment to cause a haptic display apparatus to produce a corresponding haptic display. The environment interaction model can also cause a non-haptic display

apparatus to produce a non-haptic display (e.g., a visual display and/or an audio display). However, there need not necessarily be a non-haptic display.

[0240] The magnitude of the change in haptic sensation per unit change in the state of one or more aspects of the environment is referred to herein as the "resolution" of the haptic display. For example, in a haptic interface device used for video browsing and/or editing, a knob can be rotated to advance through the frames of a video recording, a force being applied in opposition to rotation of the knob, to simulate a detent, at predetermined transitions from one video frame to the next in the video recording. The resolution of the haptic display in that haptic interface device can be the frequency of occurrence of detents in the video recording (e.g., the number of video frames between each detent). (It can also be possible, as illustrated by an example discussed further below, to define the resolution of the haptic display of such a haptic interface device in terms of the frequency of detents per unit duration of time over which the video was obtained.)

[0241] Output produced by the haptic display apparatus can include, for example, sensations of texture, force (e.g., frictional force, magnetic repulsion or attraction), vibration, mass, density, viscosity, temperature, moisture, or some combination of such sensations. When the environment is a visual and/or an audio recording, for example, force can be applied in opposition to movement of an apparatus embodying the environment interaction control apparatus and the haptic display apparatus to simulate a detent as transition is made from one video frame (or other related set of visual recording data) to the next. Additionally the haptic model can replicate a variety of characteristics of a haptic sensation, such as inertia, damping and/or compliance. The haptic display apparatus can make use of a variety of devices to produce the haptic display. For example, if appropriate for the desired haptic display, devices for producing force and/or vibrotactile sensation can be used, such as, for example, DC servo motor(s), voice coil motor(s), linear actuator(s), hydraulic actuator(s), pneumatic actuator(s), shape memory alloy(s) (SMAs) and piezoelectric transducer(s). If appropriate for the desired haptic display, thermal devices can additionally or alternatively be used, such as, for example, thermoelectric module(s), or heater and fan combination(s). If appropriate for the desired haptic display, moisture devices and/or materials can additionally or alternatively be used, such as, for example, condenser(s), mister(s), moisture-permeable barrier(s) and anhydrous material(s).

[0242] The haptic display apparatus can be embodied by, for example, a force-actuated wheel, knob, handle or arm, a heat sourcing and/or sinking device, or a moisture generating and/or absorbing device.

[0243] Various devices actively respond to user input by providing tactile cues or responses to the user. The vibrator in a cell phone or pager is a good example. Other examples include an input key that provides a clicking sound when moved; a key or touch screen that moves suddenly or vibrates in an opposed direction to the input; and a key that moves suddenly or vibrates perpendicular to the direction of input in response to a transducer attached to the device housing.

[0244] An input mechanism such as a display and/or a key may be configured for providing active tactile force feedback. An electromechanical transducer, such as a voice-coil based linear vibration motor, a piezoelectric actuator or vibrator, or the like, is mechanically connected directly to the display, and an electromechanical transducer, such as a vibrator, or the like, is mechanically connected directly to the key.

[0245] In various embodiments, a haptic interface module is configured to output pulses

of predetermined or user defined amplitude and duration in response to receiving a trigger signal from a phone processor. Alternatively, other interface logic (e.g., address decoding logic) is included between a digital signal bus, and a haptic interface module. The phone processor is programmed to trigger the haptic interface module in response to a predetermined state as determined by intelligent operations within the phone processor. Optionally, the triggering of the haptic interface module can selectively enabled or disabled in accordance with configuration settings that a user can edit. The haptic interface module is coupled to electromechanical transducers. The electromechanical transducers are driven by the output of the haptic interface module.

[0246] More generally, the electromechanical transducers are preferably driven by a signal that includes at least one approximation of a step function. (Note that a step function is a mathematical ideal that no real world circuit can achieve). A step function includes a broad range of frequencies. By using a driving signal that includes an approximation of a step function, the electromechanical transducer is caused to emit an impulse of mechanical energy that propagates to the haptic point and is felt by a user operating the cellular phone. In various embodiments, the electromechanical transducer is driven by a signal that includes one or more pulses. A pulse, e.g., a single pulse or a complex waveform, is generated in response to each detected state, where a state refers to a particular situation identified by the phone processor. Using a known pulse is advantageous in that a known pulse generates an impulse of mechanical energy that creates a tactile sensation that simulates the feel of previous states with which the user may be familiar.

[0247] A transceiver module, phone processor, AID, input decoder, D/A 510, haptic interface module, display driver, memory, and display driver are preferably part of an electric circuit that is embodied in the circuit components, and interconnecting traces of the circuit board.

[0248] Alternatively in lieu of using the phone processor, a different electric circuit may be used to drive the electromechanical transducer in order to generate tactile feedback to the haptic points.

[0249] The haptic interface module could alternatively be a pulse generator, generating digital pulses of various widths, heights, and/or frequencies based on instructions from the phone processor. Depending on the impedance match to the electromechanical transducer and current sourcing/sinking capability, an amplifier may be needed. Alternatively, the haptic interface module could simply be a current amplifier and pulses would be generated by the phone processor itself. Another possibility is that the haptic interface module comprises multiple DACs which apply analog signals as would be the case if additional audio channels were included.

[0250] Various situations could prompt different haptic responses. For example, in a pager or cell phone, a message or call from a spouse might cause all the haptic points to vibrate, or a message or call from a boss might cause the haptic points to vibrate in a circular motion around the electronic device, or a message or call from another might cause the haptic points to vibrate repeatedly up one side of the electronic device. The use of adjacent multiple vibrators in succession as described creates a perceptual illusion of movement (known as the cutaneous rabbit).

[0251] This illusion of movement could be used to give directional information for navigation. The movement along a side, around the electronic device, back and forth, can also be used to convey information, such as to gather attention, create emphasis, and general non-verbal information. The electronic device can also relay information of

its status, such as out of range, low battery, and busy signal. Such information may be valuable while the user is holding the electronic device to his/her ear and cannot readily see information on the screen.

[0252] The multiple localized force feedback could also be used for sensorial communication. Instead of sending a voice or text message or a picture or a data file, one could send a particular haptic pattern to other users. The pattern could represent a reminder, a certain mood (e.g., thinking of you, love you, missing you, etc.), a particular sensation, or any other user defined contents.

[0253] Computer devices are widely used for entertainment activities such as playing games. Currently, popular gaming computer devices include game consoles connected to a home television set, such as the Nintendo(R) 64 from Nintendo Corp., the Playstation(R) from Sony Corp. and the Dreamcast(TM) from Sega Corp. Gaming computer devices also include personal computers, such as Windows PCs, Macintosh computers, and others. Also, portable computer devices are often used for entertainment purposes, such as Game Boy(R) from Nintendo, personal digital assistants such as PalmPilot(R) from Palm Computing, and laptop computers.

[0254] Users of these computer devices typically interact with a game or other application program using an interface device connected to the host computer (e.g. game console). Such interface devices may include joysticks, gamepads, mice, trackballs, styluses, steering wheels, or other devices. A user moves a user manipulatable object (manipulandum), such as a joystick, wheel, mouse, button, dial, or other object, which is sensed by the host computer and used to manipulate a graphical environment displayed by the host computer. Recently, haptic feedback in interface devices has become available as well, where the host computer and/or a microprocessor on the interface device controls one or more motors to output forces to the user. These forces are correlated with events or objects in the graphical environment to further immerse the user in the gaming experience or interface task. Herein, the term "haptic feedback" is intended to include both tactile (or vibrotactile) feedback (forces transmitted to user skin surfaces) and kinesthetic feedback (forces provided in degree(s) of freedom of motion of the manipulandum).

[0255] Existing force feedback "gamepad" controllers (or add-on hardware for gamepad controllers) that are used to interface with games running on game consoles include the Dual Shock(TM) from Sony Corp., the Rumble Pak(TM) from Nintendo Corp., and the Jump Pack from Sega Corp, as well as other types of handheld controllers such as the MadCatz Dual Force Racing Wheel. These devices are inertial tactile feedback controllers which employ one or more motors to shake the housing of the controller and thus provide output forces such as vibrations to the user which are correlated to game events and interactions. Typically, an eccentric rotating mass (ERM) motor, i.e., pager motor, is used to generate vibration on the controller and thus to the user. The motor is rigidly coupled to the controller housing and provides a mass on a rotating shaft offset from the axis of rotation, so that when the shaft is rotated, the inertial forces from the moving mass rock the motor and the gamepad housing back and forth.

[0256] To replicate texture, a force-feedback device is preferably used to allow users to touch and feel computer generated objects. The sense of touch is preferably simulated using a haptic (sensory/touch) interface. A haptic interface is a force reflecting device that allows a user to touch, feel, manipulate, create, and/or alter simulated three-dimensional objects in a virtual environment. There are various known haptic interface objects, including a flat surface area interface, joystick, glove, thimble, stick or pen, exo-skeletal structures, tread-mills, fans, magnetic. Hardware employed includes DC

brushless motors, potentiometers, Silicon Graphics, Inc. IRIS Indigo computers, V25 board computers, 8086 compatible micro processors, CRT displays, stereo-imaging systems, magnetic and electromagnetic components, pulleys, steel belt drive trains, VME bus, encoders, potentiometers, motor controllers, encoders, cable reducers. The required software can be any of a variety of programming languages (e.g., C, C++) that are able to work with visual modeling programs.

[0257] Currently, there is no consensus on the "best" type of interface among experts. However, an example of a known haptic interface is the "Phantom Haptic Interface" developed at MIT's Artificial Intelligence Laboratory. The "Phantom Haptic Interface," delivers precise haptic stimulation to humans at a level of fidelity and convenience previously unattainable. The device built to deliver the forces that arise in "point contacts" gives the sensation of fingertip interactions with a wide variety of objects. Requiring only three motors and three sensors to accomplish this, the device provides a computationally and mechanically tractable way to enable haptic interaction with complex virtual objects.

[0258] Haptic interfaces permit user to touch and manipulate imaginary computer-generated objects in a way that evokes a compelling sense of tactile "realness." With this technology a user at a computer terminal can touch objects that exist only in the "mind" of the computer. By transmitting the correct digital signals to a master haptic interface device at a remote user location, the master device can be used to make users feel as though they were performing a real task. In reality, users would simply be interacting through motors with a computer program.

[0259] Various embodiments are optically based, and generally uses unobtrusive specialized datum's on, or incorporated within, an object whose 3D position and/or orientation is desired to be inputted to a computer. Typically such datums are viewed with a single TV camera, or two TV cameras forming a stereo pair. A location for the camera(s) may be proximate the computer display, looking outward therefrom, or to the top or side of the human work or play space.

[0260] Retroreflective glass bead tape, or beading, such as composed of Scotchlite 7615 by 3M co., provides a point, line, or other desirably shaped datum which can be easily attached to any object desired, and which has high brightness and contrast to surroundings such as parts of a human, clothes, a room etc, when illuminated with incident light along the optical axis of the viewing optics such as that of a TV camera. This in turn allows cameras to be used in normal environments, and having fast integration times capable of capturing common motions desired, and allows datums to be distinguished easily which greatly reduces computer processing time and cost.

FIG. 14a

[0261] FIG. 14a illustrates exemplary single camera based embodiments. In this case, a user C5, desires to point at an object C6 represented electronically on the screen C7 and cause the pointing action to register in the software contained in computer C8 with respect to that object (a virtual object), in order to cause a signal to be generated to the display C7 to cause the object to activate or allow it to be moved, (e.g. with a subsequent finger motion or otherwise). He accomplishes this using a single TV camera C10 located typically on top of the screen as shown or alternatively to the side (such as C11) to determine the position of his fingertip C12 in space, and/or the pointing direction of his finger C13.

[0262] It may be desirable to use retroreflective material on the finger, e.g., as either

temporarily attached to the finger as in jewelry or painted on the finger using retro-reflective coating "nail polish" or adhered to the finger such as with adhesive tape having a retro-reflective coating. Such coatings may include those of Scotch-lite 7615 and its equivalent that have high specific reflectivity, contrasting well to their surroundings to allow easy identification. The brightness of the reflection allows dynamic target acquisition and tracking at lowest cost.

[0263] The use of retroreflective and/or highly distinctive targets (e.g. bright orange triangles) allows reliable acquisition of the target in a general scene, and does not restrict the device to pointing on a desktop application under controlled lighting. Active (self luminous) targets such as LEDS may also allow such acquisition.

[0264] If we consider camera system C10 sitting on top of the screen C7 and looking at the user or more particularly, the user's hand, in a normal case of Internet telephony there is a relatively large field of view so that the user's face can also be seen. This same field of view can be used for various embodiments but it describes a relatively large volume. For higher precision, add-on lenses or zoom lenses on the camera may be used to increase the resolution.

[0265] Or it is possible according to various embodiments to have a plurality of cameras, one used for the Internet and the other used for the input application here described. Indeed with the ever dropping prices, the price of the actual camera including the plastic lens on the CMOS chip is so low, it is possible perhaps even to have multiple cameras with fixed magnifications, each having a separate chip!

[0266] These can easily be daisy chained with either fire wire or USB such that they can either be selected at will electronically in fact by the different magnifications or pointing directions desired.

[0267] Let us now return now to the question of determining location or orientation of a human portion such as typically a hand, or finger-in this case, a finger. In various embodiments, low cost lighting may be used. The power for the lighting, such as LEDs can generally be conveyed over the USB or 1394 bus however.

[0268] The user can also point or signal with an object such as C15 having datum C16 on it, such as a retroreflective dot C16 or line target C17.

[0269] It is possible to expand the sensing of 2D positions described above into 3, 4, 5 and 6 dimensions (x, y plus z, pitch, yaw, roll). Two sensing possibilities of the many possible, are described in various embodiments herein.
1. The first, illustrated in FIG. 14a and b is to utilize a single camera, but multiple discrete features or other targets on the object which can provide a multidegree of freedom solution. In one example, the target spacing on the object is known a priori and entered into the computer manually or automatically from software containing data about the object, or can be determined through a taught determining step.
2. The second is a dual camera solution shown in FIGS. 14c and d that does not require a priori knowledge of targets and in fact can find the 3D location of one target by itself, useful for determining finger positions for example. For 6-degree freedom of information, at least three point, targets are required, although line targets, and combinations of lines and points can also be used.

[0272] FIG. 14b illustrates a 3-D (3 Dimensional) sensing embodiment using single camera stereo with 3 or more datums on a sensed object, or in another example, the wrist of the user.

