US 20160085222A1

(19) **United States**

(12) **Patent Application Publication**

YABE et al.

(10) **Pub. No.: US 2016/0085222 A1**

(43) **Pub. Date: Mar. 24, 2016**

(54) **CONTROLLER, CONTROL SYSTEM, CONTROL METHOD, AND NON-TRANSITORY COMPUTER-READABLE RECORDING MEDIUM**

(71) Applicant: **MITSUBISHI ELECTRIC CORPORATION**, Tokyo (JP)

(72) Inventors: **Masaaki YABE**, Tokyo (JP); **Ichiro MARUYAMA**, Tokyo (JP); **Satoshi MINEZAWA**, Tokyo (JP); **Toshiaki YOSHIKAWA**, Tokyo (JP); **Hirotoshi YANO**, Tokyo (JP); **Daisuke IIZAWA**, Tokyo (JP); **Kenichiro TANAKA**, Tokyo (JP); **Takashi OGINO**, Tokyo (JP)

(21) Appl. No.: **14/888,727**

(22) PCT Filed: **Mar. 28, 2014**

(86) PCT No.: **PCT/JP2014/059211**

§ 371 (c)(1),
(2) Date: **Nov. 3, 2015**

(30) **Foreign Application Priority Data**

May 17, 2013 (JP) 2013-105161

Publication Classification

(51) **Int. Cl.**
G05B 15/02 (2006.01)
H04L 12/28 (2006.01)

(52) **U.S. Cl.**
CPC ***G05B 15/02*** (2013.01); ***H04L 12/2816*** (2013.01)

(57) **ABSTRACT**

A controller stores an apparatus-room association table in which an apparatus installed in a home is associated with a room in the home, and stores a room-user association table in which the room in the home is associated with the user. The controller determines whether the user is inside the home, and updates a user status. When the user status changes, the controller determines the apparatus corresponding to the user whose user status has changed, and controls the determined apparatus to execute a predetermined process based on the apparatus-room association table and the room-user association table.

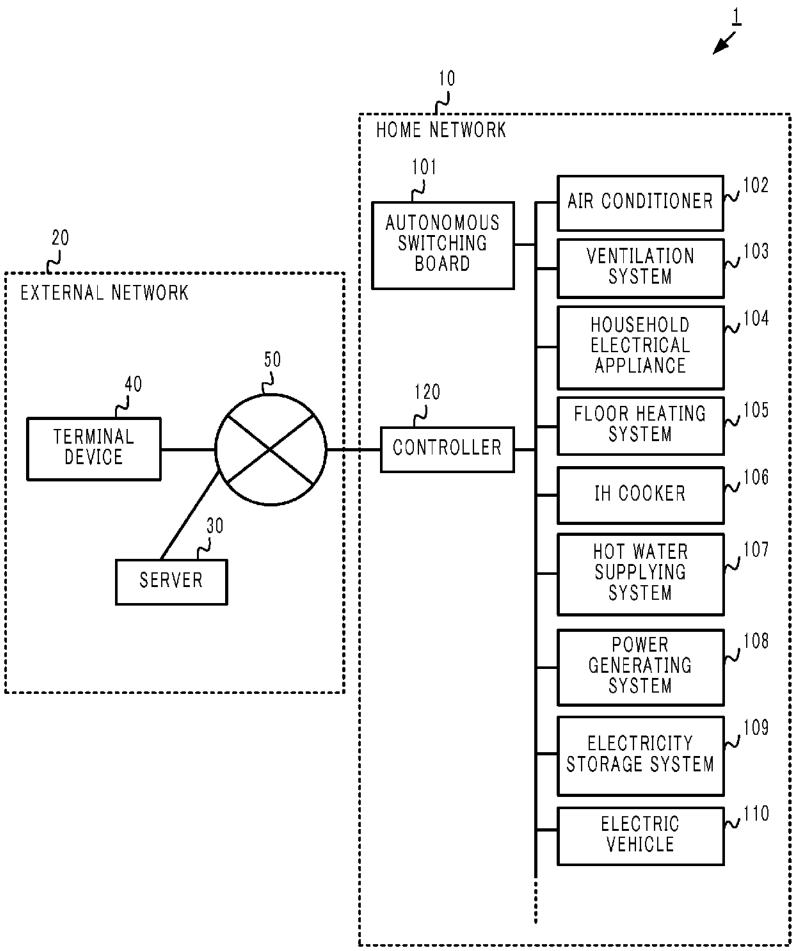

FIG. 1

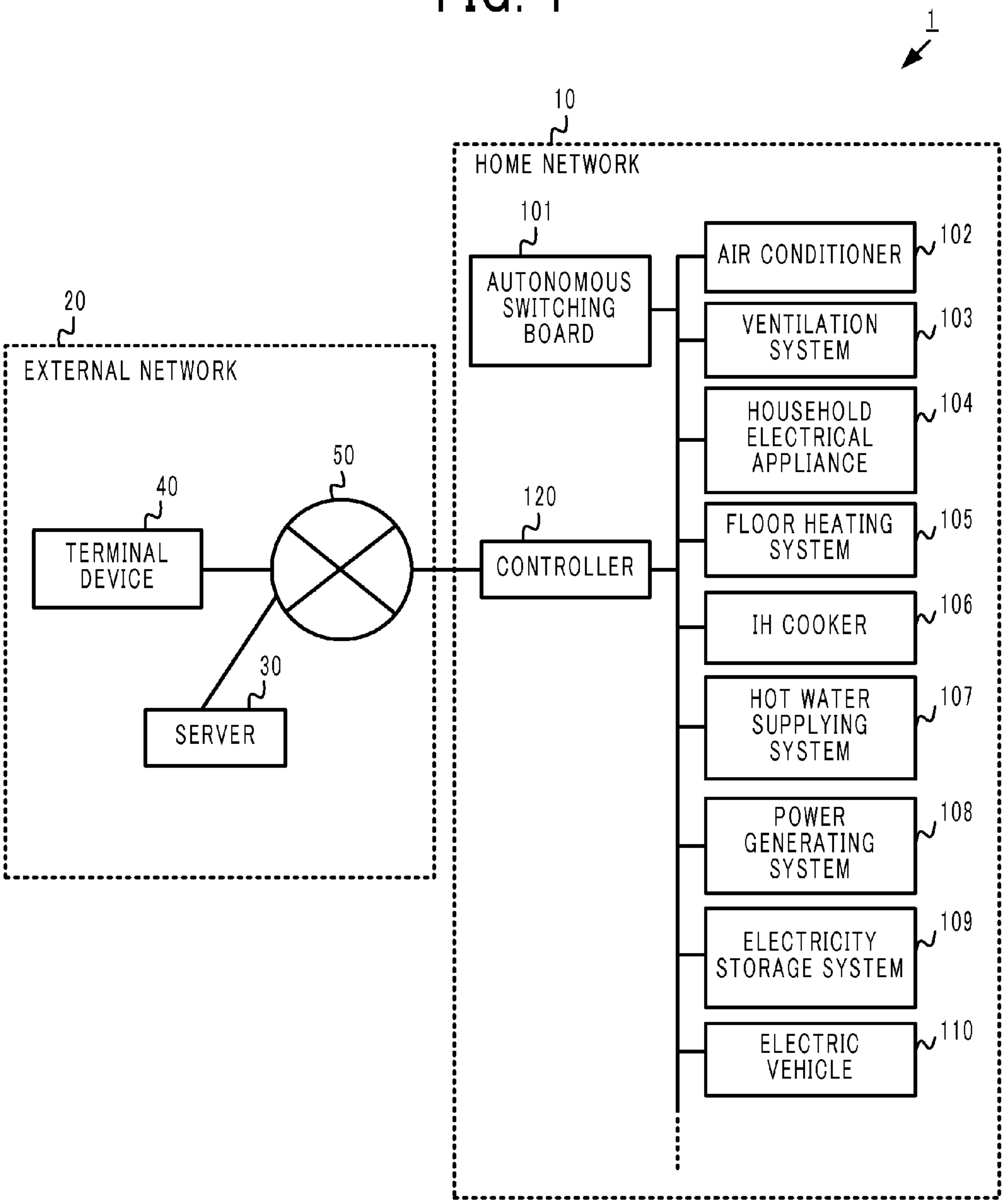
1
10
HOME NETWORK
101
AUTONOMOUS SWITCHING BOARD
AIR CONDITIONER
102
VENTILATION SYSTEM
103
HOUSEHOLD ELECTRICAL APPLIANCE
104
FLOOR HEATING SYSTEM
105
IH COOKER
106
HOT WATER SUPPLYING SYSTEM
107
POWER GENERATING SYSTEM
108
ELECTRICITY STORAGE SYSTEM
109
ELECTRIC VEHICLE
110
120
CONTROLLER
20
EXTERNAL NETWORK
40
TERMINAL DEVICE
50
30
SERVER

