IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SAMSUNG ELECTRONICS CO., LTD. and
SAMSUNG ELECTRONICS AMERICA, INC.,
Petitioners,

v.

SNAPAID, LTD.
Patent Owner

U.S. PATENT NO. 11,252,325

Case IPR2025-TBD

PETITION FOR INTER PARTES REVIEW OF U.S. PATENT NO. 11,252,325

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1 Unless otherwise specified, citations are to the original page, column, and line numbers in exhibits, and all emphasis is added unless otherwise noted.

I. INTRODUCTION

Petitioners Samsung Electronics Co., Ltd. and Samsung Electronics America, Inc. (collectively, "Petitioner" or "Samsung") respectfully request *inter partes* review of claims 1-20 ("Challenged Claims") of U.S. Patent No. 11,252,325 ("the '325 Patent").

II. OVERVIEW OF CHALLENGE AND RELIEF REQUESTED

Petitioner requests cancellation of the Challenged Claims as unpatentable under 35 U.S.C. §103.

A. Prior Art Patents and Printed Publications

Petitioner's challenge is based on the following prior art references, which predate the earliest claimed priority date to which the '325 Patent is entitled:

1. U.S. Patent No. 8,508,622 ("Anon") (EX1004) was filed on January 18, 2011, issued on August 13, 2013, and is prior art under at least 35 U.S.C §§102(a)(1) and 102(a)(2), and, to the extent the '325 Patent is entitled to its earliest claimed priority date, pre-AIA 35 U.S.C. §102(e).

2. U.S. Pat. App. Pub. No. 2010/0149361 ("Takeuchi") (EX1005) was filed October 14, 2009, published June 17, 2010, and is prior art under at least 35 U.S.C §§102(a)(1) and 102(a)(2), and, to the extent the '325 Patent is entitled to its earliest claimed priority date, pre-AIA 35 U.S.C. §102(b).

3. U.S. Pat. App. Pub. No. 2004/0012682 ("Kosaka") (EX1006) was filed July 2, 2003, published January 22, 2004, and is prior art under at least 35 U.S.C §§102(a)(1) and 102(a)(2), and, to the extent the '325 Patent is entitled to its earliest claimed priority date, pre-AIA 35 U.S.C. §102(b).

4. U.S. Pat. App. Pub. 2010/0246939A1 ("Aisaka") (EX1007) was filed August 26, 2009 as a PCT application, published September 30, 2010, and is prior art under at least 35 U.S.C §§102(a)(1) and 102(a)(2), and, to the extent the '325 Patent is entitled to its earliest claimed priority date, at least pre-AIA 35 U.S.C. §102(b).

5. U.S. Pat. App. Pub. No. 2002/0110286 ("Cheatle") (EX1008) was filed January 9, 2002, published August 15, 2002, and is prior art under at least 35 U.S.C §§102(a)(1) and 102(a)(2), and, to the extent the '325 Patent is entitled to its earliest claimed priority date, pre-AIA 35 U.S.C. §102(b).

6. U.S. Pat. App. Pub. 2009/0296989 ("Ramesh") (EX1009) was filed May 28, 2009, published December 3, 2009, and is prior art under at least 35 U.S.C §§102(a)(1) and 102(a)(2), and, to the extent the '325 Patent is entitled to its earliest claimed priority date, pre-AIA 35 U.S.C. §102(b).

7. U.S. Pat. App. Pub. 2012/0201427A1 ("Jasinski") (EX1010) was filed February 4, 2011, published August 9, 2012, and is prior art under at least 35 U.S.C

§§102(a)(1) and 102(a)(2), and, to the extent the '325 Patent is entitled to its earliest claimed priority date, at least pre-AIA 35 U.S.C. §102(a) and (e).

8. U.S. Patent No. 8,009,198 ("Alhadef") (EX1011) was filed on April 22, 2004 as a PCT application, issued on August 30, 2011, and is prior art under at least 35 U.S.C §§102(a)(1) and 102(a)(2), and, to the extent the '325 Patent is entitled to its earliest claimed priority date, pre-AIA 35 U.S.C. §102(b).