[0273] As shown the user holds in his right hand C29, object C30 which has at least 3 visible datums C32, C33, and C34 which are viewed by TV camera C40 whose signal is processed by computer C41 which also controls projection display C42. TV camera C40 also views 3 other datums C45, C46 and C47, on the wrist C48 of the users left hand, in order to determine its orientation or rough direction of pointing of the left hand C51, or its position relative to object C30, or any other data (e.g. relation to the screen position or other location related to the mounting position of the TV camera, or to the users head if viewed, or what ever. The position and orientation of the object and hand can be determined from the 3 point positions in the camera image using known photogrammetric equations (see Pinckney, reference U.S. Pat. No. 4,219,847 and other references in papers referenced).

[0274] Alternatively to the 3 discrete point target, a colored triangular target for example can be used in which the intersections of lines fitted to its sides define the target datums, as discussed below.

[0275] It is also possible to use the camera C40 to see other things of interest as well. For the direction of pointing of the user at an object C55 represented on display C42 is determine for example datum C50 on finger C52 of users left hand C51 (whose wrist position and attitude can be also determined).

[0276] Alternatively, the finger can be detected just from its general gray level image, and can be easily identified in relation to the targeted wrist location (especially if the user, as shown, has clenched his other fingers such that the finger C52 is the only one extended on that hand).

[0277] The computer can process the gray level image using known techniques, for example blob and other algorithms packaged with the Matrox brand Genesis image processing board for the PC, and determine the pointing direction of the finger using the knowledge of the wrist gained from the datums. This allows the left hand finger C50 to alternatively point at a point (or touch a point) to be determined on the object C30 held in the right hand as well.

FIG. 14c

[0278] FIG. 14c illustrates another version of the embodiments of FIGS. 14a and 14b, in which two camera "binocular" stereo cameras C60 and C61 processed by computer C64 are used to image artificial target (in this case a triangle, see also FIG. 2), C65, on the end of pencil C66, and optionally to improve pointing resolution, target C67 on the tip end of the pencil, typically a known small distance from the tip (the user and his hand holding the pencil is not shown for clarity. This imaging allows one to track the pencil tip position in order to determine where on the paper (or TV screen, in the case of a touch screen) the pencil is contacting.

[0279] It may be desirable to have independently controllable near coaxial light sources C62 and C63 are shown controlled by computer C64 to provide illumination of retroreflective targets for each camera independently. This is because at different approach angles the retroreflector reflects differently, and since the cameras are often angularly spaced (e.g. by non-zero angle A), they do not see a target the same.

[0280] Numerous other camera arrangements, processing, computation, and other issues are discussed in general relative to accurate determination of object positions using two or more camera stereo vision systems in the S.F. El Hakim paper referenced

above and the additional references referred to therein.

[0281] The computer can also acquire the stereo image of the paper and the targets in its four corners, C71-C74. Solution of the photogrammetric equation allows the position of the paper in space relative to the cameras to be determined, and thence the position of the pencil, and particularly its tip, to the paper, which is passed to display means C75 or another computer program. Even with out the target on the end, the pointing direction can be determined from target C65 and knowing the length of the pencil the tip position calculated.

[0282] A line target C76 can also be useful on the pencil, or a plurality of line targets spaced circumferentially, can also be of use in defining the pencil pointing direction from the stereo image pair.

[0283] A working volume of the measurement system is shown in dotted lines C79-that is the region on and above the desk top in this case where the sensor system can operate effectively. Typically this is more than satisfactory for the work at hand. It is noted that due to possible compound inclination of the cameras, and other geometric considerations, the effective working volume for any given accuracy or resolution criteria, does not necessarily have parallel sides.

[0284] It is noted that the dual (Stereo pair) camera system of FIG. 14 has been extensively tested and can provide highly accurate position and orientation information in up to 6 degrees of freedom. One particular version using commercial CCD Black and white cameras and a Matrox "Genesis" framegrabber and image processing board, and suitable stereo photogrammetry software running in an Intel Pentium 300 MHZ based computer, has characteristics well suited to input from a large desktop CAD station for example. This provides 30 Hz updates of all 6 axes (x y z roll pitch and yaw) data over a working volume of 0.5 meter*0.5 meter in x and y (the desktop, where cameras are directly overhead pointing down at the desk) and 0.35 meters in z above the desk, all to an accuracy of 0.1 mm or better, when used with clearly visible round retroreflective (scotchlite 7615 based) datums approx. 5-15 mm in diameter on an object for example. This may be accurate enough for precision tasks such as designing objects in 3D cad systems.

[0285] The cameras in this example are mounted overhead. If mounted to the side or front, or at an angle such as 45 degrees to the desktop, the z axis becomes the direction outward from the cameras.

[0286] FIG. 14c additionally illustrates 2 camera stereo arrangement, used in this case to determine the position and orientation of an object having a line target, and a datum on a portion of the user. Here, cameras C60 and C61 are positioned to view a retro-reflective line target C80 in this case running part of the length of a toy sword blade C81. The line target in this case is made as part of the plastic sword, and is formed of molded in corner cube reflectors similar to those in a tail light reflector on a car. It may also be made to be one unique color relative to the rest of the sword, and the combination of the two gives an unmistakable indication.

[0287] There are typically no other bright lines in any typical image when viewed retroreflectively. This also illustrates how target shape (i.e. a line) can be used to discriminate against unwanted other glints and reflections which might comprise a few bright pixels worth in the image. It is noted that a line type of target can be cylindrical in shape if wrapped around a cylindrical object, which can be viewed then from multiple angles.

[0288] Matching of the two camera images and solution of the photogrammetric equations gives the line target pointing direction. If an additional point is used, such as C82 the full 6 degree of freedom solution of the sword is available. Also shown here is yet another point, C83, which serves two purposes, in that it allows an improved photogrammetric solution, and it serves as a redundant target in case C82 cant be seen, due to obscuration, obliteration, or what have you.

[0289] This data is calculated in computer C64, and used to modify a display on screen C75 as desired.

[0290] In one embodiment a matrox genesis frame processor card on an IBM 300 mhz PC was used to read both cameras, and process the information at the camera frame rate of 30 HZ. Such line targets are very useful on sleeves of clothing, seams of gloves for pointing, rims of hats, and other decorative and practical purposes for example for example outlining the edges of objects or portions thereof, such as holes and openings.

[0291] Typically the cameras C60 and C61 have magnifications and fields of view which are equal, and overlap in the volume of measurement desired. The axes of the cameras can be parallel, but for operation at ranges of a few meters or less, are often inclined at an acute angle A with respect to each other, so as to increase the overlap of their field of view-particularly if larger baseline distances d are used for increased accuracy (albeit with less z range capability.). For example for a cad drawing application, A can be 30-45 degrees, with a base line of 0.5 to 1 meter. Where as for a video game such as FIG. 5, where z range could be 5 meters or more, the angle A and the base line would be less, to allow a larger range of action.

Data Base

[0292] The datums on an object can be known a priori relative to other points on the object, and to other datums, by selling or other wise providing the object designed with such knowledge to a user and including with it a CD ROM disc or other computer interfacable storage medium having this data. Alternatively, the user or someone, can teach the computer system this information. This is particularly useful when the datums are applied by the user on arbitrary objects.

FIG. 14d

[0293] Illustrated here are steps used in various embodiments relating to detection of a single point to make a command, in this case; the position (or change of position, i.e. movement) of a finger tip having retroreflective target attached detected by a stereo pair of TV cameras using detection algorithm which in its simplest case is based on thresholding the image to see only the bright target indication from the finger (and optionally, any object associated therewith such as a screen to be touched for example).

[0294] If this is insufficient to unambiguously defined the datum on the finger, added algorithms may be employed which are themselves known in the art (many of which are commonly packaged with image analysis frame grabber boards such as the matrox genesis. The processes can include, for example:
a brightness detection step relative to surroundings, or to immediate surroundings (contrast);
a shape detection step, in which a search for a shape is made, such as a circle, ring, triangle, etc.;

a color detection step, where a search for a specific color is made;
a movement step, wherein only target candidates which have moved from a location in a previous TV image are viewed.

[0299] Each step, may process only those passing the previous step, or each may be performed independently, and the results compared later. The orders of these steps can be changed but each adds to further identify the valid indication of the finger target.

[0300] Next the position of the targeted finger is determined by comparing the difference in location of the finger target in the two camera images of the stereo pair. There is no matching problem in this case, as a single target is used, which appears as only one found point in each image.

[0301] After the Image of finger (or other tool) tip is found, its location is computed relative to the screen or paper, and this data is inputted to the computer controlling the display to modify same, for example the position of a drawing line, an icon, or to determine a vector of movement on the screen.

Motion Detection.

[0302] The computer 8 can be used to analyze incoming TV image based signals and determine which points are moving in the image This is helpful to eliminate background data which is stationary, since often times only moving items such as a hand or object are of interest. In addition, the direction of movement is in many cases the answer desired or even the fact that a movement occurred at all.

[0303] A simple way to determine this is to subtract an image of retroreflective targets of high contrast from a first image-and just determine which parts are different-essentially representing movement of the points. Small changes in lighting or other effects are not registered. There are clearly more sophisticated algorithms as well.

[0304] Motion pre processing is useful when target contrast is not very high, as it allows one to get rid of extraneous regions and concentrate all target identification and measurement processing on the real target items.

[0305] Such processing is also useful when two camera stereo is used, as only moving points are considered in image matching-a problem when there are lots of points in the field.

[0306] Can it be assumed that the object is moving? The answer is yes if it's a game or many other activities. However there may be a speed of movement of issue. Probably frame to frame is the criteria, in a game, namely 30 Hz for a typical camera. However, in some cases movement might be defined as something much slower-e.g. 3 Hz. for a CAD system input using deliberate motion of a designer.

[0307] Once the moving datum is identified, then the range can be determined and if the object is then tracked even if not moving from that point onward, the range measurement gives a good way to lock onto the object using more than just 2 dimensions.

[0308] One might actually use an artificial movement of the target if one doesn't naturally exist. This could be done by causing it to vibrate. If one or more LEDs is used as a target, they can be made to blink, which also shows up in an image subtraction (image with led on, vs. image with led off). The same is true of a target which changed

color, showing up in subtraction of color images.

[0309] Image subtraction or other computer processing operations can also be useful in another sense. One can also subtract background, energizing the retroreflective illumination light with no retroreflective targets present, and then with them. One idea is simply to take a picture of a room or other work space, and then bring in the targeted object. That would seem pretty simple to subtract or whatever. And the net result is that any bright features in the space which are not of concern, such as bright door knobs, glasses, etc are eliminated from consideration.

[0310] This can also be done with colored targets, doing a color based image subtract- especially useful when one knows the desired colors a priori (as one would, or could, via a teach mode).
A flow chart is shown in FIG. 14d illustrating the steps as follows:
A. Acquire images of stereo pair;
B. Optionally preprocess images to determine if motion is present. If so, pass to next step otherwise do not or do anyway (as desired);
C. Threshold images;
D. If light insufficient, change light or other light gathering parameter such as integration time;
E. Identify target(S);
F. If not identifiable, add other processing steps such as a screen for target color, shape, or size;
G. Determine centroid or other characteristic of target point (in this case a retro dot on finger);
H. Perform auxiliary matching step if required;
I. Compare location in stereo pair to determine range z and x y location of target(s);
J. Auxiliary step of determining location of targets on screen if screen position not known to computer program. Determine via targets on screen housing or projected on to screen for example;
K. Determine location of target relative to screen;
L. Determine point in display program indicated;
M. Modify display and program as desired.

FIG. 14e

[0324] The following is a multi-degree of freedom image processing description of a triangular shaped color target (disclosed itself in several embodiments herein) which can be found optically using one or more cameras to obtain the 3 dimensional location and orientation of the target using a computer based method described below. It uses color processing to advantage, as well as a large number of pixels for highest resolution, and is best for targets that are defined by a large number of pixels in the image plane, typically because the target is large, or the cameras are close to the target, or the camera field is composed of a very large number of pixels.

[0325] The method is simple but unique in that it can be applied 1) in a variety of degrees to increase the accuracy (albeit at the expense of speed), 2) with 1 or more cameras (more cameras increase accuracy), 3) it can utilize the combination of the targets colors and triangles, (1 or more) to identify the tool or object. It utilizes the edges of the triangles to obtain accurate subpixel accuracy. A triangle edge can even have a gentle curve and the method will still function well. Other geometric shapes can also be processed similarly in some cases.

[0326] The method is based on accurately finding the 3 vertices (F0,G0,F1,G1,F2,G2)

of each triangle in the camera field by accurately defining the edges and then computing the intersection of these edge curves. This is generally more accurate, than finding 3 or 4 points from spot centroids. However, the choice of which to use, often comes down to which is more pleasing to the consumer, or more rugged and reliable in use.

[0327] The preferred implementation uses 1 or more color cameras to capture a target composed of a brightly colored right triangle on a rectangle of different brightly colored background material. The background color and the triangle color must be two colors that are easily distinguished from the rest of the image. For purposes of exposition we will describe the background color as a bright orange and the triangle as aqua.

[0328] By using the differences between the background color and the triangle color, the vertices of the triangle can be found very accurately. If there are more than one triangle on a target, a weighted average of location and orientation information can be used to increase accuracy.

[0329] The method starts searching for a pixel with the color of the background or of the triangle beginning with the pixel location of the center of the triangle from the last frame. Once a pixel with the triangle "aqua" color is found, the program marches in four opposite directions until each march detects a color change indicative of an edge dividing the triangle and the "orange" background. Next, the method extends the edges to define three edge lines of the triangle with a least squares method. The intersection points of the resulting three lines are found, and serve as rough estimates of the triangle vertices. These can serve as input for applications that don't require high accuracy.

[0330] If better accuracy is desired, these provisional lines are then used as a starting point for the subpixel refinement process. Each of these 3 lines is checked to see if it is mainly horizontal. If a line is mainly horizontal, then a new line will be determined by fitting a best fit of a curve through the pixel in each column that straddles the provisional line. If a line is mainly vertical, then the same process proceeds on rows of pixels.

[0331] The color of each pixel crossed by a line is translated into a corresponding numeric value. A completely aqua pixel is would receive the value 0, while a completely orange pixel would receive the value 1. All other colors produce a number between 0 and 1, based on their relative amounts of aqua and orange. This numeric value, V, assigned to a pixel is a weighted average of the color components (such as the R, G, B values) of the pixel. If the components of the calibrated aqua are AR, AG, AB and those of orange are OR, OG, OB, and the pixel components are PR, PG, PB, then the numeric value V is:
V=WR*CR+WG*CG+WB*CB
With WR, WG, WB being weighting constants between 0 and 1 and CR is defined as:
The same process can be used to define CG and CB.
This value V is compared with the ideal value U which is equal to the percentage of orangeness calculated assuming the angle of the provisional line is the same as that of the ideal line. For example, a pixel which is crossed by the line in the exact middle would have a U of 0.5, since it is 50% aqua and 50% orange. A fit of U-V in the column (or row) in the vicinity of the crossing of the provisional line gives a new estimate of the location of the true edge crossing. Finally, the set of these crossing points can be fit with a line or gentle curve for each of the three edges and the 3 vertices can be computed from the intersections of these lines or curves.