FIG. 2

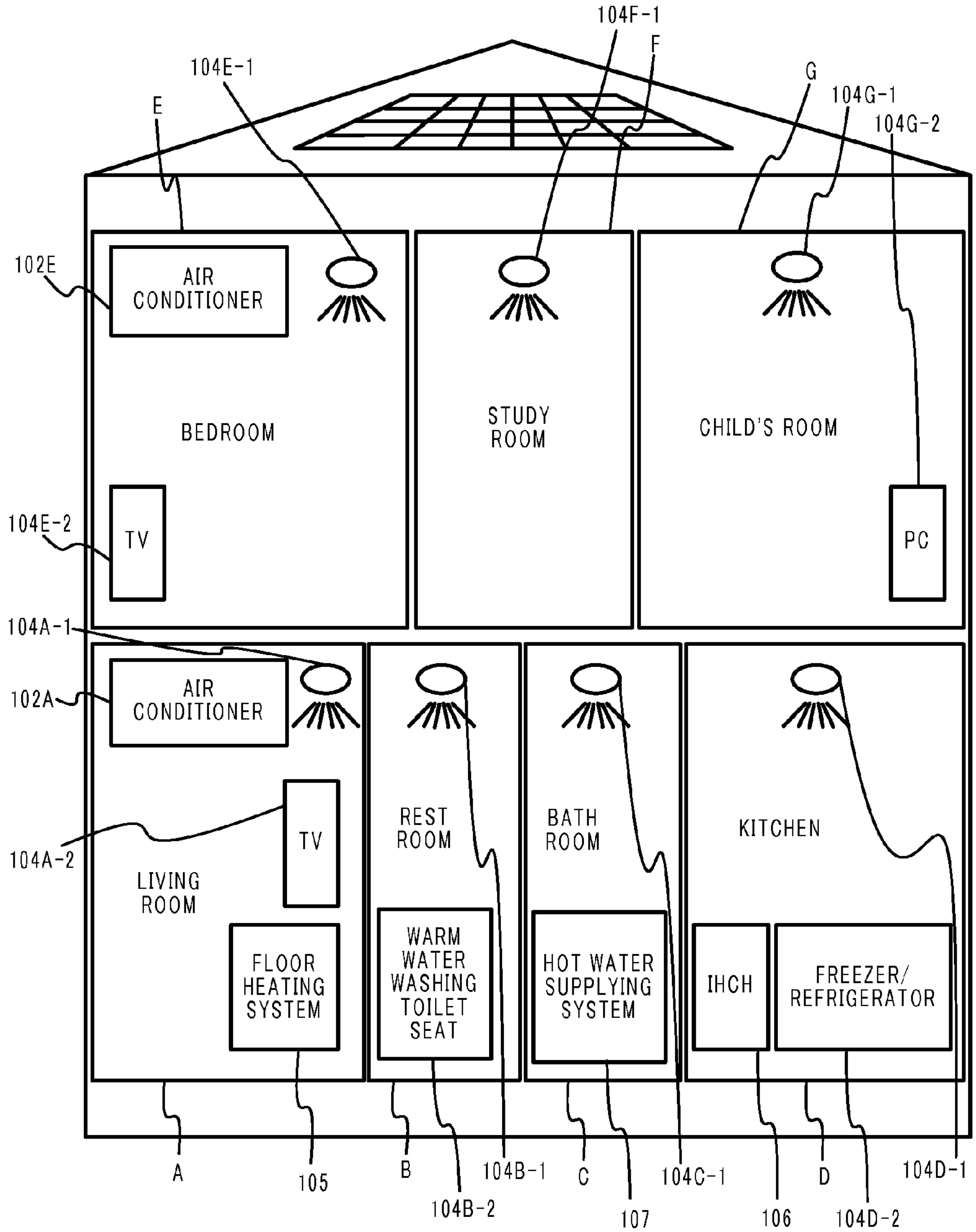
104F-1
F
104E-1
E
G
104G-1
104G-2
102E
AIR CONDITIONER
BEDROOM
STUDY ROOM
CHILD'S ROOM
104E-2
TV
PC
104A-1
102A
AIR CONDITIONER
104A-2
TV
LIVING ROOM
REST ROOM
BATH ROOM
KITCHEN
FLOOR HEATING SYSTEM
WARM WATER WASHING TOILET SEAT
HOT WATER SUPPLYING SYSTEM
IHCH
FREEZER/ REFRIGERATOR
A
105
B
104B-2
104B-1
C
107
104C-1
106
D
104D-2
104D-1

FIG. 3

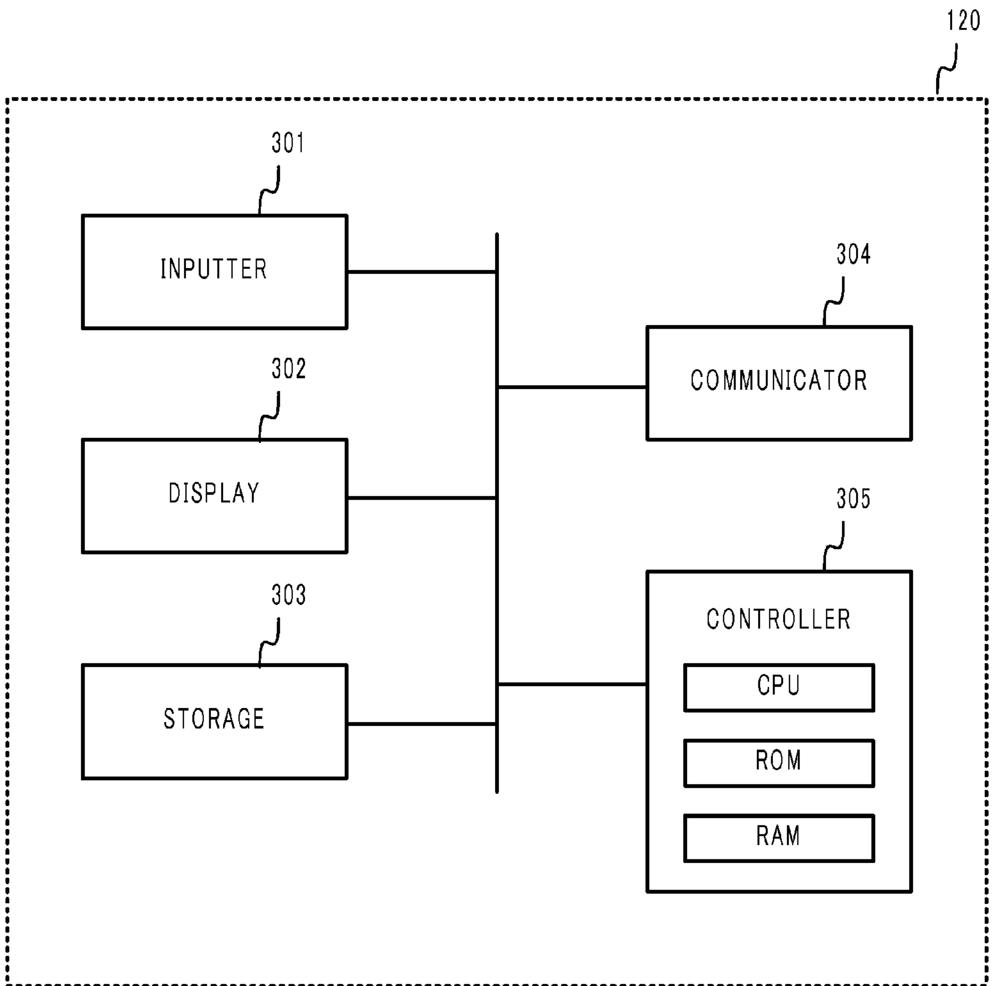
120
301
INPUTTER
302
DISPLAY
303
STORAGE
304
COMMUNICATOR
305
CONTROLLER
CPU
ROM
RAM

FIG. 4A

400

IDENTIFICATION NUMBER	FLOOR NUMBER	NAME OF ROOM	SIZE OF ROOM [MAT]	...
101	1	LIVING ROOM	12	...
102	1	RESTROOM	1	...
103	1	BATHROOM	2	...
104	1	KITCHEN	6	...
201	2	BEDROOM	6	...
202	2	STUDY ROOM	6	...
203	2	CHILD'S ROOM	6	...
...	...	...	...	...

FIG. 4B

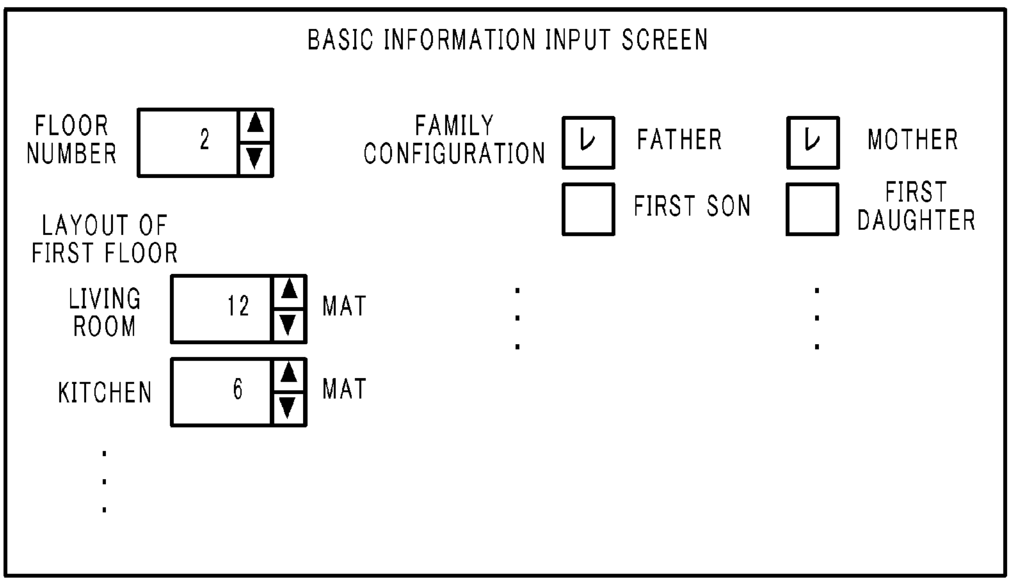

FIG. 5A

500

IDENTIFICATION NUMBER OF ROOM	IDENTIFICATION NUMBER OF APPARATUS	NAME OF APPARATUS	RATED POWER	...
101	0001	LIGHTING DEVICE	100W	...
	0002	INDOOR UNIT	600W	...
	0003	TV	120W	...
	0004	FLOOR HEATER	100W	...
...	...	...	...	...
201	0005	LIGHTING DEVICE	80W	...
	0006	INDOOR UNIT	400W	...
	0007	TV	100W	...
202	0008	LIGHTING DEVICE	100W	...
203	0009	LIGHTING DEVICE	100W	...
	0010	PC	150W	...
...	...	...	...	...