9. U.S. Pat. App. Pub. 2012/0105662A1 ("Staudacher") (EX1012) was filed October 29, 2010, published May 3, 2012, and is prior art under at least 35 U.S.C §§102(a)(1) and 102(a)(2), and, to the extent the '325 Patent is entitled to its earliest claimed priority date, at least pre-AIA 35 U.S.C. §102(a) and (e).

10. Hector Garcia-Molina *et al.*, "DATABASE SYSTEMS The Complete Book," 2009 ("Garcia-Molina") (EX1013), is a textbook published in 2009 on database design and is prior art under at least 35 U.S.C §102(a)(1), and to the extent the '325 Patent is entitled to its earliest claimed priority date, pre-AIA 35 U.S.C. §102(b).

B. Relief Requested

The grounds of the challenge are set forth below and supported by the declaration of Dr. Dan Schonfeld. (EX1003).

Ground	Claims	Proposed Statutory Rejection Under 35 U.S.C. §103
1A	1-4, 7-10	Anon, Takeuchi, Kosaka, Aisaka, Jasinski, and Garcia-Molina
1B	11, 14-17, 20	Anon, Takeuchi, Aisaka, Jasinski, and Cheatle
1C	5	Anon, Takeuchi, Kosaka, Jasinski, Aisaka, Garcia-Molina and Cheatle
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III. THE ’325 PATENT

A. Specification

The ’325 Patent, titled “Real Time Assessment of Picture Quality,” was filed as U.S. Patent Application No. 17/189,587 on March 2, 2021. The ’325 Patent describes a method and system for real-time assessment of picture quality in camera devices. EX1001, Abstract. Multiple sensors (*e.g.,* accelerometers, lens modules) are used to determine a plurality of quality indicators (QIs) for the images. *Id.,* 2:20-42. The “total” quality of captured images is evaluated by combining various quality indicators (QIs), as shown below in Figure 4.

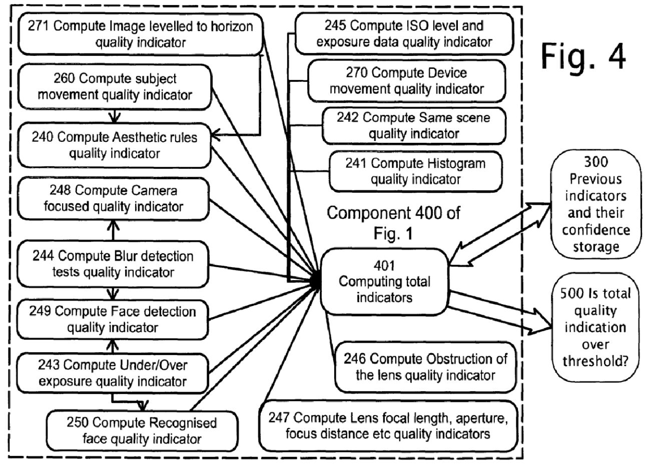


Fig. 4

The system provides real-time suggestions to users for improving photo quality based on the quality indicators. *Id.,* 3:24-29.

The '325 Patent admits the "[p]rior art has used certain independent quality indicators" and "quantif[ed] the quality by means of a total quality indicator." EX1001, 2:43-63. The '325 Patent purports to distinguish the prior art by asserting that "the weight of one indicator will take into account data from other quality indicators." *Id.,* 2:63-3:1. But that feature is not found in the majority of Challenged Claims, and, regardless, it was known in the prior art. *See* Section VI.A.4, below.