[0334] We can now use these three accurate vertices in the camera plane (F0,G0,F1,G1,F2,G2) together with lens formula (here we will use the simple lens formula for brevity) to relate the x and y of the target to F and G
F=.lambda.X/Z; G=.lambda.Y/Z
.lambda. is the focal length and z is the perpendicular distance from the lens to a location on the target. A triangle on the target is initially defined as lying in a plane parallel to the lens plane. The preferred configuration has one right triangle whose right angle is defined at x0, y0, z0 with one edge (of length A) extending along the direction of the F axis of the camera and with the other edge (of length B) extending along the direction of the G axis of the camera. The actual target orientation is related to this orientation with the use of Euler Angles .phi., .theta., psi. Together with the lens equations and the Euler equations, the 6 derived data values of the 3 vertices (F0,G0,F1,G1,F2,G2) can be used to define 6 values of location and orientation of the target. The location and orientation of a point of interest on any tool or object rigidly attached to this target can be easily computed from calibration data and ordinary translation and rotation transformations. Refinements to handle lens distortions can be handled by forming a correction function with calibration data that modifies the locations of the F and G data. The Euler formulation is nonlinear. We linearize the equations by assuming initially that the angles have not changed much since the last video frame. Thus we replace .phi. with .phi. (old)+U1., .theta. with .theta.(old)+U2, .psi. with .psi.(old)+U3, and z0 with z0(old)+U4 or:
.phi.=.phi.+U1
.theta.=.theta.+U2
.psi.=.psi.+U3
z0=z0+U4
Substituting these into the Euler equations and applying the lens formulas leads to a matrix equation
SU=R
that can be solved for the U values with a standard methods such as Gauss Jordan routine. The angles and z0 can be updated iteratively until convergence is achieved. The coefficients of the matrix are defined as:
s11=-A(cos(.phi.)(F1/.lambda. cos(.psi.)+sin(.psi.))-sin(.phi.)cos(.theta.)(F1/.lambda. sin(.psi.)-cos(.psi.)))
s12=A sin(.theta.)cos(.phi.)(F1/.lambda. sin(.psi.)-cos(.psi.)
s13=A(sin(.phi.)(F1/.lambda. sin(.psi.)-cos(.psi.))-cos(.phi.)cos(-.theta.)(F1/.lambda. cos(.psi.)-sin(.psi.)))
s14=(F0-F1)/.lambda.
s21=A(G1/.lambda.(-
cos(.phi.)*cos(.psi.)+sin(.phi.)sin(.psi.)cos(.theta.))+sin(.theta.)sin(.phi.))
s22=A cos(.phi.)(G1/.lambda. sin(.theta.)sin(.psi.)-cos(.theta.))
s23=G1/.lambda.A(sin(.psi.)sin(.phi.)-cos(.psi.)cos(.theta.)cos(.p-hi.))
s24=(G0-G1)/.lambda.
s31=0
s32=-B cos(.theta.)(F2/.lambda. sin(.psi.)-cos(.psi.))
s33=-B sin(.theta.)(F2/.lambda. cos(.psi.)+sin(.psi.))
s34=(F0-F2)/.lambda.
s41=0
s42=-B(G2/.lambda. sin(.psi.)cos(.theta.)+sin(.theta.))
s43=-BG2/.lambda. sin(.theta.)cos(.psi.)
s44=(G0-G2)/.lambda.
and the right hand side vector is defined as:
r1=(F1-F0)z0/.lambda.+A(F1/.lambda.(cos(.psi.)sin(.phi.)+cos(.thet-
a.)cos(.phi.)sin(.psi.))+sin(.psi.)sin(.psi.)-cos(.theta.)cos(.phi.)cos(-psi.))
r2=(G1-G0)z0/.lambda.+A(G1/.lambda.

(cos(.psi.)sin(.phi.)+cos(.theta.)cos(.phi.)sin(.psi.))+sin(.theta.) cos(.phi.))
r3=(F2-F0)z0/.lambda.+B sin(.theta.)(F2/.lambda. sin(.psi.)-cos(.psi.))
r4=(G2-G0)z0/.lambda.+B(G2/.lambda. sin(.theta.)sin(.psi.)-cos(.theta.))
After convergence the remaining parameters x0 and y0 are defined from the equations:
x0=F0z0/.lambda.
Y0=G0z0/.lambda.
The transition of pronounced colors can yield considerably more information than a black white transition, and is useful for the purpose of accurately calculating position and orientation of an object. As color cameras and high capacity processors become inexpensive, the added information provided can be accessed at virtually no added cost. And very importantly, in many cases color transitions are more pleasing to look at for the user than stark black and white. In addition the color can be varied within the target to create additional opportunities for statistically enhancing the resolution with which the target can be found.

Problems in 3Dimensional Input to Computers

[0335] Today, input to a computer for Three Dimensional (3D) information is often painstakingly done with a 2 Dimensional device such as a mouse or similar device. This artifice, both for the human, and for the program and its interaction with the human is un-natural, and CAD designers working with 3D design systems require many years of experience to master the skills needed for efficient design using same.

[0336] A similar situation exists with the very popular computer video games, which are becoming ever more 3 Dimensional in content and graphic imagery, but with similar limitations. These games too heretofore have not been natural for the player(s).

[0337] "Virtual reality" too requires 3D inputs for head tracking, movement of body parts and the like. This has lead to the development of a further area of sensor capability which has resulted in some solutions which are either cumbersome for the user, expensive, or both.

[0338] The limits of computer input in 3D have also restricted the use of natural type situations for teaching, simulation in medicine, and the like. It further limits young children, older citizens, and disabled persons from benefiting from computer aided living and work.

[0339] Another aspect is digitization of object shapes. There are times that one would like to take a plastic model or a real world part as a starting point for a 3D design.

[0340] We propose one single inexpensive device that can give all of this control and also act as a drawing pad, or input a 3D sculptured forms or even allow the user to use real clay that as she sculptures it the computer records the new shape.

[0341] Various embodiments relate physical activities and physical objects directly to computer instructions. A novice user can design a house with a collection of targeted model or "toy" doors, windows, walls etc. By touching the appropriate toy component and then moving and rotating the user's hand she can place the component at the appropriate position. The user can either get his or her visual cue by looking at the position of the toy on the desk or by watching the corresponding scaled view on the computer display. Many other embodiments are also possible.

Object Tracking

[0342] In one general aspect, a method of tracking an object of interest is disclosed. The method includes acquiring a first image and a second image representing different viewpoints of the object of interest, and processing the first image into a first image data set and the second image into a second image data set. The method further includes processing the first image data set and the second image data set to generate a background data set associated with a background, and generating a first difference map by determining differences between the first image data set and the background data set, and a second difference map by determining differences between the second image data set and the background data set. The method also includes detecting a first relative position of the object of interest in the first difference map and a second relative position of the object of interest in the second difference map, and producing an absolute position of the object of interest from the first and second relative positions of the object of interest.

[0343] The step of processing the first image into the first image data set and the second image into the second image data set may include determining an active image region for each of the first and second images, and extracting an active image data set from the first and second images contained within the active image region. The step of extracting the active image data set may include one or more techniques of cropping the first and second images, rotating the first and second images, or shearing the first and second images.

[0344] In one implementation, the step of extracting the active image data set may include arranging the active image data set into an image pixel array having rows and columns. The step of extracting further may include identifying the maximum pixel value within each column of the image pixel array, and generating data sets having one row wherein the identified maximum pixel value for each column represents that column.

[0345] Processing the first image into a first image data set and the second image into a second image data set also may include filtering the first and second images. Filtering may include extracting the edges in the first and second images. Filtering further may include processing the first image data set and the second image data set to emphasize differences between the first image data set and the background data set, and to emphasize differences between the second image data set and the background data set.

[0346] Processing the first image data set and the second image data set to generate the background data set may include generating a first set of one or more background data sets associated with the first image data set, and generating a second set of one or more background data sets associated with the second image data set.

[0347] Generating the first set of one or more background data sets may include generating a first background set representing a maximum value of data within the first image data set representative of the background, and generating the second set of one or more background data sets includes generating a second background set representing a maximum value of data within the second image data set representative of the background. Generating further may include, for the first and second background sets representing the maximum value of data representative of the background, increasing the values contained within the first and second background sets by a predetermined value.

[0348] Generating the first set of one or more background data sets may include generating a first background set representing a minimum value of data within the first

image data set representative of the background, and generating the second set of one or more background data sets may include generating a second background set representing a minimum value of data within the second image data set representative of the background. Generating further may include, for the first and second background sets representing the minimum value of data representative of the background, decreasing the values contained within the first and second background sets by a predetermined value.

[0349] Generating the first set of background data sets may include sampling the first image data set, and generating the second set of background data sets may include sampling the second image data set. Sampling may occur automatically at predefined time intervals, where each sample may include data that is not associated with the background.

[0350] Generating the first set of one or more background data sets may include maintaining multiple samples of the first image data set within each background data set, and generating the second set of one or more background data sets may include maintaining multiple samples of the second image data set within each background data set.

[0351] Generating each first background data set may include selecting from the multiple samples one value that is representative of the background for each element within the first image data set, and generating each second background data set may include selecting from the multiple samples one value that is representative of the background for each element within the second image data set. Selecting may include selecting the median value from all sample values in each of the background data sets.

[0352] In other implementations, generating may include comparing the first image data set to a subset of the background data set, and comparing the second image data set to a subset of the background data set.

[0353] In other implementations generating a first difference map further may include representing each element in the first image data set as one of two states, and generating a second difference map further may include representing each element in the second image data set as one of two states, where the two states represent whether the value is consistent with the background.

[0354] In still other implementations, detecting may include identifying a cluster in each of the first and second difference maps, where each cluster has elements whose state within its associated difference map indicates that the elements are inconsistent with the background.

[0355] Identifying the cluster further may include reducing the difference map to one row by counting the elements within a column that are inconsistent with the background. Identifying the cluster further may include identifying the column as being within the cluster and classifying nearby columns as being within the cluster. Identifying the column as being within the cluster also may include identifying the median column.

[0356] Identifying the cluster further may include identifying a position associated with the cluster. Identifying the position associated with the cluster may include calculating the weighted mean of elements within the cluster.

[0357] Detecting further may include classifying the cluster as the object of interest. Classifying the cluster further may include counting the elements within the cluster and

classifying the cluster as the object of interest only if that count exceeds a predefined threshold. Classifying the cluster further may include counting the elements within the cluster and counting a total number of elements classified as inconsistent within the background within the difference map, and classifying the cluster as the object of interest only if the ratio of the count of elements within the cluster over the total number of elements exceeds a predefined threshold.

[0358] The step of detecting further may include identifying a sub-cluster within the cluster that represents a pointing end of the object of interest and identifying a position of the sub-cluster.

[0359] In the above implementations, the object of interest may be a user's hand, and the method may include controlling an application program using the absolute position of the object of interest.

[0360] The above implementations further may include acquiring a third image and a fourth image representing different viewpoints of the object of interest, processing the third image into a third image data set and the fourth image into a fourth image data set, and processing the third image data set and the fourth image data set to generate the background data set associated with the background. The method also may include generating a third difference map by determining differences between the third image data set and the background data set, and a fourth difference map by determining differences between the fourth image data set and the background data set, and detecting a third relative position of the object of interest in the third difference map and a fourth relative position of the object of interest in the fourth difference map. The absolute position of the object of interest may be produced from the first, second, third and fourth relative positions of the object of interest.

[0361] As part of this implementation, the object of interest may be a user's hand, and also may include controlling an application program using the absolute position of the object of interest.

[0362] In another aspect, a method of tracking an object of interest controlled by a user to interface with a computer is disclosed. The method includes acquiring images from at least two viewpoints, processing the acquired images to produce an image data set for each acquired image, and comparing each image data set to one or more background data sets to produce a difference map for each acquired image. The method also includes detecting a relative position of an object of interest within each difference map, producing an absolute position of the object of interest from the relative positions of the object of interest, and using the absolute position to allow the user to interact with a computer application.

[0363] Additionally, this method may include mapping the absolute position of the object of interest to screen coordinates associated with the computer application, and using the mapped position to interface with the computer application. This method also may include recognizing a gesture associated with the object of interest by analyzing changes in the absolute position of the object of interest, and combining the absolute position and the gesture to interface with the computer application.

[0364] In another aspect, a multiple camera tracking system for interfacing with an application program running on a computer is disclosed. The multiple camera tracking system includes two or more video cameras arranged to provide different viewpoints of a region of interest and are operable to produce a series of video images. A processor is operable to receive the series of video images and detect objects appearing in the

region of interest. The processor executes a process to generate a background data set from the video images, generate an image data set for each received video image and compare each image data set to the background data set to produce a difference map for each image data set, detect a relative position of an object of interest within each difference map, and produce an absolute position of the object of interest from the relative positions of the object of interest and map the absolute position to a position indicator associated with the application program.

[0365] In the above implementation, the object of interest may be a human hand. Additionally, the region of interest may be defined to be in front of a video display associated with the computer. The processor may be operable to map the absolute position of the object of interest to the position indicator such that the location of the position indicator on the video display is aligned with the object of interest.

[0366] The region of interest may be defined to be any distance in front of a video display associated with the computer, and the processor may be operable to map the absolute position of the object of interest to the position indicator such that the location of the position indicator on the video display is aligned to a position pointed to by the object of interest. Alternatively, the region of interest may be defined to be any distance in front of a video display associated with the computer, and the processor may be operable to map the absolute position of the object of interest to the position indicator such that movements of the object of interest are scaled to larger movements of the location of the position indicator on the video display.

[0367] The processor may be configured to emulate a computer mouse function. This may include configuring the processor to emulate controlling buttons of a computer mouse using gestures derived from the motion of the object of interest. A sustained position of the object of interest for a predetermined time period may trigger a selection action within the application program.

[0368] The processor may be configured to emulate controlling buttons of a computer mouse based on a sustained position of the object of interest for a predetermined time period. Sustaining a position of the object of interest within the bounds of an interactive display region for a predetermined time period may trigger a selection action within the application program.

[0369] The processor may be configured to emulate controlling buttons of a computer mouse based on a sustained position of the position indicator within the bounds of an interactive display region for a predetermined time period.