FIG. 5B

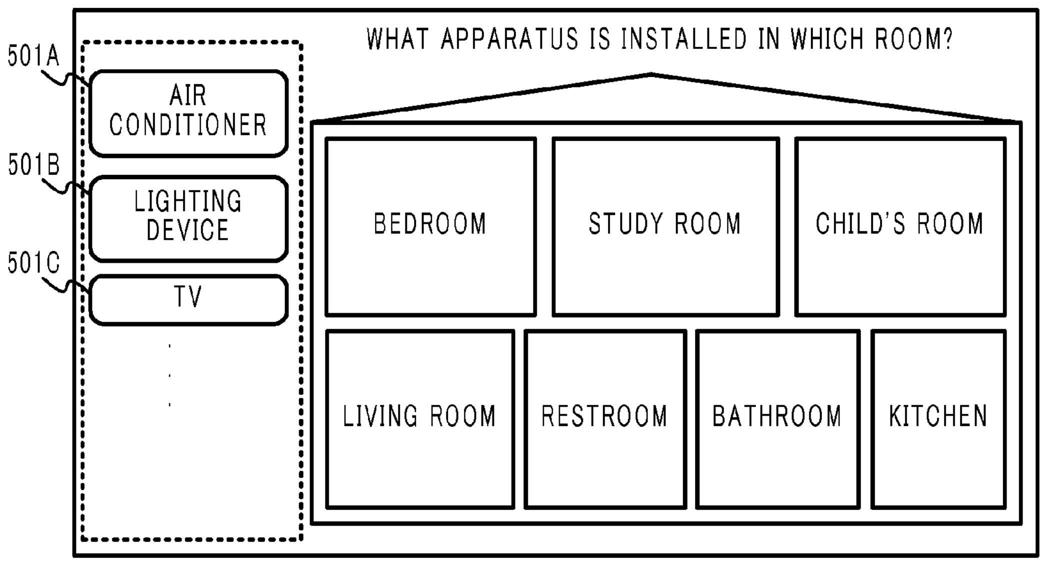
WHAT APPARATUS IS INSTALLED IN WHICH ROOM?
501A
AIR CONDITIONER
501B
LIGHTING DEVICE
501C
TV
BEDROOM
STUDY ROOM
CHILD'S ROOM
LIVING ROOM
RESTROOM
BATHROOM
KITCHEN

FIG. 6A

600

IDENTIFICATION NUMBER OF ROOM	USER
101	FATHER, MOTHER, CHILD
102	FATHER, MOTHER, CHILD
103	FATHER, MOTHER, CHILD
104	MOTHER
201	FATHER, MOTHER
202	FATHER
203	CHILD
...	...

FIG. 6B

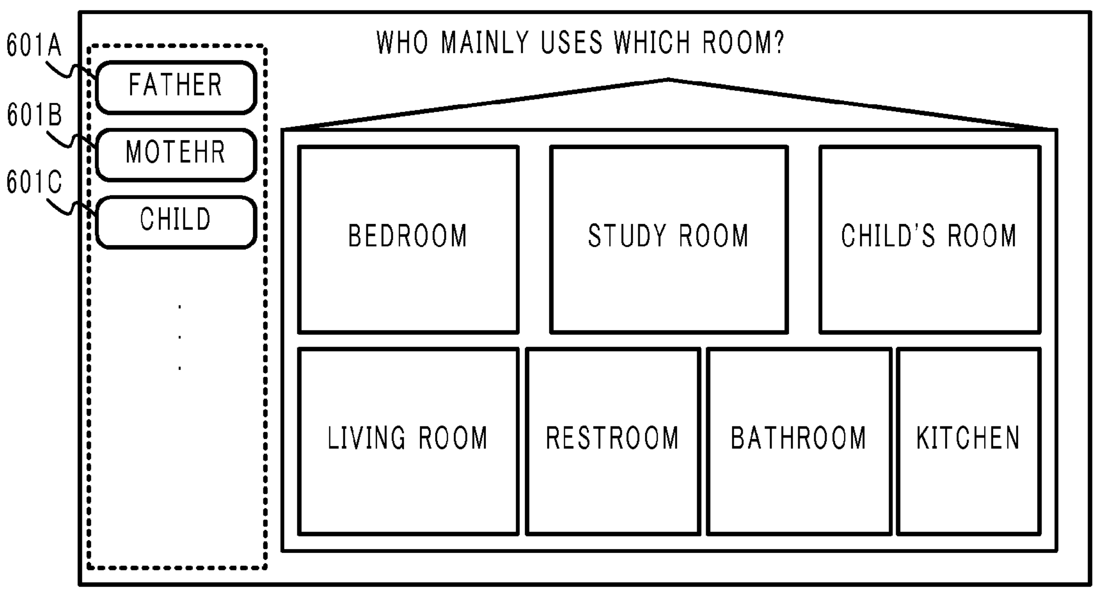

FIG. 7A

700

SCHEDULE	USER	DETAIL OF SCHEDULE	STARTING DATE AND TIME OF SCHEDULE	ENDING DATE AND TIME OF SCHEDULE	REPEAT
SCHEDULE X	FATHER	WORK	APRIL 23, 2013, 07:30	APRIL 23, 2013, 19:30	ON
SCHEDULE Y	MOTHER	SHOPPING	APRIL 23, 2013, 10:00	APRIL 23, 2013, 12:00	OFF
SCHEDULE Z	CHILD	SCHOOL	APRIL 23, 2013, 08:00	APRIL 23, 2013, 17:00	ON
...	...	...	...	...	...