B. Priority Date

The '325 Patent claims priority to Provisional Application No. 61/717,216, filed on October 23, 2012, and Provisional Application No. 61/759,643, filed February 1, 2013. Neither provisional provides support for all limitations of any Challenged Claim. *Studiengesellschaft Kohle, M.B.H. v. Shell Oil Co.*, 112 F.3d 1561, 1564 (Fed. Cir. 1997) ("35 U.S.C. § 120 requires an applicant to meet the disclosure requirement of § 112, ¶1 in a single parent application in order to obtain an earlier filing date for individual claims.”). For example, neither provisional discloses “at least one appropriate suggestion from a pre-stored table of suggestions,” which is required by claim 1 or “analyzing the captured image via deep learning algorithms for detecting or recognizing one or more objects in, or one or more characteristics of the image or at least one of object characteristics to obtain a third value (QI3) associated with the analysis” as required by independent claim 11. Therefore, the ’325 Patent is not entitled to either the October 23, 2012, or February 1, 2013, priority date. *See* 35 U.S.C. § 119(e), 37 CFR § 1.78(a)(3)-(4); *see also Droplets, Inc. v. E*TRADE Bank*, 887 F.3d 1309, 1316 (Fed. Cir. 2018).

C. Prosecution History

The prosecution of the ’325 Patent was cursory. There was no substantive discussion of any prior art reference, and no claims were rejected over prior art. The Examiner’s Reasons for Allowance merely indicates that the prior art fails to teach the whole of claim 1 and is silent regarding independent claim 11. EX1014, 27.

D. Person of Ordinary Skill in the Art

As Dr. Schonfeld explains in his declaration, (EX1003), a POSA at the time of the ’325 Patent would have had at least a bachelor’s degree in electrical engineering, computer science, or a related field, and at least two years of experience with image processing and analysis. Individuals with different education and additional experience could still be of ordinary skill in the art if that additional experience compensates for a deficit in their education and experience. (EX1003, ¶¶50-52).

IV. CLAIM CONSTRUCTION

Claims in an IPR are construed under *Phillips v. AWH Corp*., 415 F.3d 1303 (Fed. Cir. 2005). For purposes of this proceeding only, terms in the Challenged Claims need not be construed. If PO raises claim construction arguments, Petitioner reserves the right to respond.

V. OVERVIEW OF THE PRIOR ART

A. Anon

Anon discloses "[a]n image capturing device" that can "determine a plurality of image-based characteristics for a proposed image," including "a likely quality of a composition and/or recommendations for improvement usable while the image or video is being taken." EX1004, Abstract, 2:64–3:1. Anon "compute[s] a composition measure for the proposed image" from the plurality of image-based characteristics, which is used to "provide suggestions for altering at least one characteristic of the proposed image." EX1004, 1:59-2:8. Anon explains that "the photographer is provided with real time feedback as to composition and recommendations, or can be provided with such feedback after the fact." *Id.,* 3:22–