[0370] In the above aspects, the background data set may include data points representing at least a portion of a stationary structure. In this implementation, at least a portion of the stationary structure may include a patterned surface that is visible to the video cameras. The stationary structure may be a window frame. Alternatively, the stationary structure may include a strip of light.

[0371] In another aspect, a multiple camera tracking system for interfacing with an application program running on a computer is disclosed. The system includes two or more video cameras arranged to provide different viewpoints of a region of interest and are operable to produce a series of video images. A processor is operable to receive the series of video images and detect objects appearing in the region of interest. The processor executes a process to generate a background data set from the video images, generate an image data set for each received video image, compare each image data set to the background data set to produce a difference map for each image

data set, detect a relative position of an object of interest within each difference map, produce an absolute position of the object of interest from the relative positions of the object of interest, define sub regions within the region of interest, identify a sub region occupied by the object of interest, associate an action with the identified sub region that is activated when the object of interest occupies the identified sub region, and apply the action to interface with the application program.

[0372] In the above implementation, the object of interest may be a human hand. Additionally, the action associated with the identified sub region may emulate the activation of keys of a keyboard associated with the application program. In a related implementation, sustaining a position of the object of interest in any sub region for a predetermined time period may trigger the action.

[0373] The details of one or more implementations are set forth in the accompanying drawings and the description below.

[0374] FIG. 15 shows a multicamera motion tracking and control system D100 interfaced with an image viewing system. In this implementation two cameras D101 and D102 scan a region of interest D103. A controlled or known background D104 surrounds the region of interest D103. An object of interest D105 is tracked by the system when it enters the region of interest D103. The object of interest D105 may be any generic object inserted into the region of interest D103, and is typically a hand or finger of a system user. The object of interest D105 also may be a selection device such as a pointer.

[0375] The series of video images acquired from the cameras D101 and D102 are conveyed to a computing device or image processor D106. In this implementation, the computing device is a general-purpose computer that runs additional software that provides feedback to the user on a video display D107.

[0376] FIG. 16A illustrates a typical implementation of the multicamera control system D100. The two cameras D101 and D102 are positioned outside of the region of interest D103. The cameras are oriented so that the intersection D204 of their field of views (D205 for camera D101, D206 for camera D102) completely encompasses the region of interest D103. The orientation is such that the cameras D101, D102 are rotated on axes that are approximately parallel. In this example, a floor or window ledge and sidewalls provide a controlled background D104 having distinct edges. The corresponding view captured by camera D101 is shown in FIG. 16B. While not shown, it should be understood that the view captured by camera D102 is a mirror image of the view captured by camera D101. The controlled background D104 may not cover the camera's entire field of view D205. For each camera, an active image region D208 is found that is entirely contained within the controlled background D104, and also contains the entire region of interest D103. The background D104 is controlled so that a characteristic of the background can be modeled, and the object of interest D105, either in part or in whole, differs from the background D104 in that characteristic. When the object of interest D105 appears within the region of interest D103, the object 105 will occlude a portion of the controlled background D104 within the active image region D208 of each camera D101, D102. In the location of the occlusion, either as a whole or in parts, the captured images will, in terms of the selected characteristic, be inconsistent with the model of the controlled background D104.

[0377] In summary, the object of interest D105 is identified and, if found, its position within the active image region D208 of both cameras is calculated. Using the position data of each camera D101, D102, as well as the positions of the cameras relative to

the region of interest D103, and parameters describing the cameras, the position of the object of interest D105 within the region of interest D103 is calculated.

[0378] The processes performed by the image processor D106 (FIG. 15), which may be implemented through a software process, or alternatively through hardware, are generally shown in FIG. 17. The camera images are simultaneously conveyed from the cameras D101, D102 and captured by image acquisition modules D304, D305 (respectively) into image buffers D306, D307 (respectively) within the image processor D106. Image detection modules D308, D309 independently detect the object of interest D105 in each image, and determine its position relative to the camera view. The relative position information D310, D311 from both camera views is combined by a combination module D312 and optionally refined by a position refinement module D313, to determine at block D314, the global presence and position of the object of interest D105 within the region of interest D103. Optionally, specific gestures performed by the user may be detected in a gesture detection module D315. The results of the gesture detection process are then conveyed to another process or application D316, either on the same image processor D106 or to another processing device. The process of gesture detection is described in greater detail below.

[0379] Image detection modules D308 and D309 are identical in the processes that they execute. An implementation of these image detection modules D308, D309 is shown in FIG. 18. In block D402, the image processor D106 extracts, from the captured image data stored in the image buffers D306 or D307, the image data that corresponds to the active image region D208 (of FIG. 16B). The image may be filtered in a filtering process D403 to emphasize or extract the aspects or characteristics of the image where the background D104 and object of interest D105 differ, but are otherwise invariant within the background D104 over time. In some implementations, the data representing the active image region may also be reduced by a scaling module D404 in order to reduce the amount of computations required in later processing steps. Using the resulting data, the background D104 is modeled by one or more instances of a background model process at block D405 to produce one or more descriptions represented as background model data 406 of the controlled background D104. Therefore the background D104 is modeled in terms of the desired aspects or characteristics of the image. The background model(s) D406 are converted into a set of criteria in process D407. In a comparison process D408, the filtered (from process D403) and/or reduced (from module D404) image data is compared to those criteria (from process D407), and the locations where the current data is inconsistent with the background model data D406, that is where the criteria is not satisfied, are stored in an image or difference map D409. In detection module D410, the difference map D409 is analyzed to determine if any such inconsistencies qualify as a possible indication of an object of interest D105 and, if these criteria are satisfied, its position within the camera view (D205 or D206) is determined. The position of the object 105 may be further refined (optionally) at block D411, which produces a camera-relative presence and position output D310 or D311 associated with the object of interest D105 (as described above with respect to FIG. 17).

[0380] In block D402 of FIG. 18, image processor D106 extracts the image data that corresponds to the active image region D208 (of FIG. 16B). The image data may be extracted by cropping, shearing, rotating, or otherwise transforming the captured image data. Cropping extracts only the portion of the overall image that is within the active image region D208. Bounds are defined, and any pixels inside the bounds are copied, unmodified, to a new buffer, while pixels outside of the bounds are ignored. The active image region D208 may be of arbitrary shape. Shearing and rotation reorder the data into an order that is more convenient for further processing, such as a rectangular

shape so that it may be addressed in terms of rows and columns of pixels.

[0381] Rotation causes the contents of an image to appear as if the image has been rotated. Rotation reorders the position of pixels from (x,y) to (x',y') according to the following equation: ".times. .times..theta..times. .times..theta..times. .times..theta..times. .times..theta..function. ##EQU00001## where .theta. is the angle that the image is to be rotated.

[0382] If the cameras D101 and D102 are correctly mounted with respect to the region of interest D103, the desired angle of rotation will typically be small. If the desired angle of rotation is small, shearing may be used to provide an approximation that is computationally simpler than rotation. Shearing distorts the shape of an image such that the transformed shape appears as if the rows and columns have been caused to slide over and under each other. Shearing reorders the position of pixels according to the following equations: ".function..times. .times..times. ".function..times. ##EQU00002## where sh.sub.x represents the amount of horizontal shear within the image, and sh.sub.y represents the amount of vertical shear within the image.

[0383] An implementation of the multicamera control system D100 applies in scenarios where the object of interest D105, either in whole or in part, is likely to have either higher or lower luminance than the controlled background D104. For example, the background D104 may be illuminated to create this scenario. A filtering block D403 passes through the luminance information associated with the image data. A single background model D406 represents the expected luminance of the background D104. In practice, the luminance of the controlled background D104 may vary within the active image region D208, therefore the background model D406 may store the value of the expected luminance for every pixel within the active image region D208. The comparison criteria generation process D407 accounts for signal noise (above that which may be accounted for within the background model) and minor variability of the luminance of the controlled background D104 by modifying each luminance value from the background model D406, thus producing the minimal luminance value that may be classified as being consistent with the background model D406. For example, if the luminance of the controlled background D104 is higher than the luminance of the object of interest D105, then processes block D407 decreases the luminance value of each pixel by an amount greater than the expected magnitude of signal noise and variability of luminance.

[0384] In some implementations of system D100, the region of interest D103 is sufficiently narrow such that it may to be modeled as a region of a plane. The orientation of that plane is parallel to the front and rear faces of the dotted cube that represents the region of interest D103 in FIG. 15. The active image region D208 may be reduced to a single row of pixels in the optional scaling module D404 if two conditions are satisfied: 1) the object of interest D105, when it is to be detected, will occlude the background D104 in all rows of some columns of the active image region D208, and 2) a single set of values in the background model D406 sufficiently characterizes an entire column of pixels in the active image region D208. The first condition is usually satisfied if the active image region D208 is thinner than the object of interest D105. The second condition is satisfied by the implementation of blocks D403, D405, D406 and D407 described above. Application of the scaling module D404reduces the complexity of processing that is required to be performed in later processes, as well as reducing the storage requirements of the background model(s) D406.

[0385] The particular implementation of the scaling module D404 depends on the

specifics of processing blocks D403, D405, D406 and D407. If the luminance of the controlled background D104 is expected to be higher than that of the object of interest D105, as described above, one implementation of the scaling module D404 is to represent each column by the luminance of greatest magnitude within that column. That is to say, for each column, the highest value in that column is copied to a new array. This process has the added benefit that the high-luminance part of the controlled background D104 need not fill the entire controlled background D104.

[0386] An alternative implementation applies in scenarios where the controlled background D104 is static, that is, contains no motion, but is not otherwise limited in luminance. A sample source image is included in FIG. 19A as an example. In this case, the object of interest, as sensed by the camera, may contain, or be close in magnitude to, the luminance values that are also found within the controlled background D104. In practice, the variability of luminance of the controlled background D104 (for example, caused by a user moving in front of the apparatus thereby blocking some ambient light) may be significant in magnitude relative to the difference between the controlled background D104 and the object of interest D105. Therefore, a specific type of filter may be applied in the filtering process D403 that produces results that are invariant to or de-emphasize variability in global luminance, while emphasizing parts of the object of interest D105. A 3.times.3 Prewitt filter is typically used in the filtering process D403. FIG. 19B shows the result of this 3.times.3 Prewitt filter on the image in FIG. 19A. In this implementation, two background models D406 may be maintained, one representing each of the high and low values, and together representing the range of values expected for each filtered pixel. The comparison criteria generation process D407 then decreases the low-value and increases the high-value by an amount greater than the expected magnitude of signal noise and variability of luminance. The result is a set of criterion, an example of which, for the low-value, is shown in FIG. 19C, and an example of which, for the high-value, is shown in FIG. 19D. These modified images are passed to the comparison process D408, which classifies pixels as being inconsistent to the controlled background D104 if their value is either lower than the low-value criterion (FIG. 19C) or higher than the high-value criterion (FIG. 19D). The result is a binary difference map D409, of which example corresponding to FIG. 19B is shown in FIG. 19E.

[0387] The preceding implementation allows the use of many existing surfaces, walls or window frames, for example, as the controlled background D104 where those surfaces may have arbitrary luminance, textures, edges, or even a light strip secured to the surface of the controlled background D104. The above implementation also allows the use of a controlled background D104 that contains a predetermined pattern or texture, a stripe for example, where the above processes detect the lack of the pattern in the area where the object of interest D105 occludes the controlled background D104.

[0388] The difference map D409 stores the positions of all pixels that are found to be inconsistent with the background D104 by the above methods. In this implementation, the difference map D409 may be represented as a binary image, where each pixel may be in one of two states. Those pixels that are inconsistent with the background D104 are identified or "tagged" by setting the pixel in the corresponding row and column of the difference map to one of those states. Otherwise, the corresponding pixel is set to the other state.

[0389] An implementation of the detection module D410, which detects an object of interest D105 in the difference map D409, shown in FIG. 20. Another scaling module at block D603 provides an additional opportunity to reduce the data to a single dimensional array of data, and may optionally be applied to scenarios where the

orientation of the object of interest D105 does not have a significant effect on the overall bounds of the object of interest D105 within the difference map D409. In practice, this applies to many scenarios where the number of rows is less than or similar to the typical number of columns that the object of interest D105 occupies. When applied, the scaling module at block D603 reduces the difference map D409 into a map of one row, that is, a single dimensional array of values. In this implementation, the scaling module D603 may count the number of tagged pixels in each column of the difference map D409. As an example, the difference map D409 of FIG. 21A is reduced in this manner and depicted as a graph D709 in FIG. 21B. Applying this optional processing step reduces the processing requirements and simplifies some of the calculations that follow.

[0390] Continuing with this implementation of the detection module D410, it is observed that the pixels tagged in the difference map (D409 in example FIG. 21A) that are associated with the object of interest D105 will generally form a cluster D701, however the cluster is not necessarily connected. A cluster identification process D604 classifies pixels (or, if the scaling module D603 has been applied, classifies columns) as to whether they are members of the cluster D701. A variety of methods of finding clusters of samples exist and may be applied, and the following methods have been selected on the basis of processing simplicity. It is noted that, when the object of interest D105 is present, it is likely that the count of correctly tagged pixels will exceed the number of false-positives. Therefore the median position is expected to fall somewhere within the object of interest D105. Part of this implementation of the cluster identification process D604, when applied to a map of one row (for example, where the scaling module at block D603 or D404 has been applied), is to calculate the median column D702 and tag columns as part of the cluster D701 (FIG. 21B) if they are within a predetermined distance D703 that corresponds to the maximum number of columns expected to be occupied. Part of this implementation of the cluster identification process D604, when applied to a map of multiple rows, is to add tagged pixels to the cluster D703 if they meet a neighbor-distance criterion.

[0391] In this implementation, a set of criteria is received by a cluster classification process D605 and is then imposed onto the cluster D701 to verify that the cluster has qualities consistent with those expected of the object of interest D105. Thus, process D605 determines whether the cluster D701 should be classified as belonging to the object of interest D105. Part of this implementation of the cluster classification process D605 is to calculate a count of the tagged pixels within the cluster D701 and to calculate a count of all tagged pixels. The count within the cluster D701 is compared to a threshold, eliminating false matches in clusters having too few tagged pixels to be considered as an object of interest D105. Also, the ratio of the count of pixels within the cluster D701 relative to the total count is compared to a threshold, further reducing false matches.

[0392] If the cluster D701 passes these criteria, a description of the cluster is refined in process block D606 by calculating the center of gravity associated with the cluster D701 in process D607. Although the median position found by the scaling module D603 is likely to be within the bounds defining the object of interest D105, it is not necessarily at the object's center. The weighted mean D710, or center of gravity, provides a better measure of the cluster's position and is optionally calculated within process D606, as sub-process D607. The weighted mean D710 is calculated by the following equation: .times..function..times..function. ##EQU00003## where: x is the mean c is the number of columns C[x] is the count of tagged pixels in column x.