FIG. 7B

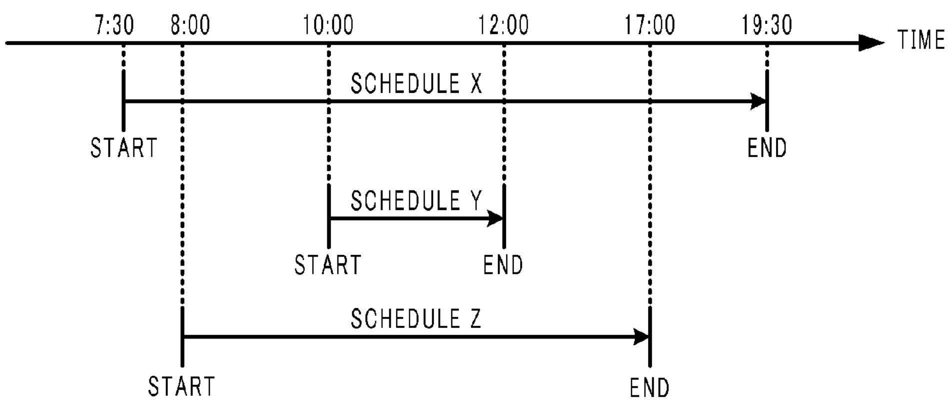

FIG. 8

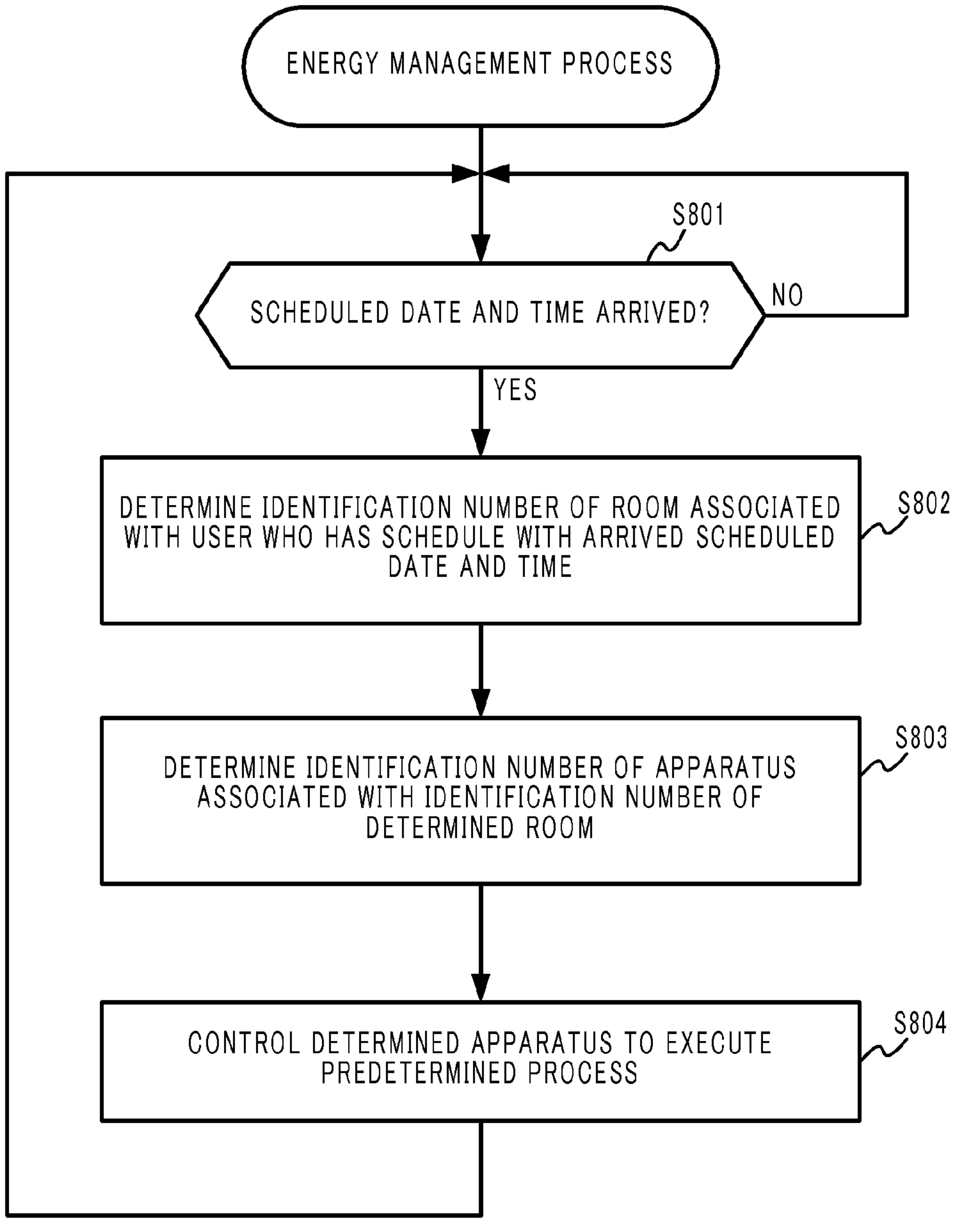
ENERGY MANAGEMENT PROCESS
S801
SCHEDULED DATE AND TIME ARRIVED?
NO
YES
DETERMINE IDENTIFICATION NUMBER OF ROOM ASSOCIATED WITH USER WHO HAS SCHEDULE WITH ARRIVED SCHEDULED DATE AND TIME
S802
DETERMINE IDENTIFICATION NUMBER OF APPARATUS ASSOCIATED WITH IDENTIFICATION NUMBER OF DETERMINED ROOM
S803
CONTROL DETERMINED APPARATUS TO EXECUTE PREDETERMINED PROCESS
S804

FIG. 9

900

IDENTIFICATION NUMBER OF ROOM	IDENTIFICATION NUMBER OF APPARATUS	NAME OF APPARATUS	CONTROL PATTERN A	CONTROL PATTERN B	...
101	0001	LIGHTING DEVICE	LIGHT OFF	LIGHT ON	...
	0002	INDOOR UNIT	TURN OFF	HEATING, 20℃	...
	0003	TV	TURN OFF	TURN ON	...
	0004	FLOOR HEATER	TURN OFF	LOW	...
...	...	...	...	...	...
201	0005	LIGHTING DEVICE	LIGHT OFF	LIGHT ON	...
	0006	INDOOR UNIT	TURN OFF	DEHUMIDITY	...
	0007	TV	TURN OFF	TRUN ON	...
202	0008	LIGHTING DEVICE	LIGHT OFF	LIGHT ON	...
203	0009	LIGHTING DEVICE	LIGHT OFF	LIGHT ON	...
	0010	PC	SLEEP	NORMAL	...
...	...	...	...	...	...

FIG. 10

1000

SCHEDULE	USER	DETAIL OF SCHEDULE	STARTING DATE AND TIME OF SCHEDULE	STARTING CONTROL PATTERN	ENDING DATE AND TIME OF SCHEDULE	ENDING CONTROL PATTERN
SCHEDULE X	FATHER	WORK	APRIL 23, 2013, 07:30	A	APRIL 23, 2013, 19:30	B
SCHEDULE Y	MOTHER	SHOPPING	APRIL 23, 2013, 10:00	A	APRIL 23, 2013, 12:00	B
SCHEDULE Z	CHILD	SCHOOL	APRIL 23, 2013, 08:00	A	APRIL 23, 2013, 17:00	NULL
...	...	...	...	...	...	...

FIG. 11

1100

USER	IDENTIFICATION INFORMATION OF TERMINAL DEVICE
FATHER	XX-XX-XX-XX-XX-XX
MOTHER	YY-YY-YY-YY-YY-YY
CHILD	ZZ-ZZ-ZZ-ZZ-ZZ-ZZ
...	...

CONTROLLER, CONTROL SYSTEM, CONTROL METHOD, AND NON-TRANSITORY COMPUTER-READABLE RECORDING MEDIUM

TECHNICAL FIELD

[0001] The present disclosure relates to an energy management controller, an energy management system, an energy management method, and a program which properly control an apparatus according to individual circumstances of a user.

BACKGROUND ART

[0002] Systems are known which control electrical energy consumed in a home (consumer's home). For example, Patent Literature 1 discloses a home energy management system (HEMS) which is installed in a consumer's home having power supplying means which is autonomously operable, and at least one load, and which controls both the power supplying means and the load.

[0003] In addition, Patent Literature 2 discloses a network system that enables, when a user installs a new apparatus in a home, the user to intuitively input settings of an installation location by a simple operation. This network system acquires, when determining that the apparatus is newly connected with a home network, a corresponding icon image, and displays the icon image in a manner overlaid on the surrounding position of a room layout image.

CITATION LIST

Patent Literature

[0004] Patent Literature 1: Unexamined Japanese Patent Application Kokai Publication No. 2012-228043

[0005] Patent Literature 2: Unexamined Japanese Patent Application Kokai Publication No. 2005-198252

SUMMARY OF INVENTION

Technical Problem

[0006] Although an association between a room and the apparatus is made by displaying the overlaid icon image, this does not help to specify a main user of the apparatus. Hence, the problem exists that the apparatus cannot be controlled properly according to the activity of the user.

[0007] The present disclosure has been made in view of the aforementioned circumstances, and it is an objective of the present disclosure to properly control apparatus according to the individual circumstances of a user.

Solution to Problem

[0008] In order to accomplish the above objective, an energy management controller according to the present disclosure includes:

[0009] a table storage configured to prestore an apparatus-room association table in which an apparatus installed in a home is associated with a room in the home, and to prestore a room-user association table in which a room in the home is associated with a user;

[0010] a determiner configured to determine whether the user is inside the home, and to determine, when a user status that indicates whether the user is inside or outside the home changes, an apparatus corresponding to the user whose user status has changed, based on the apparatus-room association table and the room-user association table; and

[0011] an apparatus controller configured to control the apparatus determined by the determiner to execute a predetermined process.

Advantageous Effects of Invention

[0012] Proper control of apparatus according to the individual circumstances of a user can be possible.

BRIEF DESCRIPTION OF DRAWINGS

[0013] FIG. **1** is a diagram illustrating a structure of an energy management system;

[0014] FIG. **2** is a diagram illustrating an example of a room layout in a home and an arrangement of electrical appliances therein;

[0015] FIG. **3** is a diagram illustrating a structure of a controller;

[0016] FIG. **4**A is a diagram illustrating an example structure of a layout defining table;

[0017] FIG. **4**B is a diagram illustrating an example structure of a basic information input screen;

[0018] FIG. **5**A is a diagram illustrating an example structure of an apparatus-room association table;

[0019] FIG. **5**B is a diagram illustrating an example structure of a screen for inputting an association between a room and an apparatus;

[0020] FIG. **6**A is a diagram illustrating an example structure of a room-user association table;

[0021] FIG. **6**B is a diagram illustrating an example structure of a screen for inputting an association between a room and a user;

[0022] FIG. **7**A is a diagram illustrating an example structure of a schedule table;

[0023] FIG. **7**B is a diagram illustrating a starting date and time and an ending date and time of a schedule that is set in the schedule table;

[0024] FIG. **8** is a flowchart for explaining an energy management process;

[0025] FIG. **9** is a diagram illustrating an example structure of an apparatus-room association table;

[0026] FIG. **10** is a diagram illustrating an example structure of a schedule table; and

[0027] FIG. **11** is a diagram illustrating an example structure of a terminal device-and-user association table.

DESCRIPTION OF EMBODIMENTS

[0028] Embodiments of the present disclosure will be described below with reference to the figures.

First Embodiment

[0029] FIG. **1** illustrates a structure of an energy management system **1** according to this embodiment. The energy management system **1** monitors electric energy consumed by various apparatuses and systems installed in a home (consumer's home), and controls the operation of individual apparatuses and systems. For example, a home network **10** includes an autonomous switching board **101**, an air conditioner **102**, an ventilation system **103**, other household electrical apparatus **104** such as a television receiver and lighting device, a floor heating system **105**, an induction heating (IH) cooker **106**, and a hot water supplying system **107**.

[0030] In addition, the home network **10** includes a power generating system **108** that utilizes, for example, solar power, an electricity storage system **109** that includes batteries, an electric vehicle **110** which can be disconnected as needed and which includes batteries, and a controller **120**.

[0031] A home power line (unillustrated) of the energy management system **1** is connected, through the autonomous switching board **101**, to a commercial power supply from an electricity company.

[0032] The autonomous switching board **101**, the air conditioner **102**, the ventilation system **103**, the household electrical appliance **104**, the floor heating system **105**, the IH cooker **106**, the hot water supplying system **107**, the power generating system **108**, the electricity storage system **109**, the electric vehicle **110**, and the controller **120** are all connected to the home power line, and powered from at least one of the a commercial power source, the power generating system **108**, the electricity storage system **109**, and the electric vehicle **110**.