26. Anon's system, which incorporates a "composition and feedback engine 300," is illustrated below:

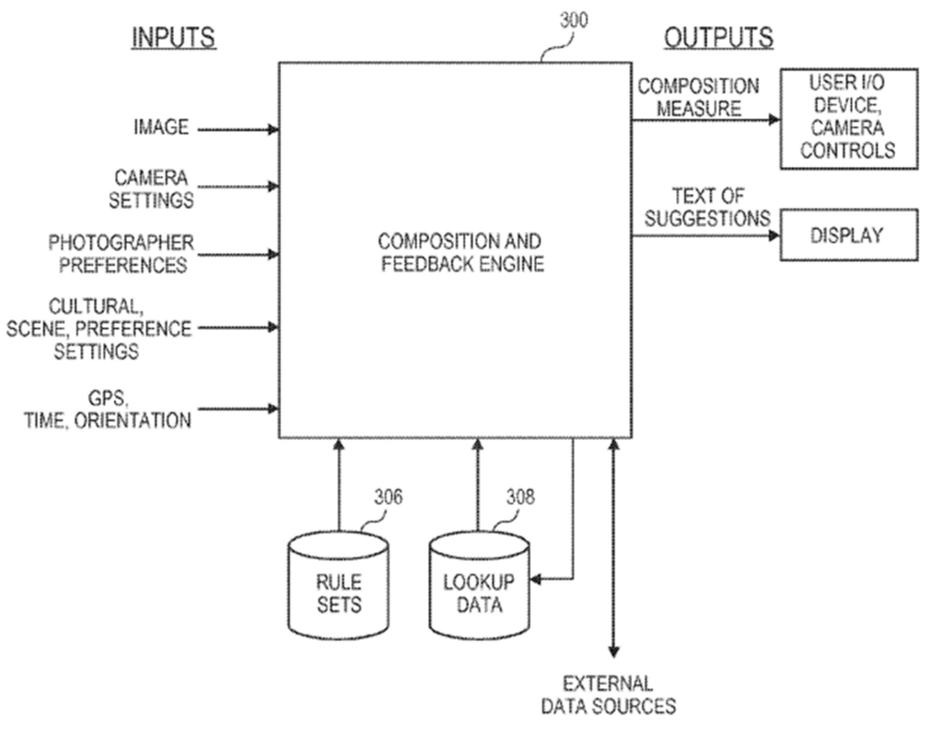


FIG. 3

Id., 6:32-41, Fig. 3. The composition and feedback engine ("CFE") performs its evaluation and computation of a composition measure using a "weighted, combination of parameters." *Id.,* 8:32-35; *see also id.,* 6:42-45. Anon's CFE makes use of inputs from the image capturing device, such as the image itself, device settings, and metadata, combines it with rule sets 306 and lookup data 308, and outputs recommendations to improve image quality. *Id.,* 7:4-21.

B. Takeuchi

Takeuchi relates to an "image evaluation apparatus and camera which are capable of evaluating an image which is comprehensively good." EX1005, Abstract, ¶[0006]. Like Anon, Takeuchi's system provides a comprehensive evaluation of image quality, including, for example, explicit detection and quantification of overexposure and underexposure, and offers feedback or correction suggestions to the user. *See e.g., id.,* ¶¶[0147], [0290]. Takeuchi also teaches using a "total evaluation result" for an image using a weighted combination of different quality evaluation methods. *Id*., ¶[0269].

C. Aisaka

Aisaka discloses an image processing apparatus that evaluates and selects images based on the sharpness and acceptability of the subject, utilizing a subject extraction process that combines multiple feature maps—such as luminance, color, edge, face, and motion information—into a subject map through weighted addition. The apparatus employs deep learning, specifically "neural-network-based learning," to determine the optimal weights for generating the subject map, thereby enabling more reliable subject detection across diverse images. As described, "the weight being used to generate a subject map for specifying a region of a subject on an image" is learned by "extracting a feature value of a feature of the region of the subject from a learning image that includes the subject and that is used for the learning, and generating an information map representing the feature value in each region of the learning image." EX1007, ¶¶[0014], [0020].

The process involves "performing weighted addition of, using the weight, the plurality of information maps representing the feature value of the feature, which are different from each other," and "calculating an amount of change by which the weight is to be changed using the subject map and an image label that is determined in advance and that represents the region of the subject in the learning image; and updating means for adding the amount of change to the weight and updating the weight." *Id.,* ¶¶[0014], [0021], [0022].

VI. SPECIFIC GROUNDS FOR PETITION UNDER 37 C.F.R. § 42.104(B)

A. Ground 1A: Claims 1-4 and 7-10 are Obvious in View of Anon, Takeuchi, Kosaka, Aisaka, Jasinski, and Garcia-Molina

1. Independent Claim 1

i. *[1.pre.]*

To the extent that the preamble is limiting, Anon discloses a method for estimating image quality of at least one image from a stream of images. Anon explains that, "unless otherwise indicated, what is explained about a photographer using a camera to capture a photograph can equally apply, unless otherwise indicated, to a videographer using a video camera to capture a video sequence…." EX1004, 3:2-10. Anon analyzes multiple image-based characteristics, computing a composition measure, and providing real-time suggestions to the user. *See id.*, 2:9-14, 2:16-28, 2:33-38, 3:14-26.

Anon describes "[a]n image capturing device includ[ing] an image sensing device, a processor, and a memory." *Id.,* Abstract, 1:59-2:8. Anon explains that "light passing through **lens 102** impinges on **CCD 104** to form a digital, electronically readable image" (*Id.,* 5:54-56) and "Camera 100 is equipped with a processor 106 ... and a composition and feedback engine ('engine') 108 (5:56-59). A POSA would have understood this to mean that the device comprises at least one optical lens for focusing received light from a scene and an image sensor (e.g., CCD) coupled to the lens for capturing an image of the scene.