[0393] The cluster's bounds D704 may also be optionally calculated within process

D606, shown as process D608. The cluster D703 may include some false-positive outliers, so as part of this implementation, the bounds may be defined as those that encompass a predetermined percentile of the tagged pixels, or, in scenarios where relatively few pixels are expected to be tagged, encompasses those tagged pixels (or columns, if scaling module D603 is applied) that form tight sub-clusters, that is those tagged pixels (or columns) that have neighbors that are also tagged.

[0394] In addition to the middle and bound coordinates, the orientation of the object of interest D105 may optionally be inferred by calculation of the moments of the cluster. This calculation is represented by a cluster orientation calculation process at sub-process D609 within process D606.

[0395] In some applications of the system D100, the object of interest D105 is used as a pointer. In this case, the "pointing end" of the object D105 is desired and may also be determined by a pointing end calculation sub-process within process D606 if the region of interest D103 contains a sufficient number of rows and the number of rows has not been reduced. An example is depicted in FIG. 21C. The object of interest D105 will typically enter, or be constrained to enter, the active image region D208 from a known border of that region. The pointing end D705 (for example the user's fingertip) of the object of interest D105 is likely to be the portion of the cluster D701 that is furthest from the region of entry D706 into the active image region D208. The cluster D701 may include some false-positive outliers. As such, the pointing end D705 may be defined as the region D707 within the cluster D701 that encompasses multiple tagged pixels near the furthest bounding side of the cluster D701, or, in scenarios where relatively few pixels are expected to be tagged, encompasses the furthest tagged pixels that form a tight sub-cluster; that is those tagged pixels that have neighbors that are also tagged. This sub-cluster is identified by a sub-cluster pointing end process D610, and the position of the sub-cluster is found in process D611.

[0396] Continuing with this implementation, a process implemented by a smoothing module D612 may optionally be applied to any or all of the positions found in process D606. Smoothing is a process of combining the results with those solved previously so they move in a steady manner from frame to frame. The weighted mean coordinate D710, found by the center of gravity determination process D607, is dependent on many samples and therefore is inherently steady. The bound D704, found by the cluster bounding dimension determination process D608, and pointing end D705, found by D611, coordinates are dependent on relatively fewer members of the cluster, and the state of a single pixel may have a significant effect. Since the size of the region occupied by the object of interest 105 is expected to remain relatively steady, smoothing may be applied to the distance between the bounds D704 measured relative to the cluster's weighted mean coordinate D710. Since the shape and orientation of the object of interest D105 is expected to change less rapidly than the overall position object of interest D105, smoothing may be applied to the distance of the pointing end D705 measured relative to the cluster's weighted mean coordinate D710.

[0397] A process used in the center of gravity process D607 is Eq. 1 as follows:
s(t)=(a.times.r(t))+((1-a).times.s(t-1))
In Eq. 1, the smoothed value at time t (s(t)) is equal to one minus the scalar value (a) multiplied by the smoothed value at time minus one (t-1). This amount is added to the raw value at time t (r(t)) multiplied by a scalar (a) that is between zero and one.

[0398] Referring to FIG. 22, implementations of system D100 make use of, as described above, one or more background models D406 (FIG. 22).

An implementation of the background model process or component D405 that generates the background model data D406 is shown in FIG. 22. This implementation of the background model component D405 automatically generates and dynamically updates the background model, allowing unattended operation of the system.

[0399] Input data D802 is provided by the output of scaling module 404 for this implementation of the background model component D405. Input is available every frame, and is sampled in a sampling process D803. The sample may contain the object of interest D105 occluding part of the controlled background D104. For each pixel, a range of values may be a better representative of the background D104 than a single value. By including the effects of this range in the background model, the expansion in process D407 may be made tighter. Contributing multiple frames of data to the sample allows this range to be observed, but also increases the portion of the background D104 that is occluded by the object of interest D105 if the object of interest D105 is in motion while the frames are being sampled. The optimal number of frames to use is dependent on the expected motion of the object of interest D105 in the particular application of the system. In practice, for systems that are tracking a hand, 10 frames, representing approximately 0.33 seconds, is sufficient to observe the majority of that range without allowing motion of the object of interest to occlude an undue portion of the background. If the particular background model is to be compared in comparison process D408 as the upper bound on values that are considered to be consistent with the background D104, then the maximum value of each pixel observed in the multiple frames may be recorded as the sample value. If the particular background model D406 is to be compared in process D408 as the lower bound on values that are considered to be consistent with the background D104, then the minimum value of each pixel observed in the multiple frames may be recorded as the sample value.

[0400] In this implementation of the background model component D405, samples from the sampling process D803 are added to a buffer D804 having storage locations to store n samples, where the oldest sample in the history is replaced. The history therefore contains n sampled values for each pixel. The span of time, d, represented in the buffer is dependent on the rate that new samples are acquired and added to the history, r, by Eq. 2, described as follows: ##EQU0004##

[0401] In this implementation, a median process block D805 selects, for each pixel, a value that it determines is representative of the controlled background D104 at the location represented by that pixel. One method of selecting a value representative of the controlled background D104 within process block D805 is to select the median value of the n samples of each pixel. For any pixel, a number of the n sampled values in the buffer D804 may represent the object of interest D105. Duration d is selected so that it is unlikely that the object of interest D105 will occlude any one pixel of the controlled background D104 for an accumulated duration of d/2 or longer within any time-span of d. Therefore, for any pixel, the majority of the sampled values will be representative of the background D104, and therefore the median of the sampled values will be a value representative of the background D104.

[0402] The background model component D405 is adaptive, and any changes to the background D104 will be reflected in the output of median process block D805 once they have been observed for time of d/2. This system does not require that the entire controlled background D104 be visible when initialized, the object of interest D105 may be present when initialized, however it does require that samples be observed for time of d before providing output. Optionally, the constraint may be applied that the object of interest D105 must be absent when the system is initialized, in which case the first observed sample values may be copied into all n samples of the buffer D804, allowing

the system to produce an output sooner.

[0403] The duration that any one pixel of the controlled background D104 will be occluded by the object of interest D105, and therefore the duration d, is dependent on the particular application of the system. The number of samples, n, can be scaled for the memory buffer and processing power available.

[0404] The preceding discussion presents one implementation of obtaining the position of the object of interest D105 within and relative to the images acquired by the cameras D101 and D102. If the object of interest D105 was successfully detected and its coordinates found in both cameras views D205 and D206 by detection modules D308 and D309 of FIG. 17, then the combination of these coordinates is sufficient to recover the position of the object of interest D105 within the region of interest D103. In the implementation outlined in FIG. 17, the position of the object of interest D105 is calculated in combination module D312.

[0405] Turning to FIGS. 23A and 23B, an implementation of the combination module D312 is shown. For each camera D101 and D102, the position p D902 of the object of interest D105 on the camera's image plane D904 is converted to an angle D905, which is referred in this description as beta (.beta.), and is measured on the reference plane whose normal is defined by the axes of the rotations of the cameras D101, D102. (In practice, the axes are not precisely parallel and do not exactly define a single plane, however the process described herein is tolerant of that error). By approximating the camera D101, D102 as an ideal pinhole model of the camera, that angle (.beta.), relative to the vector D906 defining the orientation of the camera, is approximated.

[0406] Eq. 3, as shown in FIG. 23A, illustrates an approximation calculation as follows: .beta..times. ##EQU00005## To approximate the angle beta (.beta.), the inverse tangent is applied to the quantity of the focal length (f) divided by the position p on the image plane projected onto the intersection of the reference plane and the image plane.

[0407] For maximum precision, the intrinsic camera parameters (location of the principal point and scale of image) and radial distortion caused by the lens should be corrected for by converting the distorted position (as represented by the relative position information D310, D311) to the ideal position. More specifically, the ideal position is the position on the image plane D904 that the object D105 would be projected if the camera D101, D102 had the properties of an ideal pinhole camera, whereby Eq. 3 will produce the exact angle. One set of correction equations are presented in Z. Zhang, A Flexible New Technique for Camera Calibration, Microsoft Research, http://research.microsoft.com/.about.zhang, which is incorporated by reference. For many applications of the system, the approximation has been found to provide sufficient precision without this correction noted above.

[0408] Continuing with the description of combination module D312, a reference vector D907, as illustrated in FIG. 23B, is defined such that it passes through the positions of both cameras D101 and D102 on the reference plane where the reference plane is defined such that the axis of rotation of the cameras define the normal of the reference plane. The angles D908 that the cameras are rotated are measured relative to the reference vector D907.

[0409] A formula for measurement of the angles is shown in Eq. 4: .alpha.=.beta..sub.0+.beta. Measurement of the angle alpha (.alpha.) is equal to the angle beta_not (.beta..sub.0) and the angle beta (.beta.).

[0410] Eq. 4 is applied to measure the angles D909 of the object of interest D105 relative to the reference vector D907. That angle is referred to by the alpha (.alpha.) symbol herein. The angle alpha D909 for each camera D101 and D102, and the length of the reference vector D907, are sufficient to find the position of the object of interest D105 on the reference plane, by Eq. 5 and Eq. 6.

[0411] Eq. 5 calculates the offset of the object of interest (y) by the formula: .times. .times..times. .times..alpha..times..times. .times..alpha. .times..times. .times..alpha..times. .times..alpha. ##EQU00006## The offset (y) is equal to the reciprocal of the tangent of the angle (.alpha..sub.A) for camera A 101 and the tangent of the angle (.alpha..sub.B) for camera B D102 multiplied by the vector length D907 (w), the tangent of the angle (.alpha..sub.A) for camera A D101 and the tangent of the angle (.alpha..sub.B) for camera B D102.

[0412] Eq. 6 calculates the offset of the object of interest (x.sub.A) as follows: .times. .times..alpha. ##EQU00007## In Eq. 6, the offset (x.sub.A) is measured by the offset from Eq. 5 (y) divided by the tangent of the angle (.alpha..sub.A) for camera A D101.

[0413] The position of the object D105 on the axis perpendicular to the reference plane may be found by Eq. 7, which is applied to the position in each image, using the distance of the object of interest D105 from the camera. .times. .times. ##EQU00008##

[0414] In Eq. 7, the position (z) is calculated as the position (p) on the image plane projected onto the vector of the image plane perpendicular to that use in Eq. 3 divided by the focal length (f) multiplied by the distance of the object of interest D105 from the camera (l).

[0415] These relations provide a coordinate of the object of interest D105 relative to Camera A D101. Knowing the position and size of the region of interest D103 relative to Camera A D101, the coordinate may be converted so that it is relative to the region of interest D103, D312 of FIG. 17.

[0416] Smoothing may optionally be applied to these coordinates in refinement module D313 of the implementation of this system shown in FIG. 17. Smoothing is a process of combining the results with those solved previously so that motion is steady from frame to frame. One method of smoothing for these particular coordinate values (x.sub.A, y, z found by combination module D312) is described herein. Each of the components of the coordinate values associated with the object of interest D105, that is x, y, and z, are smoothed independently and dynamically. The degree of dampening S is calculated by Eq. 8, where S is dynamically and automatically adjusted in response to the change in position is calculated as follows: .times. .times..ltoreq..alpha..times. .times..alpha..times..times. .times..times. .times..alpha..times. .times.<<.times. .times..gtoreq..times..times..function..function. ##EQU00009## In Eq. 8, s(t) is the smoothed value at time t, r(t) is the raw value at time t, D.sub.A and D.sub.B are thresholds, and S.sub.A and S.sub.B define degrees of dampening.

[0417] Two distance thresholds, D.sub.A and D.sub.B, as shown in FIG. 24, define three ranges of motion. A change in position that is less than D.sub.A, motion is heavily dampened D1001 by S.sub.A, thereby reducing the tendency of a value to switch back and forth between two nearby values (a side effect of the discrete sampling of the images). A change in position greater than D.sub.B is lightly dampened D1002 by S.sub.B, or not dampened. This reduces or eliminates lag and vagueness that is introduced in some other smoothing procedures. The degree of dampening is varied for

motion between D.sub.A and D.sub.B, the region marked as D1003, so that the transition between light and heavy dampening is less noticeable. The scalar a, which is applied to Eq. 1, is found by Eq. 9 as follows: .times. ##EQU00010## In Eq. 9, scalar (a) is bound such that equal to or greater than zero, and less than or equal to one, the dampening value of S is found by Eq. 8, and e is the elapsed time since the previous frame.

[0418] These coordinates D314 of the object of interest D105, if found, are typically conveyed to another process such as a user application program D316 for use. They may be conveyed to another process executing on the same image processor D106 as the above calculations where performed, or to another computing device. The method in which the data are conveyed to the application program D316 may include emulation of a traditional user input device (including mouse and keyboard), allowing the system to provide control of existing control functions within the application program D316. The coordinates D314 of the object of interest D105 may be calculated for every video frame captured by the cameras, where one video frame is typically captured 30 times or more every second. This results in little latency between the user's actions and the application's reactions.

[0419] In a typical implementation of the system, the application program D316 provides user feedback by displaying to the video display D107 a visual representation of an indicator. The indicator is caused to move such that its position and motion mimics the motion of the object of interest D105 (typically the user's hand).

[0420] In one variation of this form of user interface, the indicator, such as a mouse pointer, is shown in front of other graphics, and its movements are mapped to the two dimensional space defined by the surface of the screen. This form of control is analogous to that provided by a computer mouse, such as that used with the Microsoft(R) Windows(R) operating system. An example feedback image of an application that uses this style of control is shown as D1102 in FIG. 25A.

[0421] Referring to FIG. 25A (and briefly to FIG. 17), the image processor D106 also includes an optional coordinate re-mapping process D317 (FIG. 17). The coordinate re-mapping process D317 is operable to remap the global presence and position coordinates D314 (associated with the object of interest D105) into the position where the indicator D1101 (such as a cursor or mouse pointer) is overlaid onto the image D1102 by way of Eq. 10 for the x coordinate, and the equivalent of this equation for the y coordinate, as follows: <.ltoreq..ltoreq.>##EQU00011##

[0422] In Eq. 10, x.sub.h is the coordinate position D314 associated with the object D105, x.sub.c is the cursor position on the screen, mapped 0-1, and b.sub.l and b.sub.r are the positions of the left and right bounds of a sub-region within the region of interest D103. As illustrated in FIG. 25B, the entire region of the display D1102 is represented by a sub-region D1103 contained entirely within the region of interest D103. Positions (for example, position A D1105) within the sub-region D1103 are linearly mapped to positions (for example, D1106) within the display D1102. Positions (for example, position B D1107) outside the sub-region D1103 but still within the region of interest D103 are mapped to the nearest position (for example, D1108) on the border of the display region D1102. This reduces the likelihood of the user unintentionally removing the object of interest D105 (usually the user's hand or pointing finger) from the sub-region while attempting to move the indicator D1101 to a position near a border of the display.