[0033] In addition, each apparatus or system includes an unillustrated wireless communication device, and is communicable wirelessly. However, some or all of the communications may be performed in a wired manner. In the following description, an apparatus or a system to be controlled by the energy management system **1** is simply referred to as an "apparatus".

[0034] Still further, unillustrated power measuring devices are installed at multiple locations on the home power line in the energy management system **1**, and thus electric energy, and the like consumed by the air conditioner **102**, the ventilation system **103**, the household electrical appliance **104**, the floor heating system **105**, the IH cooker **106**, the hot water supplying system **107**, the power generating system **108**, and the electricity storage system **109** can be measured as needed. A measurement result is transmitted to the controller **120**.

[0035] The home network **10** is connected to an external network **20** that comprises a server **30**, a terminal device **40**, and a communication network **50**. A typical communication network **50** is the Internet. A user can operate each apparatus within the home network **10** by a remote operation through the terminal device **40** within the external network **20**.

[0036] The terminal device **40** is accessible to the home network **10** and the external network **20** through wireless communication. An example terminal device **40** is a mobile phone, a personal computer, or a tablet-type terminal. The user can carry to operate the terminal device **40** not only inside the home but also at a location outside the home.

[0037] The operating mode of the energy management system **1** can be generally divided into two operating modes. The one mode is an interconnection mode in which the in-home power line is connected to the commercial power source through the autonomous switching board **101**, and electric power is supplied from the commercial power source. In the interconnection mode, electric power generated by the power generating system **108** can be supplied to the commercial power source, or can be sold.

[0038] The other mode is an autonomous operating mode in which the home power line is disconnected from the commercial power source through the autonomous switching board **101**, and electric power generated by the power generating system **108**, and/or electric power stored in the electricity storage system **109**, and/or power stored in the electric vehicle **110** is supplied to the home without electric power from the commercial power source.

[0039] The operating mode is switched by the autonomous switching board **101** based on a detection result that is detected by the autonomous switching board **101** and that indicates the power supply status from the commercial power source. Typically, the mode is set to the interconnection mode while the power failure does not occur in the commercial power source, and when a power failure is detected in the commercial power source, the mode is switched to the autonomous operating mode.

[0040] Each apparatus and system installed in the home illustrated in FIG. **1** is installable at any location within the home. FIG. **2** illustrates an example layout (room layout) of rooms in the home, and an example arrangement of household electrical apparatus **104** and the like installed therein. As illustrated in FIG. **2**, the home of this embodiment includes seven spaces that are a living room A, a restroom B, a bathroom C, a kitchen D, a bedroom E, a study room F, and a child's room G. Various household electrical apparatuses are installed in the respective spaces.

[0041] A lighting device **104**A-**1**, an air conditioner **102**A, a television receiver (indicated as "TV" in FIG. **2**) **104**A-**2**, and the floor heating system **105** that heats the floor with electrical power, and the like, are installed in the living room A.

[0042] A lighting device **104**B-**1** and a warm water washing toilet seat **104**B-**2**, and the like, are installed in the restroom B.

[0043] A lighting device **104**C-**1** and the hot water supplying system **107**, and the like, are installed in the bathroom C.

[0044] A lighting device **104**D-**1**, the IH cooker (indicated as "IHCH" in FIG. **2**) **106**, and a freezer/refrigerator **104**D-**2**, and the like, are installed in the kitchen D.

[0045] A lighting device **104**E-**1**, an air conditioner **102**E, and a television receiver **104**E-**2**, and the like, are installed in the bedroom E.

[0046] A lighting device **104**F-**1**, and the like, is installed in the study room F.

[0047] A lighting device **104**G-**1** and a personal computer (indicated as "PC" in FIG. **2**) **104**G-**2**, and the like, are installed in the child's room G.

[0048] Each apparatus illustrated in each room A-G communicates with the controller **120**, and the operation of each apparatus can be controlled by the controller **120**.

[0049] The layout, the kind of apparatus installed in each room, the number of apparatuses, and the installation location of the apparatus as illustrated in FIG. **2** are merely examples, and are not limited by the present disclosure.

[0050] Next, a structure of the controller **120** will be described with reference to FIG. **3** and the like. The controller **120** monitors and controls the entire energy management system **1**.

[0051] An inputter **301** includes input devices, such as buttons, a keyboard, and a touch panel. The inputter **301** accepts an input of an instruction given by the user.

[0052] A display **302** includes a display device such as a liquid crystal display.

[0053] A storage **303** includes a non-volatile memory. The storage **303** stores, in addition to programs to be executed by a controller **305**, a layout defining table that defines a layout of the rooms in the home, an apparatus-room association table that defines an installation location (room) in the home of each apparatus to be controlled by the controller **120**, and a room-user association table that defines an association between the room and the user. The details of the tables will be explained later.

[0054] A communicator **304** includes a network interface card (NIC), and wirelessly communicates with each apparatus within the energy management system **1**.

[0055] The controller **305** includes, for example, a central processing unit (CPU), a read only memory (ROM) for storing programs for an operating system and the like, a random access memory (RAM) that serves as a work area, and the like. The controller **305** executes the programs stored in the storage **303**, and controls the whole controller **120**.

[0056] For example, the controller **305** detects a user status indicating whether the user is inside the home, stores a detection result in the storage **303**, and updates the result as needed.

[0057] A typical server, mainframe, personal computer, or the like is applicable as the controller **120**.

[0058] FIG. **4**A illustrates an example structure of a layout defining table **400** stored in the storage **303** of the energy management system **1** installed in a two-story single-family home. The layout defining table **400** contains an identification number of a room, a floor number of a room, a name of a room, and a size of a room in association with one another. The controller **305** is capable of changing the layout defining table **400** as needed based on an input given by the user.

[0059] The controller **305** can generate a schematic diagram of a building as illustrated in FIG. **2** based on the layout defining table **400** and template image data that represents an external appearance or the like of the building, and display the generated diagram on the display. The schematic diagram may not faithfully represent the reality exactly, but such a diagram may be enough for the user to visually recognize a room where the apparatus is installed. The scheme of generating the schematic diagram by the controller **305** is not limited by the present disclosure.

[0060] FIG. **4**B illustrates an example structure of a screen for accepting an input of basic information from the user in the energy management system **1**. This screen is displayed on the display at the time when, for example, the energy management system **1** is set up. The user inputs basic information, such as the layout and a family structure. The controller **305** generates or updates the layout defining table **400** based on the input details.

[0061] FIG. **5**A illustrates an example structure of an apparatus-room association table **500**. The apparatus-room association table **500** contains, in association with the identification number of a room, an identification number of an apparatus installed in the room, and a name of the apparatus. The apparatus-room association table **500** may further contain a characteristic value such as the rated power of the apparatus.

[0062] When, for example, the user purchases an apparatus and installs the apparatus in a room, the user operates the controller **120** to display a screen to edit the apparatus-room association table **500**, and inputs the name of a room where the apparatus is installed, the name of the installed apparatus, and the like. The controller **305** changes the apparatus-room association table **500** as needed based on the input given by the user.

[0063] FIG. **5**B illustrates an example structure of a screen for accepting, from the user, an input for an association between a room and an apparatus. For example, the user drags and moves an icon **501** (three icons **501**A, **501**B, and **501**C in this figure) that represents an apparatus into a frame that represents the room where the apparatus is installed. The controller **305** generates or updates the apparatus-room association table **500** based on the input details through this screen.

[0064] The controller **120** may accept, from the user, an input of a model number of the apparatus and the serial number thereof, and transmit the input information to a server (unillustrated) on the Internet. The server may acquire, from a database, a characteristic value such as the rated power of the apparatus corresponding to the model number or the serial number, and transmit the acquired value to the controller **120**. The controller **120** may update the apparatus-room association table **500** with the characteristic value acquired from the server.

[0065] FIG. **6**A illustrates an example structure of a room-user association table **600**. The room-user association table **600** contains, in association with the identification number of a room, information on a person that mainly uses the room. For example, the room with the identification number “101” is associated with three persons who are “father”, “mother”, and “child”.

[0066] FIG. **6**B illustrates an example structure of a screen for accepting, from the user, an input for an association between a room and a user. For example, the user drags and moves an icon **601** (three icons **601**A, **601**B, and **601**C in this figure) that represents a user into a frame that represents the room where the apparatus is installed. The controller **305** generates or updates the room-user association table **600** based on the input details through this screen.

[0067] When the apparatus-room association table **500** and the room-user association table **600** are combined together, an association between the apparatus and the user can be acquired since the identification number of the room is a common element therebetween.

[0068] Specifically, the apparatus-room association table **500** in FIG. **5**A shows that the room with the identification number “101” is associated with lighting device with an identification number “0001”, indoor unit with an identification number “0002”, a television receiver (TV) with an identification number “0003”, and a floor heating system with an identification number “0004”. In addition, the room-user association table **600** in FIG. **6**A shows that the room with the identification number “101” is associated with a father, a mother, and a child. Therefore, the controller **305** can determine that the four apparatuses which are the lighting device with the identification number “0001”, the indoor unit with the identification number “0002”, the television receiver (TV) with the identification number “0003”, and the floor heating system with the identification number “0004” are associated with three persons who are the father, the mother, and the child.

[0069] Likewise, for all apparatuses, the controller **305** can determine the user associated with the apparatus.