Anon discloses that the device is a single, integrated unit, explaining that "[i]n a typical operation, the photographer uses a device that is either a camera (e.g., point-and-shoot, DSLR, SLR) or a multi-purpose device that includes a camera (such as a mobile telephone with a camera)" and that "[t]he photographer uses a device ... to stage a shot ... and then capturing the image." EX1004, 3:14-20. A POSA would have understood from this that the camera components are housed within a single enclosure, as is standard for digital cameras and camera-equipped mobile devices. Anon's exemplary camera is a digital camera. *See e.g., id.*, Fig. 1, 3:11-14.

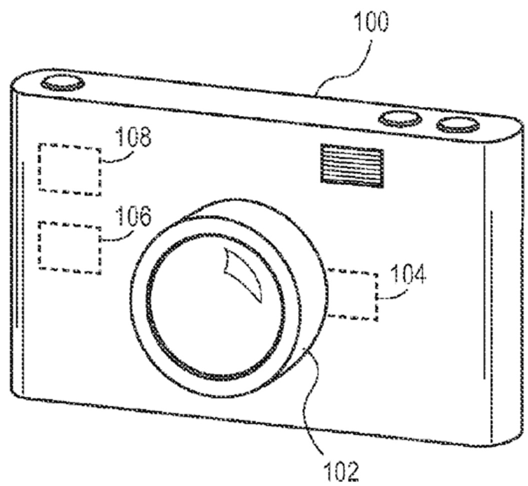


FIG. 1

Anon explains that "[c]amera-specific external inputs might include the camera's current geographic location, time of day, orientation and the like," *id*., 4:24-33, and expressly discloses the use of motion sensors such as an "accelerometer for orientation." *Id.*, 4:28-31; *see also id.,* 7:4-7. Anon also teaches a "motion sensor that can provide the engine with inputs as to how the camera is moving." *Id.*, 10:27–46, 2:64–3:10.

Anon describes a CFE which is coupled to the image sensor, CCD 104, and other camera components. *Id.*, 5:62-64. Anon further explains that the CFE "could be implemented as … software elements executed on **a processor** …." *Id.*, 6:34-41. Anon's Figure 3, below, shows that the engine has various inputs including an image, camera settings, and GPS, time, and orientation inputs, illustrating that as implemented on a processor, e.g., processor 106, that processor is coupled to at least one image sensor and to the digital camera for receiving data therefrom. *Id.*, 3:53-

60, cl. 9 ("a processor, coupled to the image sensor"). A POSA would have understood that, to receive an image as an input, the engine comprises a processor coupled to the image sensor and the camera itself and that it performs a method comprising use of at least one value and weight as outlined below. EX1003, ¶59. Anon also contemplates post-capture processing of a stream of images, explaining that, "[a]s post-processing, the engine might provide a filter to provide suggestions for images from a large body of images that are the more aesthetic images." EX1004*,* 10:1-20.

ii. *[1.a]*

Anon discloses that inputs to CFE 300 include the image itself, camera settings, photographer preferences, cultural preferences, scene preferences, as well as ***location***, time, and ***orientation*** inputs. EX1004, Fig. 3, 4:24-34, 7:4-29. Anon explains that "parameters from the camera may be used to make the judgment, such as the orientation of the camera, where the camera is focused-upon, where within the scene is a face recognized, and the like," (*id.*, 8:28-31), and that "[c]amera-specific external inputs might include the camera's current geographic location, time of day, orientation and the like." *See id.,* 4:24-26. For example, Anon explains that "if the engine is aware of the camera location and has access to a data set of rules (e.g., 'when located at the GPS coordinates of the front of Cinderella's Castle™ in Disneyland, suggest centering on the castle rather than rule of thirds')." *Id.*, 5:3-7. A

POSA would have understood that GPS coordinates constitute a value—e.g., longitude and latitude coordinates—which is the claimed "first value (Q1)." Anon also discusses the use of motion sensors "that can provide the engine with inputs as to how the camera is moving," *id.,* 10:26-35, which a POSA would also understand constitute a value. Anon explains, for example, that "it might be a preference when a subject is moving quickly in a scene to frame more of the scene in front of the subject than in back of the subject and this could be suggested by the engine to a videographer." *Id.,* 10:31-35.