[0423] In scenarios where the region of interest D103 is immediately in front of the

video display D107, the sub-region D1103 may be defined to be aligned to the video display D107, so that the indicator D1101 will appear to be aligned with the object of interest D105. If the region of interest D103 is relatively thin, for example less that 5 cm, and the sub-region D1103 is defined in this way, then the system approximates, in terms of user-interaction, a "touch-screen" without limitations on the size of the video display D107, and without requiring direct contact between the user and video display's D107 surface (for example, the video display and user may be on opposite sides of a window). As will be appreciated, the system D100 can be used with a variety of video display sizes, and may include not only computer monitors (whether CRT or LCD type displays), but also may include rear projection style television monitors, large flat screen LCD monitors, and forward projection style presentation systems.

[0424] In scenarios where the region of interest D103 is not immediately in front of a large video display D107, and the active image region D208 is sufficiently deep that the orientation of the object of interest is found in the orientation calculation process D609, a vector may be extended from the object of interest's position to the video display D107 using the angle of orientation to detect the position on the video display that the user is "pointing to."

[0425] Most often, however, the active image region D208 is not sufficiently deep to accurately calculate the orientation in process block D609. In these scenarios, where the region of interest D103 is not immediately in front of a large video display D107 and the orientation is not calculated, Eq. 10 may be applied where the sub-region D1103 is smaller than the video display. The processor then maps the absolute position of the object of interest D105 to the position indicator such that movements of the object of interest D105 are scaled to larger movements of the location of the position indicator on the video display, which allows the entire area of the video display to be easily reached by the user (for example the sub region D1103may be defined to be at most 750 mm in width and proportional in height, a size that is easily reached by most users). When setup in this way, the system still provides the user the feeling of "pointing to the screen."

[0426] In another variation of this form of user interface, the user causes a representation of an indicator to move within a representation of a three dimensional virtual environment (examples are presented in FIG. 26A and FIG. 26B). The virtual environment may be rendered using projective transforms, so that the depths of the virtual environment are implied by the image presented on the video display D107. Techniques for rending this sort of virtual environment include OpenGL. Eq. 10 is used to remap the x, y, and z coordinates (the sub-region 1103 becomes, for example, a cube).

[0427] Applications that are controlled by a movable on screen indicator (for example, FIGS. 25A, 26A, and 26B), whose control has been discussed, typically present graphic representations of data or interactive elements (for example, a button D1109 or an object representation D1202). The user is expected to cause the indicator D1101 to be positioned over one of these objects, or if a three-dimensional virtual environment is presented, touches or interacts with the object. For a two-dimensional interface, this condition may be detected by comparing the remapped indicator position D1106 to the bounds (for example, D1110) of the graphic representation of the object, where this condition is true if the indicator position is within the object bounds. For the three-dimensional interface, this condition may be detected by comparing the bounds D1203 of either the entire indicator D1101, or if finer control is required, a part of the indicator, with the bounds D1204 of the object D1202. The user optionally receives feedback indicating that the cursor is positioned over an object. Feedback may be of a variety of

forms, including an audio cue and/or a change in the graphical representation of either or both the cursor and object. The user may then activate, manipulate, or move the object that is under the cursor. The user is expected to indicate his intention to activate, manipulate, or move the object by performing a gesture.

[0428] The motion of the object of interest D105 may optionally be interpreted and classified by the gesture detection module D315 as described above with respect to FIG. 17. The gesture detection process D315 may utilize the data produced from any component of the system. The final coordinates D314, image coordinates D310 and D311, or a combination of D310, 311, and 314, may be sampled over time and provided as input to the gesture detection process D315. A variety of gestures (for example, "hovering" and "poking") have been successfully detected using this data as input to a gesture detection process D315.

[0429] In scenarios where the application's state (that is, whether of not the indicator D1101 is over a button D1109) is known and is conveyed to the gesture detection module D315. One gesture that the user performs to indicate the intention to activate the object (for example screen objects D1109, D1202) that is under the cursor D1101 is to cause the cursor to hover over the object (examples D1109, D1202) for longer than a predefined duration. This gesture performed by the user is detected by monitoring the application's state and triggering the gesture when the application state remains unchanged for the predetermined duration. The application need not be created specifically for the multicamera control system D100, as techniques exist that can unobtrusively monitor an application's state (in the Windows operating system by setting a "hook" using the Windows SDK function "SetWindowsHookEx") and emulating a mouse "click" (in the Windows operating system by using the Windows SDK function "SendInput").

[0430] In some scenarios, the application state may not be available and may not be monitored. In this case, some exemplary gestures that indicate the intention to active the object (for example screen objects D1109, D1202) under the cursor D1101 are holding the hand stationary ("hovering"), or poking the hand quickly forward and back.

[0431] A method by which "hovering" has been detected is by keeping a history of the position of the object of interest D105, where that history contains all records of the position and state for a predefined duration of time, ending with the most recent sample. That duration represents the minimum duration that the user must hold the hand stationary. The minimum and maximum position, separately in each of the three (x,y,z) dimensions, is found within the history. If the object of interest D105 was present within the region of interest D103 in all samples of the history, and the distance between the minimum and maximum is within a predefined threshold for each of the three dimensions, then the "hovering" gesture is reported. Those distance thresholds represent the maximum amount that the object of interest D105 is allowed to move, plus the maximum amount of variation (or "jitter") expected to be introduced into the hand position by the various components of the system. The typical method in which this gesture is reported, where the system is emulating a mouse as described above, is to emulate a mouse "click." Gestures representing additional operations of the mouse, "double clicks" and "dragging," have also been detected and those operations have been emulated.

[0432] In addition, gestures that are independent of the position of the indicator relative to an object may optionally be detected and given meaning by the application that may or may not be dependent on the application's state. An application that uses this style of interaction typically does not explicitly use or display the object of interest's position

D317 or other positions. These applications can be wholly or primarily controlled with only the interpretations of the positions made by this system. These applications also need not be created specifically for this system because the interpretations made by this system can be used to simulate an action that would be performed on a traditional user input device, such as a keyboard or joystick.

[0433] Many useful interpretations depend directly on the absolute position of the object of interest D105 within the region of interest D103. (Alternately, the indicator position D1105 within the sub-region D1103 may be used in an equivalent manner). One method of making these interpretations is to define boxes, planes, or other shapes. A state is triggered on if the position (for example the position defined by block D314, or alternately by the remapped coordinates from remapping process D317) of the object of interest D105 is found to be within a first box (or beyond the border defined by the first plane), and had not been in the immediately preceding observation (either because it was elsewhere within the region of interest D103, or was not detected). This state is maintained until the hand position is not found to be within a second box (or beyond the border defined by the second plane), at which time the state is triggered off. The second box must contain the entire first box, and is typically larger. The use of a larger box reduces occurrences of the state unintentionally triggering on and off when the object of interest D105 is detected to be near the border of the boxes, where a very small motion or minor noise in the image signals would otherwise cause the position D317 to otherwise drift in and out of the box. Typically one of three methods of interpreting this state is used, depending on the intended use of the gesture. In one method, the gesture directly reflects the state with an on and off trigger. When emulating a keyboard key or joystick fire button, it is "pressed" when the state is triggered on, and "released" when the state is triggered off. In another method, the gesture is only triggered by the transition of the state from off to on. When emulating a keyboard key or joystick button, the key is "clicked." Although the duration and off state are not reported to the application, they are maintained so that the gesture will not be repeated until after the state is triggered off, so that each instance of the gesture requires a clearly defined intent by the user. A third method is to trigger the gesture when by the transition of the state from off to on, and to periodically re-trigger the gesture at predefined intervals so long as the state remains on. This emulates that way in which, holding a key down on a keyboard, causes the character to repeat in some applications.

[0434] One way in which boxes or planes, for the above techniques, may be defined within the region of interest D103 is as follows. By defining a first plane (D1501 in FIG. 27A) and second plane D1502 that divides the region of interest into "fire" D1503 and "neutral" D1504 regions (the gesture reported when the object of interest D105 is in the region D1505 between the planes depends on the previous positions of the object, as described above), the above technique can detect the object of interest D105 (typically a hand) "pushing" forward, which is one gesture for emulating a fire button on a joystick, or causing the application to respond in a way that is commonly associated with the pressing of a joystick button (for example, the firing of a weapon in a video game).

[0435] Another technique in which boxes or planes, for the above techniques, may be defined within the region of interest D103 is as follows. Planes of the first type D1506, D1507, D1508, D1509 are defined that separate each of the left, right, top and bottom portions of the region of interest D103, overlapping in the corner regions as illustrated in FIG. 27B. Planes of the second type are labeled as D1510, D1511, D1512, D1513. Each pair of first and second planes is processed independently. This combination of planes emulates the four directional cursor keys, where a hand in a corner triggers two

keys, commonly interpreted by many applications as the four secondary 45 degree (diagonal) directions. Emulating the keyboard cursor in this method allows a variety of existing applications to be controlled by system D100, including, for example, Microsoft(R) PowerPoint(R) which responds to the emulated cursor keys (e.g. the up and down arrow keys) by advancing to the next or previous slide in a presentation sequence.

[0436] Another method of emulating control of discreet directions applies for applications that expect the four 45 degree direction states to be explicitly represented. Boxes D1514, D1515, D1516, D1517 are defined for each of the four primary (horizontal and vertical) directions, with additional boxes D1518, D1519, D1520, D1521 defined for each of the secondary 45 degree (diagonal) directions as illustrated FIG. 27C. For clarity, only boxes of the first type are illustrated. A gap is placed between these boxes. FIG. 27D illustrates how neighboring boxes are defined. The gap between boxes of the first type D1522, D1523 assures that the user intentionally causes the object of interest D105 to enter the box, while the gap D1524 is filled by overlapping boxes of the second type D1525, D1526, so that the system will report the previous gesture until the user was clearly intended to move the object of interest D105 into either a neighboring box or the central neutral region. This combination of buttons can be used to emulate an eight-directional joystick pad.

[0437] A wider class of gestures depend on motion instead of or in addition to position. An example is the gesture of "swiping the hand to the left." This is a one gesture to convey to an application that it is to return to a previous page or state. Through emulation of a keyboard and mouse, this gesture may be used to control information presentation software, in particular Microsoft(R) PowerPoint(R), to go to the previous slide of a presentation sequence. Through emulation of a keyboard and mouse, this gesture causes a web browser to perform the action associated with its "back" button. Similarly, the gesture of "swiping the hand to the right" is one gesture to convey to an application that the user desires to go to the next page or state. For example, this gesture causes presentation software to go to the next slide of a presentation sequence, and causes browser software to go to the next page.

[0438] One method for detecting "swiping the hand to the left" is as follows. A thin stripe along the leftmost part of the region of interest D103 is defined as the left-edge region. The position (for example the position defined by block D314, or alternately by the remapped coordinates from remapping process D317) of the object of interest D105 is represented as the following three states: 1. Object of interest is present and not inside the left-edge region 2. Object of interest is present and inside the left-edge region 3. Object of interest is not present within the hand detection region.

[0439] A transition from state 1 to state 2 above causes the gesture detection module D315 to enter a state whereby it starts a timer and waits for the next transition. If a transition to state 3 is observed within a predetermined duration of time, the "swiping the hand off to the left" gesture is reported to have occurred. This technique is typically duplicated for the right, upper, and lower edges, and, because the hand position is found in three dimensions, also duplicated to detect "pulling the hand back."

[0440] A variety of gesture detection techniques have been discussed. Still other gesture detection techniques (for example, Hidden Markov Layers) are described in research literature, and may be applied in the various implementations of the system D100 described herein.

[0441] Referring back to FIGS. 15 and 17, another implementation of the multicamera

control system D100 is described in further detail. While FIG. 15 shows a two camera system, it should be understood that the image processor D106 can be configured to receive input from more than two cameras, and may for particular applications include four (4) or more video cameras. In the four camera implementation, components D304-D311 of FIG. 17 are duplicated to support the two additional cameras. Additionally, the combination module D312 is configured to receive four sets of camera-relative presence and position data (similar to data D310 and D311) associated with the object of interest D105 being tracked. The techniques and equations (in particular, Eq. 5 and Eq. 6) previously described can be applied to the additional pair(s) of cameras, where the output of the combination module D312 is the average of all the position from each of the camera pairs. The gesture detection module D315 is similarly reconfigured to receive four sets of cameral-relative presence and position data D310, D311 from the two additional detection modules (similar to D308, D309) which are substantially similar to detection modules D310 and D311.

[0442] The output from the image processor 106, which now includes processed object position coordinates and gesture information associated with four cameras, can be used by another process or user application program 316. The formulas and geometry (described above) used to calculate coordinate information associated with the object of interest 105 from the two additional cameras are also used.

[0443] In one implementation using four cameras, the two additional cameras are positioned at the bottom two corners within the controlled background D104 and are oriented such that the region of interest D103 is within the field of view D205 of each camera. The advantage of a four camera system is that the position of the object of interest D105 can be tracked with greater accuracy. Thus, the application program may include more screen objects with increased density on the video display D107 because the increased tracking accuracy allows objects that are close in proximity to be correctly selected by small movements with the object of interest D105. Moreover, the two additional cameras reduce errors in tracking the object of interest D105 when a portion of the object of interest D105 is occluded within the field of view D205 associated with one or more of the other cameras.

Neutral Position of a Device

[0444] According to one general aspect, a method is disclosed. The method includes determining a neutral position of a device in relation to at least a first axis, the device including at least a first control associated with a first plurality of output signals, and measuring an angular displacement of the device about at least the first axis. The method also includes receiving a selection of the first control, and outputting one of the first plurality of output signals based at least upon the selection and the angular displacement.

[0445] Implementations may include one or more of the following features. For example, the neutral position of the device may be determined in relation to at least a second axis, orthogonal to the first axis, where the angular displacement may include a first-axis component and a second-axis component. Furthermore, the neutral position of the device may be determined in relation to at least a third axis orthogonal to the first axis and the second axis, where the angular displacement may include a third-axis component. The first axis, the second axis, and/or the third axis may intersect within the device.

[0446] The first control may be associated with at least three output signals, or at least nine output signals, where each of the plurality of output signals may correspond to a

character, such as an alphanumeric character. The method may further include displaying the output signal, and/or displaying an indication of the angular displacement. The method may also further include defining a plurality of tilt regions about the first axis, wherein one of the first plurality of output signals is also output based upon the plurality of tilt regions. The angular displacement of the device about the first axis may be measured as 0.degree., where a first tilt region encompasses an angular displacement of 0.degree., or the first tilt region may be defined as a region encompassing approximately -30.degree. to 0.degree. about the first axis, where the second tilt region is defined as a region encompassing approximately 0.degree. to +30.degree. about the first axis. In a further aspect, a first output signal may be output if the angular displacement is within the first tilt region when the selection is received, where a second output signal may be output if the angular displacement is within the second tilt region when the selection is received. A third or fourth output signal may be output if the angular displacement is within the third or fourth tilt region, respectively, when the selection is received.