[0070] In general, the layout defining table **400** illustrated in FIG. **4**A and the room-user association table **600** illustrated in FIG. **6**A are not frequently changed, and thus the user does not need to change the tables once inputting the information unless the home is re-constructed or the user moves out to another home. In addition, as for the apparatus-room association table **500** illustrated in FIG. **5**A, it is necessary for the user to change the table only when the user purchases a new apparatus or replaces the apparatus, and thus the user does not need to frequently change this table. The user has many opportunities to be aware of who mainly uses which room (that is, the details of the room-user association table **600**), and which room is whose (that is, the details of the apparatus-room association table **500**), but has little opportunity to be aware of who mainly uses which apparatus. In particular, it is unusual to let the user previously provide a direct input of an association between the apparatus and the main user thereof in the household. When, however, the layout defining table **400**, the apparatus-room association table **500** and the room-user association table **600** of this embodiment are applied, the controller **120** can easily determine an association between the apparatus and the user without burdening the user.

[0071] When the association between the apparatus and the user is determined, the energy management system **1** enables power consumption and operating of the apparatus to be finely managed in accordance with, for example, a life pattern of the user. For example, the energy management system **1** can manage energy more efficiently based on the action schedule of each member of a family, such that when the father has a schedule of being out, the lighting in the study room is automatically turned off at the scheduled time.

[0072] FIG. **7**A illustrates an example structure of a schedule table **700**. An entry in the schedule table **700** is made by the user through the inputter **301** of the controller **120**, or with a personal computer, a mobile terminal, or the like that is communicable with the controller **120**, and the schedule table **700** is stored in the storage **303**. A schedule is associated with the user, the detail of the schedule, a starting date and time of the schedule, an ending date and time of the schedule, and a flag indicating whether a repeat of the schedule is set. The repeat setting of the schedule is freely selected such as on a daily, weekdays-only, or weekends-only basis.

[0073] FIG. **7**B illustrates a starting date and time and an ending date and time for each of a schedule X, a schedule Y, and a schedule Z set in the schedule table **700**.

[0074] For example, the schedule table **700** contains schedule X for the father who goes out from Apr. 23, 2013, 07:30 to Apr. 23, 2013, 19:30. The controller **305** determines that the study room with the identification number **202** is associated with only the father who is the user indicated by schedule X. When the lighting device **104**F-**1** associated with the determined study room is left turned on at the starting date and time of schedule X, the controller **305** controls the lighting device **104**F-**1** to be turned off.

[0075] The controller **305** excludes, from the determination result, a room associated with not only the father but also the mother and/or the child (that is, excludes the living room with the identification number "101", the restroom with the identification number "102", the bathroom with the identification number "103", and the bedroom with the identification number "201"). Although the lighting device **104A-1**, the air conditioner **102**A, the television receiver **104**A-**2**, and the floor heating system **105** that are associated with the living room, the lighting device **104**B-**1** and the warm water washing toilet seat **104**B-**2** that are associated with the restroom, the lighting device **104**C-**1** and the hot water supplying system **107** that are associated with the bathroom, and, the air conditioner **102**E, the lighting device **104**E-**1**, and the television receiver **104**E-**2** that are associated with the bedroom are turned on, the controller **305** does not turn off such apparatus.

[0076] In addition, there is also schedule Z for the child who is out from Apr. 23, 2013, 08:00 to Apr. 23, 2013, 17:00. The controller **305** determines that the child's room with the identification number "203" is associated with the child only. The controller **305** controls the lighting device **104**G-**1** and the personal computer **104**G-**2** both associated with the child's room, to be turned off at the starting date and time of schedule Z.

[0077] Since the time period of schedule Z is completely included within the time period of schedule X, the father and the child are out within the time period of schedule Z.

[0078] When there is a room associated with only the two persons who are the father and the child, the controller **305** determines such a room, and controls the apparatus associated with the determined room, to be turned off.

[0079] The controller **305** excludes, from the determination result, a room associated with not only the child but also the mother (that is, the living room with the identification number "101", the restroom with the identification number "102", and the bathroom with the identification number "103"). Although the lighting device **104**A-**1**, the air conditioner **102**A, the television receiver **104**A-**2**, and the floor heating system **105** that are associated with the living room, the lighting device **104**B-**1** and the warm water washing toilet seat **104**B-**2** that are associated with the restroom, the lighting device **104**C-**1** and the hot water supplying system **107** that are associated with the bathroom are all turned on, the controller **305** does not turn off such apparatus.

[0080] Still further, the schedule table **700** contains schedule Y for the mother who is out from Apr. 23, 2013, 10:00 to Apr. 23, 2013, 12:00. The controller **305** determines that the kitchen with the identification number "104" is associated with the mother who is the user indicated by schedule Y. The controller **305** controls the lighting device **104**D-**1**, the freezer/refrigerator **104**D-**2**, and the IH cooker **106** all associated with the determined kitchen so as to be turned off at the starting date and time of schedule Y.

[0081] The controller **305** may not, exceptionally, turn off an apparatus that is desirably always turned on, such as the freezer/refrigerator **104**D-**2**. Whether to always turn on the equipment is set beforehand by the user or the controller **305**.

[0082] Since the time period of schedule Y completely overlaps the time periods of schedule X and schedule Z, all of the three persons who are the father, the mother, and the child are out within the time period of schedule Y. The controller **305** controls all apparatuses so as to be turned off at the starting date and time of schedule Y.

[0083] During the time period from Apr. 23, 2013, 08:00 to Apr. 23, 2013, 10:00, and the time period from Apr. 23, 2013, 12:00 and Apr. 23, 2013, 17:00, the two persons who are the father and the child are out but the mother stays at home. If there is a room associated with only the two persons who are the father and the child, the controller **305** controls the apparatus associated with the room associated with only the two persons who are the father and the child so as to be turned off during those time periods.

[0084] As explained above, when the value of the user status changes from the value indicating that the user is at home to the value indicating that the user is out, the controller **305** determines the room associated with only the user who has the changed user status, and controls the apparatus associated with the determined room.

[0085] In addition, the controller **305** is capable of controlling the apparatus according to whether the user is at home. The controller **305** can not only turn off the apparatus but also turn on the apparatus according to the user status.

[0086] When the ending date and time of schedule Y arrives, the mother comes home and the father and the child are still out. The controller **305** determines that the kitchen with the identification number "104" is associated with only the mother. In this case, the controller **305** may perform control so as to turn on the lighting device **104**D-**1**, the freezer/refrigerator **104**D-**2**, and the IH cooker **106** all associated with the kitchen.

[0087] Still further, the controller **305** may perform control so as to turn on the apparatus associated with the room associated with at least the mother. For example, the living room with the identification number "101" is associated with the father, the child, and also the mother. When the ending date and time of schedule Y arrives, the controller **305** may turn on the lighting device **104**A-**1**, the air conditioner **102**A, the television receiver **104**A-**2**, and the floor heating system **105** all associated with the living room. The same is true of the restroom with the identification number "102", the bathroom with the identification number "103", and the bedroom with the identification number "201". When there is apparatus already turned on, the controller **305** may not control such apparatus.

[0088] When the ending date and time of schedule Z comes, the child comes home, and only the father is still out. The controller **305** determines that the child's room with the identification number "203" is associated with the child only. In this case, the controller **305** may perform control so as to turn on the lighting device **104**G-**1** and the personal computer **104**G-**2** both associated with the child's room.

[0089] In addition, the controller **305** may perform control so as to turn on the apparatus associated with the room associated with at least the child. For example, the living room with the identification number "101" is also associated with the child. Hence, when the ending date and time of schedule Y arrives, the controller **305** may turn on the lighting device **104**A-**1**, the air conditioner **102**A, the television receiver **104**A-**2**, and the floor heating system **105** all associated with the living room with the identification number "101". The same is true of the restroom with the identification number "102", and the bathroom with the identification number "103". When there is apparatus already turned on, the controller **305** may not control such apparatus.

[0090] When the ending date and time of schedule X arrives, the father comes home. The controller **305** determines that the study room with the identification number "202" is associated with the father only. The controller **305** may control the lighting device **104**F-**1** associated with the study room so as to be turned on.

[0091] After the ending date and time of schedule X has arrived, all members who are the father, the mother, and the child are at home. The controller **305** may control the equipment associated with the room associated with at least one of the father, the mother, and the child so as to be turned on.

[0092] As explained above, when the user status changes from the value indicating that the user is out to the value indicating that the user is at home, the controller **305** determines the room associated with at least the user who has the changed user status, thereby controlling the apparatus associated with the determined room.

[0093] The controller **305** may control the apparatus to perform an arbitrary action other than turning on or off the apparatus.

[0094] Next, an energy management process executed by the energy management system **1** of this embodiment is described with reference to the flowchart of FIG. **8**. The flowchart does not clearly show that the controller **305** of the controller **120** includes a built-in clock that performs time-keeping of the current date and time, and always keeps the current date and time simultaneously with the energy management process.

[0095] First, the controller **305** reads the schedule table **700** stored in the storage **303**, and determines whether the clocks current date and time reaches the scheduled date and time set in the schedule table **700** (step S**801**). When, for example, schedules are scheduled in the schedule table **700** as illustrated in FIG. **7**A, the controller **305** determines whether the current date and time reaches any of the starting dates and times of the three schedules.

[0096] When determining that the clocks current date and time does not reach the set and scheduled date and time yet (step S**801**: NO), the controller **305** repeats the process in the step S**801**. Conversely, when determining that the clocks current date and time reaches the set and scheduled date and time (step S**801**: YES), the controller **305** determines the user associated with the schedule based on the schedule table **700**, determines that the user status of the user is changing, and further determines the identification number of the room associated with the determined user based on the room-user association table **600** (step S**802**).

[0097] In this embodiment, however, when the identification number of the determined room is also associated with a user other than the determined user, the controller **305** excludes the identification number of such a room also associated with the other user. When, for example, the schedule that has the arrived starting date and time is "schedule X", the controller **305** determines that the user associated with this schedule X is the father, and acquires, based on the room-user association table **600**, the identification number "202" of the room associated with the father only. The controller **305** excludes the identification numbers "101", "102", "103", and "201" which are associated with the father and also associated with the other user.