iii. *[1.b]*

Anon's engine "estimat[es] a first weight (c1) associated with the first value" as claimed. Anon's engine determines a plurality of image-based characteristics for a proposed image, and then "compute[s] a composition measure for the proposed image and the given settings that depends from at least two of the plurality of image-based characteristics of the proposed image." *See* EX1004, 1:64-67. Anon's engine takes into account both intrinsic image characteristics (such as color, focus, brightness, and energy) and external characteristics (such as geographic location, time of day, user preferences, and cultural rules), and indicates that "[a] typical composition and feedback engine, according to embodiments of the present invention, will consider more than one independent value for some characteristic of an image and provide recommendations that might not be optimal for one characteristic versus another characteristic." EX1004, 5:26-30. This would have indicated to a POSA that the system weighs different characteristics, sometimes even trading off optimality in one for a better overall composition measure. EX1003, ¶64.

Anon also expressly discloses assigning a weight to each of the inputs into the CFE: "In various embodiments, these parameters may be input into a fuzzy logic set, or the like, and an evaluation, ***e.g. weighted, combination of parameters*** may be performed by the composition and feedback engine." EX1004, 8:32-35. Based on these teachings, a POSA would have understood that location and motion are variables that would be weighed in Anon's CFE based on Anon's express disclosure that motion is a characteristic "optimized" by the CFE. EX1004, 10:27-46; EX1003, ¶65. Thus, a POSA would understand that Anon's engine "estimat[es] a first weight (c1) associated with the first value" as claimed.

To the extent PO contends that "estimating" should be narrowly construed to require a real-time, context-dependent determination of the claimed "weight," Anon discloses this. Anon expressly teaches that an input into the CFE (e.g., object detection, location, and characteristics) influences the determination of the ***weights*** attached to other characteristics. EX1004, 3:53-4:3 ("This input can be used to influence how various characteristics are weighted").

To the extent that Anon is argued to not disclose dynamic estimation of weights, Jasinski remedies any deficiency. For each new set of images, Jasinski describes computing weights for each image region dynamically, based on the current image data. See, e.g., EX1010, ¶¶[0120]-[0122]. These weights are recalculated for every image or sequence, enabling the system to adapt instantly to changing scene conditions. *Id.*, ¶¶[0119]-[0122]. As Jasinski explains: "[t]he weighting coefficients w_i can be determined using any method known in the art. In a preferred embodiment, the weighting coefficients w_i are determined to be representative of the estimated relative importance of the image regions to a user." *Id.*, ¶[0120]. Jasinski discloses attributes that can be considered in the determination of the relative importance, *id.,* ¶[0120], including:

- Image detail: "image regions 365 with high levels of image detail can be weighted more highly," *id.*, ¶[0121].
- Scene brightness: "local scene brightness level can also be an indication of the suitability of an image region... the choice of image regions with a higher local brightness level avoids areas where low signal-to-noise can interfere with the calculation of accurate motion velocities," *id.*, ¶[0114]
- Region position or presence of important features: "image regions 365 in a face zone or an autofocus zone can be weighted more heavily than other image regions 365 because they are more likely to be a main subject.," *id.*, ¶[0120]

- Confidence in the measurement: "the shape of the fitting function 475 can provide an indication of the relative confidence level," *id.*, ¶[0122]

Jasinski's dynamic weighting is not limited to motion estimation, but can be more broadly applied to determining image capture settings. *See id.*, ¶[0031].