[0447] The method may also define a plurality of first-axis tilt regions about the first axis and a plurality of second-axis tilt regions about the second axis, where the one of the first plurality of output signals may also be output based upon the plurality of first-axis tilt regions and/or the plurality of second-axis tilt regions. When the selection is received, a first output signal may be output if the first-axis component is within a first first-axis tilt region and if the second-axis component is within a first second-axis tilt region, a second output signal may be output if the first-axis component is within a second first-axis tilt region and if the second-axis component is within the first second-axis tilt region, a third output signal may be output if the first-axis component is within the second first-axis tilt region and if the second-axis component is within a second second-axis tilt region, and/or a fourth output signal may be output if the first-axis component is within the second first-axis tilt region and if the second-axis component is within the second second-axis tilt region.

[0448] Alternatively, in another aspect, when the selection is received, a first output signal may be output if the first component is within a first first-axis tilt region and if the second-axis component is within a first second-axis tilt region, a second output signal may be output if the first component is within the first first-axis tilt region and if the second-axis component is within a second second-axis tilt region, a third output signal may be output if the first component is within the first first-axis tilt region and if the second-axis component is within a third second-axis tilt region, a fourth output signal may be output if the first component is within a second first-axis tilt region and if the second-axis component is within the first second-axis tilt region, a fifth output signal may be output if the first component is within the second first-axis tilt region and if the second-axis component is within the second second-axis tilt region, a sixth output signal may be output if the first component is within the second first-axis tilt region and if the second-axis component is within the third second-axis tilt region, a seventh output signal may be output if the first component is within a third first-axis tilt region and if the second-axis component is within the first second-axis tilt region, an eighth output signal may be output if the first component is within the third first-axis tilt region and if the second-axis component is within the second second-axis tilt region, and/or a ninth output signal may be output if the first component is within the third first-axis tilt region and if the second-axis component is within the third second-axis tilt region.

[0449] According to another general aspect, a device is disclosed. The device includes a tilt sensor configured to determine a neutral position of a device in relation to at least a first axis, and further configured to measure an angular displacement of the device about at least the first axis. The device also includes at least a first control associated

with a first plurality of output signals, and a processor configured to receive a selection of the first control and further configured to output one of the first plurality of output signals based at least upon the selection and the angular displacement.

[0450] Implementations may include one or more of the following features. For example, the first axis and the second axis may intersect at a center of the device, or at a periphery portion of the device. The device may further include at least second through tenth controls each associated with second through tenth pluralities of output signals, respectively. The first control may be a button, and/or the device may be a telephone. The displacement signal may be measured using a tilt sensor, which may be a gyroscope. The device may further include a display configured to display the output signal, and/or configured to display an indication of the angular displacement, and the device may further include a keyboard configured to input the selection.

[0451] According to another general aspect, a computer program product, tangibly stored on a computer-readable medium, is disclosed. The computer program product is operable to cause a computer to perform operations including determining a neutral position of a device in relation to at least a first axis, the device including at least a first control associated with a first plurality of output signals, and measuring an angular displacement of the device about at least the first axis. The computer program product is also operable to cause a computer to perform operations including receiving a selection of the first control, and outputting one of the first plurality of output signals based at least upon the selection and the angular displacement.

[0452] According to another general aspect, a telephone device is disclosed. The telephone device includes a tilt sensor configured to determine a neutral position of the telephone device in relation to at least a roll axis, and further configured to measure an angular displacement of the telephone device about the roll axis. The telephone device also includes at least first through eighth buttons each associated with at least four alphanumeric characters. Furthermore, the telephone device includes a processor configured to receive a selection of the first button and further configured to output one of the at least four alphanumeric characters based at least upon the selection and the angular displacement.

[0453] The details of one or more implementations are set forth in the accompanying drawings and the description below. Other features will be apparent from the description and drawings, and from the claims.

[0454] FIG. 28 depicts the exterior appearance of a device according to one exemplary implementation, in a state where the device is in the neutral position. The hardware environment of device E100 includes a keypad including at least a first control E102 for entering text data and user commands into the device E100, a display E105 for displaying text and images to a user, and an indicator, such as a tilt indicator E106, for displaying an indication of angular displacement or tilt orientation about at least one axis.

[0455] Display E105 displays the graphics, images, and text that comprise the user interface for the software applications used by this implementation, as well as the operating system programs necessary to operate the device E100. A user of device E100 uses first control E102 to enter commands and data to operate and control the operating system programs as well as the application programs.

[0456] Display E105 is configured to display the GUI to a user of device E100. A speaker may also be present also generate voice and sound data received from the

application programs operating on device E100, such as a voice from another user generated by a telephone application program, or a ring tone generated from a ring tone application program. A microphone may also be used to capture sound data generated by the user, for example, when the user is speaking to another user during a telephone call via device E100. Furthermore, tilt indicator E106 is configured to indicate the angular displacement or tilt orientation of device E100, to provide visual feedback to the user of device E100 and to make the user aware of the tilt orientation that will be used to interpret a control selection.

[0457] The operation of device E100 is based upon its orientation in two states: the "neutral" position, and a "selection" position corresponding to the position of the device prior to, at the time of, or after the selection of first control E102. More specifically, and as described fully below, the output of an output signal by device E100 is dependent upon the angular displacement between the neutral position and the selection position, in relation to at least one axis, where the angular displacement has an angular displacement component for each axis of interest.

[0458] FIG. 28, for example, depicts device E100 in one contemplated three-axis neutral position In particular, orthogonal X, Y and Z-axes intersect at the center of device E100, where the X-axis extends parallel to the longitudinal direction of device E100. According to this exemplary neutral position, a rotation around the X-axis would effectuate a rolling motion, a rotation around the Y-axis would effectuate a pitching motion, and a rotation around the Z-axis would effectuate a yawing motion. These roll, pitch, and yaw motions are generically referred to herein as "tilt" motions.

[0459] The determination of the number of axes of interest, and the location and orientation of the axes with relation to device E100, is a device-specific and application-specific determination, and no limitation of any of these characteristics is inferred in the following description. For example, where it is undesirable or impossible to manipulate the device in a yawing motion, or where the number of output signals may be effectively controlled using motion about one or two axes, the neutral position of the device may be determined with regard to these one or two axes alone. Furthermore, the at least one axis may not intersect device E100, or the at least one axis may extend along a periphery or edge portion of device E100. Additionally, one of the axes may extend parallel along the longitudinal direction of device E100 or it may extend at an angle to the longitudinal direction of device E100. In any regard, the neutral position is aligned with an axis relative to the Earth, such as a magnetic or true North axis, or an axis pointing to the center of the Earth, or toward the horizon, with an axis relative to the user, the device, or other axis.

[0460] With regard to telephony, a one-axis neutral position is provided in the case where angular displacement is to be measured with regard to roll rotation around the X-axis, or a two-axis neutral position is provided in the case where angular displacement is to be measured with regard to roll and pitch rotation around the X-axis and Y-axis, respectively. In either case, the X-axis and Y-axis intersect at the center of the device, with the X-axis extending longitudinally parallel to the longitudinal direction of the device. Other neutral position orientations are contemplated as well.

[0461] When inputting characters into a device such as a telephone, the user typically holds the device at an positive (upwards) pitch angle while looking into the display. In that regard, the X-axis of the telephone in the neutral position may be defined at a similar upwards angle, such that flattening the angle of the telephone with regard to the ground would be registered as a pitched forward tilting motion. In other instances, of course, an X-axis which is parallel to the ground is the "neutral" X-axis position.

[0462] Although device E100 is illustrated in FIG. 28 as a mobile telephone, in further aspects device E100 may include a desktop PC, a laptop, a workstation, a midrange computer, a mainframe, a handheld or tablet computer, a personal data assistant ("PDA") or another type of embedded system such as a computer keyboard or a remote control.

[0463] FIG. 29 depicts an example of an internal architecture of the implementation of FIG. 28. The computing environment includes processor E200 where the computer instructions that comprise an operating system or an application are processed; display interface E202 which provides a communication interface and processing functions for rendering graphics, images, and texts on display E105; keypad interface E204 which provides a communication interface to the keypad, including first control E102; tilt sensor E206 for measuring angular displacement of device E100 about at least a first axis; indicator interface E208 which provides a communication interface to the indicators, including tilt indicator E106, random access memory ("RAM") E210 where computer instructions and data are stored in a volatile memory device for processing by processor E200; read-only memory ("ROM") E211 where invariant low-level systems code or data for basic system functions such as basic input and output ("I/O"), startup, or reception of keystrokes from the keypad are stored in a non-volatile memory device; and optionally a storage E220 or other suitable type of memory (e.g. such as random-access memory ("RAM"), read-only memory ("ROM"), programmable read-only memory ("PROM"), erasable programmable read-only memory ("EPROM"), electrically erasable programmable read-only memory ("EEPROM"), magnetic disks, optical disks, floppy disks, hard disks, removable cartridges, flash drives), where the files that comprise operating system E230, application programs E240 and data files E246 are stored. The constituent devices and processor E200 communicate with each other over bus E250.

[0464] RAM E210 interfaces with bus E250 so as to provide quick RAM storage to processor 200 during the execution of software programs such as the operating system application programs, and device drivers. More specifically, processor E200 loads computer-executable processes from memory media into a field of RAM E210 in order to execute software programs. Data is stored in RAM E210, where the data is accessed by processor E200 during execution.

[0465] Also shown in FIG. 29, storage E220 stores computer-executable code for an operating system E230, application programs E240 such as word processing, spreadsheet, presentation, graphics, image interpretation training, gaming, or other applications, and data files E246. Although it is possible to use the above-described implementation, it is also possible to implement the functions according to the present disclosure as a dynamic link library ("DLL"), or as a plug-in to other application programs such as an Internet web-browser such as the MICROSOFT(R) Internet Explorer web browser.

[0466] Processor E200 is one of a number of high-performance computer processors, including an INTEL(R) or AMD(R) processor, a POWERPC(R) processor, a MIPS(R) reduced instruction set computer ("RISC") processor, a SPARC(R) processor, a HP ALPHASERVER(R) processor, an ACORN(R) RISC Machine ("ARM(R)") architecture processor, or a proprietary computer processor for a computer or embedded system, without departing from the scope of the present disclosure. In an additional arrangement, processor E200 in device E100 is more than one processing unit, including a multiple CPU configuration found in high-performance workstations and servers, or a multiple scalable processing unit found in mainframes.

[0467] Operating system E230 may be MICROSOFT(R)WINDOWS NT(R)/WINDOWS(R) 2000/WINDOWS(R) XP Workstation; WINDOWS NT(R)/WINDOWS(R) 2000/WINDOWS(R) XP Server; a variety of UNIX(R)-flavored operating systems, including AIX(R) for IBM(R) workstations and servers, SUNOS(R) for SUN(R) workstations and servers, LINUX(R) for INTEL(R) CPU-based workstations and servers, HP UX WORKLOAD MANAGER(R) for HP(R) workstations and servers, IRIX(R) for SGI(R) workstations and servers, VAXNMS for Digital Equipment Corporation computers, OPENVMS(R) for HP ALPHASERVER(R)-based computers, MAC OS(R) X for POWERPC(R) based workstations and servers; SYMBIAN OS(R), WINDOWS MOBILE(R) or WINDOWS CE(R), PALM(R), NOKIA(R) OS ("NOS"), OSE(R), or EPOC(R) for mobile devices, or a proprietary operating system for computers or embedded systems. The application development platform or framework for operating system E230 may be: BINARY RUNTIME ENVIRONMENT FOR WIRELESS(R) ("BREW(R)"); Java Platform, Micro Edition ("Java ME") or Java 2 Platform, Micro Edition ("J2ME(R)"); PYTHON(TM), FLASH LITE(R), or MICROSOFT(R) .NET Compact.

[0468] Tilt sensor E206 detects the orientation of device E100, as described below, and is a gyroscope, an optical sensor, and/or other type of tilt sensor. An optical sensor, for example, may be used to detect the orientation of device E100 using an optical flow of a sequence of images from a camera embedded in device E100 to determine the motion and orientation of device E100. Optical flow describes the apparent relative velocity of features within a sequence of images. Since optical flow is relative to the camera, motion of the camera will result in apparent velocities of features in the camera view. The motion of the camera is calculated from the apparent velocities of features in the camera view. Position or orientation are also calculated relative to the neutral position, over an extended span of time. Although tilt sensor E206 has been described as an optical sensor using an optical flow approach for tracking the tilt or inclination of device E100 using camera, in other aspects the tilt or inclination of device E100 is tracked without using the optical flow approach, such as by using an accelerometer.

[0469] Computer readable memory media stores information within device E100, and is volatile or non-volatile. Memory may be capable of providing mass storage for device E100. In various different implementations, the memory may be a floppy disk device, a hard disk device, an optical disk device, or a tape device. While FIGS. 28 and 29 illustrate one possible implementation of a computing system that executes program code, or program or process steps, other types of computers or devices may also be used as well.

[0470] FIG. 30 is a flowchart illustrating a method in accordance with another exemplary implementation. Briefly, the method includes determining a neutral position of a device in relation to at least a first axis, the device including at least a first control associated with a first plurality of output signals, and measuring an angular displacement of the device about at least the first axis. The method also includes receiving a selection of the first control, and outputting one of the first plurality of output signals based at least upon the selection and the angular displacement.

[0471] In more detail, method E300 begins (step ES301), and a plurality of tilt regions are defined about a first axis (step ES302). As is described in more detail below, the output of an output signal is based at least upon the angular displacement of a device upon the selection of a first control. In accordance with one aspect, tilt 'regions' are defined such that, upon the selection of the control, if the angular displacement falls within a particular tilt region or band of angles, an output associated with the tilt region

is output.

[0472] FIGS. 31A to 31D illustrates several example tilt regions with regard to a hypothetical neutral axis, labeled the "N-axis," where the neutral represents the neutral X, Y and/or Z-axis. Each of the X, Y, or Z-axis can have individually-determined tilt regions, a common tilt region definition can be applied to multiple axes, or axes can have no defined tilt regions.