[0098] The controller **305** determines the identification number of the apparatus associated with the identification number of the room determined in step S**802** based on the apparatus-room association table **500** (step S**803**).

[0099] For example, in the apparatus-room association table **500** illustrated in FIG. **5**A, when the identification number of the room determined in step S**802** is "202", the controller **305** acquires the identification number "0008" of the apparatus (lighting device) associated with the identification number "202" of the room.

[0100] Next, the controller **305** executes the predetermined process for the apparatus indicated by the identification number determined in step S**803** (step S**804**).

[0101] An example predetermined process is "to turn off". When the apparatus indicated by the identification number determined in step S**804** is a lighting device, the controller **305** turns off this lighting device to turn the lighting device out. However, the specific details of the predetermined process are not limited by the present disclosure, and are freely selected.

[0102] When the controller **305** acquires the identification numbers of multiple apparatuses in step S**803**, the controller **305** executes the predetermined process for all of the apparatuses. In addition, the predetermined process may differ from apparatus to apparatus.

[0103] According to this embodiment, the energy management system **1** can properly control the apparatus according to the individual circumstances of the user. When the user previously inputs a personal schedule, wasteful power consumption may be automatically reduced according to the input schedule. If the user forgets to turn off the lighting device when going out, the energy management system **1** automatically turns off this lighting device. Accordingly, an efficient and well-kept energy control is realizable.

[0104] When, in step S**802**, there are multiple users associated with the determined schedule, the controller **305** acquires the identification number of the room associated with each of the multiple users, and the identification number of the room associated with all of the multiple users.

[0105] When, for example, the users determined in step S**802** are both father and mother, the controller **305** acquires three identification numbers which are (1) the identification number "201" of the room associated with both father and mother, (2) the identification number "202" of the room associated with the father only, and (3) the identification number "104" of the room associated with only the mother, from the room-user association table **600** illustrated in FIG. **6**A. However, the identification numbers "101", "102", and "103" of the rooms associated with both the father and the mother and also the child are excluded from the control target in step S**804**.

Second Embodiment

[0106] Next, a second embodiment is described. According to this embodiment, an energy management system **1** enables a determined apparatus to execute an operation freely selected and set by the user at both of or either the starting date and time and the ending date and time registered by the user.

[0107] FIG. **9** illustrates an example structure of an apparatus-room association table **900**. Unlike the apparatus-room association table **500** illustrated in FIG. **5**A, the apparatus-room association table **900** of this embodiment contains, in association with the identification number of the room, information that specifies at least a control pattern. In the example illustrated in FIG. **9**, two different control patterns are stored. The number of control patterns associated with each apparatus is freely selected.

[0108] For example, the lighting device with the identification number "0001" is set with a control pattern A to turn off a light, and a control pattern B to turn on a light. When the current date and time reaches the starting date and time or the ending date and time of the schedule, the controller **305** of the controller **120** turns off the lighting device with the identification number "0001" when the control pattern A is specified, and turns on the lighting device with the identification number "0001" when the control the control pattern B is specified.

[0109] Typically, when the user status indicated by the schedule changes from the value indicating that the user is at home to the value indicating that the user is out, the control pattern A to control the lighting device to be turned out is specified. According to this setting, when the user goes out, the lighting device is automatically turned out. However, the process that is executable when the user goes out from the home is not limited to this process, and is optional, such as to turn off the air conditioner **102**, to turn off the television receiver, and to change the mode of the personal computer from the normal mode to the sleep mode.

[0110] When the user status indicated by the schedule changes from the value indicating that the user is out to the value indicating that the user is at home, the control pattern B to control the lighting device to be turned on is specified. According to this setting, when the user comes home, the lighting device is automatically turned on. However, the process executable when the user comes home from the outside is not limited to this process, and is optional, such as to turn on the air conditioner **102**, to turn on the television receiver, and to change the mode of the personal computer from the sleep mode to the normal mode.

[0111] The details of operation set by the control pattern are optional. The energy management system **1** may set the control pattern beforehand depending on the kind of apparatus, or the user may freely set the control pattern. When the user is allowed to freely set the control pattern, the inputter **301** may receive an input given by the user, or a terminal (for example, a highly functional mobile phone) communicable through the communicator **304** may receive an input given by the user. The controller **305** may acquire the received input from the user, and may update the apparatus-room association table **900** based on the acquired input.

[0112] There may be an apparatus that is not associated with an operation pattern. In this case, this apparatus is not subjected to an automatic operation control according to the schedule of the user. For example, a fixed-line phone, an intercom, a security system, and the like may cause some trouble when turned off, and thus such an apparatus may be excluded from the automatic control setting.

[0113] FIG. **10** illustrates an example structure of a schedule table **1000** according to this embodiment. Unlike the schedule table **700** illustrated in FIG. **7**A, the schedule table **1000** illustrated in FIG. **10** stores a starting time control pattern that specifies the control to be executed by the controller **120** when the current date and time reaches the starting date and time of the schedule, and an ending time control pattern that specifies the control to be executed by the controller **120** when the current date and time reaches the ending date and time of the schedule.

[0114] The starting time control pattern and the ending time control pattern specify any control pattern that is set in the apparatus-room association table **900**. When, however, operation control of the apparatus is not required at the starting date and time of the schedule, the controller **305** may set no specific starting time control pattern, or may set, in the starting time control pattern, a value indicating no operation control required. Likewise, when operation control of the apparatus is not required at the ending date and time of the schedule, the controller **305** may set no specific ending time control pattern, or may set, in the ending time control pattern, a value indicating no operation control required.

[0115] When, for example, the user registers a schedule of going out, and desires that a room is heated beforehand when going home, the user can set, for example, "heating, temperature XX ° C." in the ending time control pattern for the schedule of going out. As described above, the apparatus is controllable in order to not only accomplish energy saving but also to allow the user to have a more comfortable life.

[0116] The specific flow of the energy management process in this embodiment is the same as the flowchart illustrated in FIG. **8**, and it is appropriate if the "predetermined process" in step S**804** is changed to a "process specified by the starting time control pattern or the ending time control pattern".

[0117] When the user status changes from the value indicating that the user is at home to the value indicating that the user is out, the controller **305** determines in step S**802** the room associated with only the user whose user status has changed. When another user other than the determined user is also associated with the room, the controller **305** excludes the room also associated with the user other than the determined user.

[0118] For example, when, in the room-user association table **600** illustrated in FIG. **6**A, the user who has the changed user status is the father, the controller **305** determines that the room with the identification number "202" is associated with only the father. Next, the controller **305** determines that the apparatus with the identification number "0008" is the apparatus to be controlled and associated with the room that has the identification number "202".

[0119] The room also associated with the mother and/or the child in addition to the father is excluded. The room with the identification number "101" is also associated with the mother and the child in addition to the father. The room with the identification number "101" is determined when the three users who are the father, the mother, and the child have the respective user statuses changed to the same value.

[0120] The room with the identification number "101" is associated with the three users who are the father, the mother, and the child. When all three users who are the father, the mother, and the child go out, the controller **305** controls the apparatus associated with the room that has the identification number "101" to execute the predetermined process. The same is true of the rooms with the respective identification numbers "102" and "103".

[0121] Conversely, when the user status changes from the value indicating that the user is out to the value indicating that the user is at home, the controller **305** determines, in step S**802**, the room associated with the users including the user whose user status has changed. When another user other than the determined user is also associated with this room, as long as the determined user is included, the controller **305** determines the room also associated with, in addition to the determined user, the another user.

[0122] For example, when, in the room-user association table **600** illustrated in FIG. **6**A, the user who has the changed user status is the father, the controller **305** determines the five rooms associated with at least the father and having the respective identification numbers "101", "102", "103", "201", and "202". Next, the controller **305** determines that the apparatus associated with any of those five rooms is to be controlled.

[0123] The room with the identification number "101" is associated with the three users who are the father, the mother, and the child. When at least anyone of those three users comes home, the controller **305** controls the apparatus associated with the room that has the identification number "101" to execute the predetermined process. The same is true of the rooms with the respective identification numbers "102" and "103".

[0124] According to this embodiment, the energy management system **1** can properly control the apparatus according to the individual circumstances of the user. The energy management system **1** can not only perform control for energy saving but also automatically controls the apparatus to operate as needed as desired by the user.

Third Embodiment

[0125] Next, a third embodiment is described. In each of the above embodiments, the controller **305** controls each apparatus and system based on the action schedule previously input by the user. In contrast, according to this embodiment, the controller **305** detects the presence or absence of the user, and controls each apparatus and system based on the detection result.

[0126] More specifically, the controller **305** determines whether each user is at home based on whether the terminal device **40** of each user is within the communication range of the home network **10**. Next, when the user status indicating whether the user is at home changes, the controller **305** controls the apparatus associated with this user to execute the predetermined process. The specific details of the process to be executed are optional.

[0127] The controller **305** determines whether the user is at home based on a terminal device-and-user association table **1100** in which the user is associated with the identification information of the terminal device **40** as illustrated in FIG. **11**, and based on the determination result on whether the terminal device **40** is communicable within the home network **10**.

[0128] According to this embodiment, the identification information of the terminal device **40** is a media access control (MAC) address. However, it is appropriate if the identification information is information that can identify the terminal device **40**, and the identification information may be a static IP address, a serial number, or a phone number in the case of a mobile phone.