A POSA would have understood that using dynamic estimation of weights (as taught by Jasinski) as part of a weighted combination of parameters (as taught by Anon) would allow for accounting of changes in the reliability, relevance, and importance of parameters over different regions of the image or over time. EX1003, ¶67. A POSA would have appreciated that dynamically weighting Anon's composition inputs as taught by Jasinski would have allowed the system to adapt to the most current and relevant scene conditions, thereby providing a more accurate assessment of quality. Jasinski's region-based weighting fits naturally with Anon's teaching that object and region detection influences the weights of other quality characteristics. This combination of Anon and Jasinski is the use of a known technique (Jasinski's dynamic weights) to improve similar devices in the same way. For these reasons, a POSA would have been motivated to combine the complementary teachings of Anon and Jasinski with a reasonable expectation of success. EX1003, ¶67.

iv. [1.c]

Anon does not expressly disclose obtaining a measurement value indicating whether an image is under or over exposed. Takeuchi, however, explicitly uses exposure information in its image quality evaluation. The system computes luminance information and exposure values. *See* EX1005, ¶¶[0084], [0090], [0137]. Takeuchi explains that the evaluation includes checks for underexposure (blackout) and overexposure (whiteout), both for the main subject (*i.e.*, at least a part of the image) and the overall image. Points are added or subtracted from the image quality score based on whether the exposure is within a preferred range. *See id.,* ¶[0147].

Furthermore, Takeuchi's describes evaluating exposure specifically at the position of the main subject, including a person's face, explaining that "[t]he body side microcomputer 21 judges whether there is underexposure (blackout) or overexposure (whiteout) at the position of the main subject ***estimated to be a face***." *Id.* This demonstrates that Takeuchi's system measures and evaluates under or over exposure specifically for face exposure.

Both Anon and Takeuchi are directed to the problem of evaluating and improving the quality of digital images, albeit with different emphases. Takeuchi's system provides a comprehensive evaluation of image quality, including explicit detection and quantification of overexposure and underexposure, and offers feedback or correction suggestions to the user. *See e.g.,* EX1005, ¶¶[0147], [0290].

Anon's system, on the other hand, is focused on real-time feedback regarding image composition and overall quality, using a variety of image-based characteristics (such as color, focus, brightness, and energy) to compute a "composition measure". *See* EX1004, 1:59-2:8.

A POSA would have recognized that exposure quality—specifically, the presence of overexposed or underexposed regions—is a fundamental aspect of overall image quality. Poor exposure can result in loss of detail, which directly impacts the aesthetic and technical value of a photograph. Anon's system is designed to provide feedback and suggestions to improve image quality, and explicitly contemplates using multiple image-based characteristics, including brightness, as part of its composition measure. *Id.,* 2:9-15. A POSA would have been motivated to combine Takeuchi's exposure determination with Anon's composition feedback system for several reasons (EX1003, ¶70):

- Anon's system seeks to provide a holistic evaluation of image quality, and Takeuchi's exposure analysis offers a robust, quantitative method for detecting and scoring exposure problems. Integrating this would have filled a clear need in Anon's framework for a reliable exposure input.
- Anon's teaches that different types of characteristics can be used to judge an image with its system. EX1004, 8:14–35, 10:47-50 ("what

characteristics are used to determine what is a 'good' image are very flexible and can be enhanced or changed completely over time").

• Both systems are designed to provide actionable feedback to the user. Takeuchi's system not only detects exposure issues but also suggests corrections (EX1005, ¶[0290]), which aligns with Anon's goal of providing real-time suggestions to improve image quality. See EX1004, 3:22-26.

• It was well-established in the field of digital imaging that exposure is a key determinant of image quality. A POSA would have been aware of many prior art systems which analyze exposure as part of their quality assessment. Thus, a POSA would have naturally considered exposure analysis as a potential input for any comprehensive image quality or composition evaluation system. EX1003, ¶70.

A POSA would have a reasonable expectation of success in implementing Takeuchi's exposure determination as an input to Anon's system for several reasons (EX1003, ¶71):

• Takeuchi's exposure evaluation produces quantitative results (*e.g.,* scores or flags for overexposure/underexposure) that are readily usable as input features in Anon's composition measure, which is designed to aggregate multiple image-based characteristics. EX1005, ¶[0147].