[0473] FIG. 31A illustrates an example of two tilt regions defined about the neutral axis. An angular displacement from approximately -90.degree. to 0.degree. about the neutral axis is within region E401, and an angular displacement from approximately 0.degree. to approximately 90.degree. about the neutral example is within region E402. An angular displacement from approximately 91.degree. to -91.degree., indicative of a device that is upside down, does not correspond to any region, and an angular displacement of exactly 0.degree. is in either region E401 or E402.

[0474] Where the neutral axis represents the X-axis, an angular displacement in region E401 would result from a negative roll of the device (to the left), and an angular displacement in region E402 would result from a positive roll of the device (to the right). Where the neutral axis represents the Y-axis, an angular displacement in region E401 would result from a negative pitch (forward) the device, and an angular displacement in region E402 would result from a positive pitch (rearward) of the device. Where the neutral axis represents the Z-axis, an angular displacement in region E401 would result from a negative yaw (counterclockwise), and an angular displacement in region E402 would result from a positive yaw (clockwise). Although two tilt regions are depicted, any number of tilt regions may be defined, depending largely upon the sensitivity of the tilt sensor, the number of output signals associated with each control and the ability of the user to discriminate between small angles when manipulating the device.

[0475] In any case, the signal output by the device is dependant upon the angular displacement and the tilt region. For example, the device outputs a first of a plurality of signals if the angular displacement of the device is within a first region, and a second of a plurality of signals if the angular displacement of the device is within a second region, even if the same control is selected in both circumstances. Although FIG. 28 illustrates regions E401 and E402 as encompassing .±.90.degree. bands, in a similar aspect tilt region E401 defines a region encompassing approximately -30.degree. to 0.degree. about the neutral axis, and the tilt region E402 defines a region encompassing approximately 0.degree. to +30.degree. about the neutral axis.

[0476] FIG. 31B illustrates an example of four tilt regions defined about the neutral axis, with a dead space between regions at 0.degree. about the neutral axis. Due to the insensitivity of a tilt sensor, the inability of a user to discriminate, or for other reasons, it is often desirable define a dead space between two otherwise-adjacent regions. Where the neutral axis represents the Y-axis, an angular displacement of between approximately 91.degree. to -91.degree., indicative of a device which is upside down, or an angular displacement of approximately 0.degree. does not correspond to any tilt region. If a control is selected when the device is not oriented in a tilt region, a default output is output, the last output is output, no output is output, an output associated with the closest tilt region or a complementary tilt region is output, or another type of output is output.

[0477] An angular displacement in region E404 would result from a hard negative pitch of the device, although an angular displacement in region E405 would also result from a negative pitch which is lesser in magnitude than a region E404 negative pitch. An

angular displacement in region E407 would result from a hard positive pitch of the device, although an angular displacement in region E406 would also result from a positive pitch which is lesser in magnitude than a region E407 negative pitch.

[0478] FIG. 31C illustrates an example of two tilt regions defined about the neutral axis, where the area around 0.degree. about the neutral axis is substantially within a first region. In particular, where the neutral axis represents the X-axis, the device would remain in region E409 if negatively rolled, if unmoved from the neutral position, or if modestly rolled in the positive direction. In order for the device to be oriented in region E410, a hard positive roll would have to occur. The tilt regions depicted in FIG. 31C would be desirable, for instance, where region E409 represents a default desired output, and where an affirmative, high magnitude manipulation of the device would be necessary to place the device in region E410, thus overriding the default desired output. In the FIG. 31C example, tilt region E409 encompasses an angular displacement of 0.degree., where the angular displacement of the device is in tilt region E409 if the angular displacement about the first axis is measured as 0.degree.

[0479] FIG. 31D illustrates an example of two tilt regions defined about the neutral axis, where a single region occupies angular displacement bands on both sides of the neutral axis. More particularly, region E412 is defined by the area surrounding 0.degree. about the neutral axis, and region E411 occupies symmetrical angular bands in the positive and negative angular directions. Where the neutral axis represents the Z-axis, an angular displacement in region E411 would result from a high-magnitude positive or negative yaw. An angular displacement in region E412 would result from a more modest positive or negative yaw, or from the orientation of the device remaining in the neutral position.

[0480] In any of the above described examples, the neutral axis may represent the X, Y, and/or Z-axis, thus effectively multiplying the total number of available tilt regions. For example, if the neutral axis in the FIG. 31A example represents the X-axis, and the neutral axis in the FIG. 31B example represents the Y-axis, a total of eight tilt regions would be available, since the four pitch tilt regions of FIG. 31B would each be divided into the two roll tilt regions of the FIG. 31A example. Assuming that each axis has an equal number n tilt regions, the total number of tilt regions for a two-axis arrangement is n.sup.2 and the total number of tilt regions for a three-axis arrangement is n.sup.3.

[0481] Finally, it is contemplated that in some instances the angular displacement itself, and not the tilt region, will be determinative of the output signal, and thus would be unnecessary to define tilt regions. Furthermore, tilt regions are also defined implicitly in the case where the range of motion about a desired axis is divided equally by the number of output signals, where each output signal corresponds to a mathematically-determined range of angles.

[0482] Returning to FIG. 30, the neutral position of a device is determined in relation to at least a first axis, the device including at least a first control associated with a first plurality of output signals (step ES304).

[0483] FIG. 32 illustrates a top exterior view of an example device according another exemplary implementation. Device E500, a mobile telephone, has a keypad including at least first control E502 associated with a first plurality of output signals. In the illustrated example, first control E502 is a key, or button, on the keypad or keyboard of device E500, where each individual control represents a multiple of alphanumeric characters or symbols. Specifically, first control E502 is labeled "9", and corresponds to four output signals indicative of the characters "W", "X", "Y", and "Z", or twelve output

signals indicative of the case-sensitive characters "W", "X", "Y", "Z", "w", "x", "y", "z", and the symbols ",", ".", "/", and "". There is no limit for the number of output signals or characters that can correspond to a single control. In particular aspects, first control E502 is associated with a plurality of output signals, such as three output signals, or nine output signals. Each of the plurality of output signals may correspond to a character, such as an alphanumeric character or a symbol.

[0484] The neutral position of device E500 is determined, for example, when device E500 is powered on, prior to or after a selection of the first control, or at the site of manufacture. In one aspect, a memory buffer stores output data of the tilt sensor, and the neutral position of device E500 is reconstructed from the orientation of device E500 when a control is selected and the output data. In another aspect, the neutral position is a factory pre-set condition, such as the case where the neutral X-axis is defined as extending perpendicular to the center of the Earth, such that an angular displacement is measured if device E500 faces any direction other than up. In a further aspect, a processor, a tilt sensor, and the memory communicate to determine a common neutral position based upon the average position of device E500 whenever the control is ordinarily selected. Moreover, in an additional aspect, the neutral position is user-selectable. In any regard, the neutral position operates effectively to reset the tilt sensor to 0.degree. across each axis of interest, where any motion of device E500 away from the neutral position serves to register an angular displacement. In relation to the user of device E500 or the Earth, the neutral position is a flat position, a vertical upright position, or a canted or tilted position.

[0485] In an additional aspect, the neutral position of device E500 is determined in relation to at least a second axis, orthogonal to the first axis, where the angular displacement includes a first-axis component and a second-axis component. In a further aspect, the neutral position of device E500 is determined in relation to at least a third axis orthogonal to the first axis and the second axis, where the angular displacement includes a third-axis component. The first axis, the second axis, and/or the third axis intersect within the device E500, outside of device E500, or along a peripheral portion or edge of device E500.

[0486] Since device E500 includes a tilt sensor that detects the orientation of the device, entry of text into the device is facilitated. For example, the tilt sensor detects a degree to which the device has been rolled to the left, to the right, or pitched up or down, where the tilt orientation or angular displacement of the device about the axes of interest indicates how selection of control E502 is interpreted and output. For example, if control E502 corresponds to multiple characters, the orientation of device E502 identifies which of the multiple characters is output when control E502 is selected, or identify a case in which the appropriate character is output.

[0487] Using the orientation of the device to identify a character to be output enables a character to be output each time a single control is selected, increasing the speed of text entry by reducing the number of control selections required to enter text. Because a fixed number of controls selections represents entry of a character, a user may specify a subsequent character immediately after a current character has been specified, eliminating the need to wait for a predetermined amount of time before specifying the subsequent character, also increasing the speed of text entry.

[0488] As indicated above, the neutral position of the device is a reference orientation from which an angular displacement is measured about at least one axis, to the selection position, the selection position corresponding to the position of the device prior to, at the time of, or after the selection of a control such as the first control. In one

aspect, the neutral position of the device is determined in relation to one axis, and the neutral position is determined as a "flat" position, where the one axis is parallel to the ground. In another aspect, the neutral position of the device is determined in relation to two axis, and the neutral position is ergonomically determined as the orientation of a device as it would commonly be held by a user of the device. In a further aspect, the neutral position of the device is determined in relation to three axis, where one axis is determined as parallel to a magnetic North-South axis, one axis is determined as parallel to an East-West axis, and the third axis is determined as facing towards and away from the center of the Earth.

[0489] Returning to FIG. 30, an angular displacement of the device is measured about at least the first axis (step ES305). In particular, a tilt sensor, such as tilt sensor E206, measures the angular displacement between the current position of the device and the neutral position, where the angular displacement includes a component for each axis of interest. In one aspect, the tilt sensor E206 measures the angular displacement of the device at the moment the control is selected. Since the selection of the control itself may affect the orientation of the device, in another aspect the tilt sensor measures the angular displacement of the device a time before or after the control is selected.

[0490] The tilt sensor detects the orientation of the device. For example, the tilt sensor detects a degree to which the device has been rolled to the left or right, pitched up or down, or yawed clockwise or counterclockwise. In one aspect, the tilt sensor measures at least two discrete levels of roll tilt about the X-axis, in which case the device may be said to be rolled left, rolled right, or not rolled left or right. In addition, the tilt sensor measures at least two discrete levels of pitch tilt about the Y-axis in the forward or backward direction, in which case the device may be said to be pitched up, pitched down, or not pitched up or down. Further, the tilt sensor measures at least two discrete levels of yaw tilt about the Z-axis, in which case the device may be said to be yawed clockwise, yawed counterclockwise, or not yawed. In such an implementation, the tilt sensor indicates that the device has been rolled to the left when the device has been rolled between 15.degree. and 45.degree. to the left. As another example, the tilt sensor indicates that the device has not been pitched forward or backwards when the device has been pitched less than 15.degree. forward and less than 15.degree. backward. In another implementation, the tilt sensor may indicate more than three levels of tilt in each of the left-to-right and forward or backwards directions. In such an implementation, each of the levels of tilt in a particular direction corresponds to a range of degrees in which the device has been tilted.

[0491] An indication of the angular displacement is displayed (step ES306). As described above, it is possible that the orientation of the neutral position may not be instinctive to a user. Furthermore, each axis may have two or more tilt regions in each direction about each axis. For these and other reasons, an indicator is provided to display either an indication of the angular displacement, or an indication of the tilt region to which the angular displacement corresponds, in real-time or near real-time. If the angular displacement is measured at a time before or after the control is selected, the indicator estimates the appropriate angular displacement or indication of the tilt region at the time based upon all available information. If the neutral position is defined in relation to more than one axis, the user can determine which axis the indicator is indicating, the indicator can have a default or preset axis of interest, or the determination may be context sensitive.

[0492] FIGS. 33A to 33B illustrate example indicators according to one exemplary aspect. In FIG. 33A, indicator E600 indicates the orientation of the device on a display. The indicator provides visual feedback so that the user is aware of the orientation of the

device that will be used to interpret a control selection.

[0493] Indicator E600 includes positive tilt indicator E601 and negative tilt indicator E604, that point in the negative (left) and positive (right) directions, respectively. In addition, indicator E600 includes center indicator E602 that is visually distinguished from positive tilt indicator E601 and negative tilt indicator E604 when the device is not tilted, such as when the device is in the neutral position or in a position that is unregistered by the tilt sensor, such as upside down. One of the tilt indicators is illuminated or otherwise visually distinguished from the other tilt indicator and center indicator E602 when the device is tilted in the indicated direction. Furthermore, center indicator E602 is illuminated or otherwise visually distinguished from positive tilt indicator E601 and negative tilt indicator E604 when the device is not rolled to the left of the right. The center indicator, for example would be illuminated when the device is oriented as illustrated in FIG. 28. Positive tilt indicator E601 would be illuminated when the device is oriented as illustrated in region E402 of FIG. 31A, and negative tilt indicator E604 would be illuminated when the device is oriented as illustrated in region E401 of FIG. 31A.

[0494] In another implementation illustrated in FIGS. 33B and 33C, indicator E605 also includes two partial tilt indicators E606 and E607 that also point in the negative and positive directions, respectively. Each of the partial tilt indicators is located between center indicator E604 and either negative tilt indicator E604 or positive tilt indicator E601. The partial tilt indicators are illuminated or otherwise visually distinguished from the other components of indicator E605 when the device is tilted partially in an indicated direction. In one implementation, both the partial tilt indicator and the center indicator are illuminated when the device is partially tilted partially in the corresponding direction. For example, negative tilt indicator E604 would be illuminated when the device is oriented in tilt region E404 of FIG. 31B, negative partial tilt indicator E606 and center indicator E602 would be illuminated when the device is oriented in tilt region E405 of FIG. 31B, center indicator 602 would be illuminated when the device is oriented in the neutral position, as illustrated in FIG. 28, positive partial tilt indicator E607 and center indicator 602 would be illuminated when the device is oriented in tilt region E406 of FIG. 31B, and positive tilt indicator E601 would be illuminated when the device is oriented in tilt region E407 of FIG. 31B. Any number of tilt indicators or partial tilt indicators are contemplated for each axis. For an axis having several dozen associated tilt regions, for example, the same number, more or fewer tilt indicators may be used to provide visual feedback.

[0495] FIG. 33D illustrates a two-axis tilt indicator which may be presented on the display. Although the axes discussed in conjunction with FIG. 33D are referred to as the pitch (forward and backward) and roll (left and right) axes, these designations are arbitrary, and one set of indicators could also be the yaw axis, or another axis. Indicator E609 operates similarly to indicator E605 with regard to one axis, however, indicator E609 also integrates a pitch tilt indicator comprising negative pitch indicator E610, partial negative pitch indicator E611, partial positive pitch indicator E612, and positive pitch indicator E614, to the previously described one-axis indicator E605, which was described as a roll indicator. In another aspect illustrated in FIG. 33E, the indicator includes a single feature E615 that indicates the significance of the orientation of the device. For example, the single feature indicator indicates whether or not numbers may be output because of the measurement of the angular displacement of the device.

[0496] Although the indicator is depicted in FIGS. 28 and 33 as a series of arrows or intuitive lights, in one aspect the indicator is incorporated into the display, such as display E105, or the indicator is a speaker which plays sounds or sound files which