[0129] The controller **305** transmits heartbeat signals to the terminal devices **40** of the respective users at a periodical timing. When there is a response to the transmitted heartbeat signal, the controller **305** determines that the terminal device **40** is present within the home, that is, the user associated with the terminal device **40** is at home. Next, the controller **305** sets, in the user status, a value indicating that the user is at home.

[0130] Conversely, when there is no response to the transmitted heartbeat signal, the controller **305** determines that the communication with the terminal device **40** is disconnected, and determines that the terminal device **40** is not present within the home, that is, the user associated with the terminal device **40** is out. Next, the controller **305** sets, in the user status, the value indicating that the user is out (not at home).

[0131] Next, the controller **305** controls the apparatus associated with the user whose user status has changed to execute the predetermined process.

[0132] A changed user status is typically a case in which the location of the determined user changes from the inside to the outside of the home, and a case in which the location of the determined user changes from the outside to the inside of the home.

[0133] When, for example, the user who is determined as being out is the father, the controller **305** acquires, from the room-user association table **600** illustrated in FIG. **6**A, the identification number "202" of the room associated with the father only. In addition, the controller **305** determines that, from the apparatus-room association table **500** illustrated in FIG. **5**A, the identification number of the apparatus to be controlled is "0008" (lighting device). Next, the controller **305** turns off the apparatus (lighting device) that has the determined identification number "0008".

[0134] When there are multiple determined users, the controller turns off the apparatus associated with all of the multiple determined users, and the apparatus associated with only a user among the multiple users.

[0135] According to this embodiment, the energy management system determines, based on whether the terminal device **40** of each user is within the communication range of the home network **10**, the presence or absence of the user, and can properly control the apparatus.

[0136] The present disclosure is not limited to the above embodiments, and various changes and modifications are applicable. In addition, the respective components of the above embodiments can be freely combined.

[0137] In each of the above embodiments, the user inputs the schedule beforehand, and the controller **120** determines whether the date and time set in the schedule arrives. However, instead of having the user input the schedule beforehand, the user may be allowed to instruct the execution of a control in each case. In this case, the controller **305** of the controller **120** may determine that the user has input a schedule which has the starting date and time that is “right now”, and which also has the ending date and time that is “not yet determined”, and may operate the process previously associated with the apparatus.

[0138] For example, the controller **305** displays a software button associated with the father on the display, and determines the apparatus associated with the father when this software button is depressed by the user, and operate the process previously associated with the apparatus. Hence, the controller can collectively control all of predetermined apparatus associated with the father to operate by a single input operation. The same is true of the mother and the child. A hardware button may be adopted instead of the software button.

[0139] The controller **305** may display a button associated with any user, determine the apparatus associated with the user indicated by the touched button, and operate the process previously associated with the apparatus.

[0140] For example, the controller **305** displays a button indicating “visitor” who is not a family member. In addition, a specific room (for example, the living room in FIG. **2**) is associated beforehand with the “visitor” in the room-user association table **600**. When the “visitor” button is depressed, the controller **305** determines that the room associated with the “visitor” is the “living room”, and controls the apparatus associated with the “living room” (the lighting device **104**A-**1**, the air conditioner **102**A, the TV **104**A-**2**, and the floor heating system **105** in FIG. **2**) to execute all together the respective processes assigned beforehand. According to this structure, the user can immediately run the multiple apparatuses through a single button operation.

[0141] A program that causes a computer to run as all of or a part of the above energy management system **1** may be distributed in a manner stored in a non-transitory computer-readable recording medium, such as a memory card, a CD-ROM, a DVD, or a magneto optical disk (MO), and may be installed in a separate computer to cause this computer to serve as the above means or to execute the above processes.

[0142] In addition, this program may be stored in a disk device or the like of a server device on the Internet, and may be downloaded to a computer in a manner, for example, superimposed on carrier waves.

[0143] As described above, each of the above embodiments enables the apparatus to be properly controlled according to the individual circumstances of a user.

[0144] The foregoing describes some example embodiments for explanatory purposes. Although the foregoing discussion has presented specific embodiments, persons skilled in the art will recognize that changes may be made in form and detail without departing from the broader spirit and scope of the invention. Accordingly, the specification and drawings are to be regarded in an illustrative rather than a restrictive sense. This detailed description, therefore, is not to be taken in a limiting sense, and the scope of the invention is defined only by the included claims, along with the full range of equivalents to which such claims are entitled.

[0145] This application claims the priority based on Japanese Patent Application No. 2013-105161, the entire contents of which are herein incorporated in this specification by reference.

REFERENCE SIGNS LIST

[0146] **1** Energy management system
[0147] **101** Autonomous switching board
[0148] **102** Air conditioner
[0149] **103** Ventilation system
[0150] **104** Household electrical appliance
[0151] **105** Floor heating system
[0152] **106** IH cooker
[0153] **107** Hot water supplying system
[0154] **108** Power generating system
[0155] **109** Electricity storage system
[0156] **110** Electric vehicle
[0157] **120** Controller
[0158] **301** Inputter
[0159] **302** Display
[0160] **303** Storage
[0161] **304** Communicator
[0162] **305** Controller
[0163] **400** Layout defining table
[0164] **500** Apparatus-room association table
[0165] **600** Room-user association table
[0166] **700** Schedule table
[0167] **900** Apparatus-room association table
[0168] **1000** Schedule table
[0169] **1100** Terminal device-and-user association table

1. A controller comprising:
a table storage configured to prestore an apparatus-room association table in which an apparatus installed in a home is associated with a room in the home, and to prestore a room-user association table in which a room in the home is associated with a user; and
an apparatus controller configured to control, when a user status that indicates whether the user is inside or outside the home changes, an apparatus corresponding to the user whose user status has changed, based on the apparatus-room association table and the room-user association table.

2. The controller according to claim **1**, wherein
the apparatus controller is configured to control the apparatus corresponding to the user
to execute a process corresponding to a movement of the user from the inside to the outside of the home when the user status changes from a status indicating that the user is inside the home to a status indicating that the user is outside the home.

3. The controller according to claim **1**, wherein
the apparatus controller is configured to control the apparatus corresponding to the user to execute a process corresponding to a movement of the user from the outside to the inside of the home when the user status changes from a status indicating that the user is outside the home to a status indicating that the user is inside the home.

4. The controller according to claim **1**, further comprising a schedule storage configured to store a schedule of the user inputted by the user,

wherein when a time specified by the schedule of the user arrives, the apparatus controller is configured to control the apparatus corresponding to the user, based on the apparatus-room association table and the room-user association table.

5. The controller according to claim **4**, wherein

the apparatus-room association table stores, in association with the apparatus, information that specifies a process to be executed when the time specified by the schedule of the user arrives; and

the apparatus controller is configured to execute the process specified in the apparatus-room association table.

6. The controller according to claim **5**, wherein

the schedule stored in the schedule storage specifies a starting time of the schedule and an ending time thereof; and

the apparatus controller is configured to control, when the starting time arrives, an apparatus corresponding to the user associated with the schedule having the arrived starting time, to execute the specified process, and when the ending time arrives, an apparatus corresponding to the user associated with the schedule having the arrived ending time, to execute the specified process.

7. The controller according to claim **6**, further comprising:

an input acceptor configured to accept, from the user, an input that indicates the schedule including the starting time and the ending time, and to accept, from the user, an input that specifies the process to be executed when the starting time or the ending time arrives; and

an updater configured to update the table storage and the schedule storage based on the input accepted by the input acceptor.

8. The controller according to claim **1**, further comprising:

an identification information storage configured to store the user and identification information of a terminal device of the user in association with each other; and

a communicator configured to wirelessly communicate with the terminal device,

wherein the apparatus controller is configured to control the apparatus corresponding to the user when a communication between the communicator and the terminal device is disconnected.

9. The controller according to claim **1**, wherein when there is a plurality of the users having the changed user status, the apparatus controller is configured to control the apparatus associated with all of the users having the changed user status and the apparatus associated with a single user among the user having the changed user status.

10. (canceled)

11. A controller comprising:

a table storage configured to prestore an apparatus-room association table in which an apparatus installed in a home is associated with a room in the home, and to prestore a room-user association table in which the room in the home is associated with a user; and

an apparatus controller configured to control, when a first user status indicating whether a first user is inside the home changes and a second user status indicating whether a second user is inside the home does not change, an apparatus corresponding to the first user and not corresponding to the second user, based on the room-user association table and the apparatus-room association table.

12. A control system comprising:

a table storage configured to prestore an apparatus-room association table in which an apparatus installed in a home is associated with a room in the home, and to prestore a room-user association table in which a room in the home is associated with a user; and

an apparatus controller configured to control, when a user status that indicates whether the user is inside the home changes, an apparatus corresponding to the user whose user status has changed, based on the apparatus-room association table and the room-user association table.

13. (canceled)

14. (canceled)

15. A control method comprising:

controlling, when a user status that indicates whether a user is inside or outside a home changes, an apparatus corresponding to the user whose user status has changed, based on an apparatus-room association table in which an apparatus installed in the home is associated with a room in the home, and a room-user association table in which a room in the home is associated with a user.

16. (canceled)

17. (canceled)

18. A non-transitory computer-readable recording medium storing a program, the program causing a computer to function as:

a table storage configured to prestore an apparatus-room association table in which an apparatus installed in a home is associated with a room in the home, and to prestore a room-user association table in which a room in the home is associated with a user; and

an apparatus controller configured to control, when a user status that indicates whether the user is inside the home, an apparatus corresponding to the user whose user status has changed, based on the apparatus-room association table and the room-user association table.

19. (canceled)

20. (canceled)

* * * * *