• Both references describe modular systems where different evaluation units (*e.g.,* for exposure, focus, color, etc.) contribute to an overall image score or feedback mechanism. Integrating an additional input such as exposure would have been a straightforward extension of Anon. EX1003, ¶71.

v. *[1.d]*

Anon's engine "estimat[es] a second weight (c2) associated with the second value" as claimed. As discussed above in *supra* Section VI.A.1.iii, Anon expressly discloses, or with Jasinski renders obvious, estimating and assigning weights to each of Anon's quality-indicator inputs. Based on the teachings of Anon and Takeuchi discussed in the previous section—*supra* Section VI.A.1.iv—a POSA would have understood that this "weighted, combination of parameters," EX1004, 8:32-35, would include assigning a weight to the exposure measure of Takeuchi—QI2—in combination with Anon. EX1003, ¶72.

vi. *[1.e]*

Anon explicitly contemplates the detection and recognition of faces within the image:

> Other inputs might include an indication of where in the image the subject is (e.g., ***find faces and draw a rectangle around the most prominent face in the image***, …). This input can be used to influence how various characteristics are weighted.

EX1004, 3:62-4:3. A POSA would have understood this passage to mean that Anon detects and recognizes faces within the image.

Takeuchi also makes extensive use of face detection as part of its image quality evaluation process. For example, Takeuchi's system detects the position of what is estimated to be a person's face within an image. *See* EX1005, ¶[0115]. This is achieved using a database of pattern images with common facial features and applying pattern matching to the image data. When a region matches a face pattern, it is estimated to be a face, and this information is used for main subject estimation. During the main subject estimation, "the body side microcomputer 21 segments the picture of the target image into a plurality of blocks and compares this image with the face detection region information obtained in Step S103 for the image in question. Then, the body side microcomputer 21 adds a predetermined number of points to the region where a face image is detected." *Id.,* ¶[0134]. According to Takuechi, in the main subject estimation computation, the contribution of each item "may be adjusted by appropriately setting the size of the number of points to be added for each item." *Id.,* ¶[0136].

Furthermore, both Anon and Takeuchi calculate properties of a face by determining movement and/or exposure of detected objects such as faces. Takeuchi describes evaluating movement by calculating motion vectors and analyzing changes over time: "the body side microcomputer 21 detects the correlation value between the image information of the previous acquisition, and the image information of the current acquisition, for the image information acquired at a frame rate... [and] acquires the motion vector of the subject for each block," and further, "[t]he body side microcomputer 21 … calculates a speed change rate (relative movement state) of the main subject between the frames." *Id.,* ¶¶[0113] and [0162]. For exposure, Takeuchi states, "the microcomputer 29 carries out the exposure computations considering the luminance of the main subject together with the luminance information calculated in Step S302, using the location of the main subject sought in Step S305." *Id.,* ¶[0309].

Similarly, Anon refers to using camera parameters and image analysis to judge exposure, such as "parameters from the camera may be used to make the judgment, such as the orientation of the camera, where the camera is focused-upon, where within the scene is a face recognized, and the like," and explains that the system may judge a "good" image as one where the subject (*e.g.,* a person) is in focus, the subject's eyes are open, and the subject is not obscured by background objects. *See* EX1004*,* 8:19-23 ("if a photographer is taking a picture of a person in front of an object, such as the Eiffel Tower, a 'good' shot is typically judged when the Eiffel Tower is positioned to not be directly behind the subject's head"). Anon also discusses movement in the context of video: "the video camera might include a motion sensor that can provide the engine with inputs as to how the camera is moving

... it might be a preference when a subject is moving quickly in a scene to frame more of the scene in front of the subject than in back of the subject and this could be suggested by the engine to a videographer." EX1004, 8:28-31, 10:27-35. Thus, both references calculate exposure of a face or movement of a subject to obtain a value.

It would have been obvious to a POSA to calculate the exposure of a face (main subject) or the movement of the subject to obtain a value—the claimed "(QI3)"—for input into Anon's CFE because both parameters are well-established indicators of image quality and are explicitly discussed as relevant factors in both Anon and Takeuchi. Anon describes that "parameters from the camera may be used to make the judgment, such as the orientation of the camera, where the camera is focused-upon, where within the scene is a face recognized, and the like," and further explains that "the characteristics that are used to judge a properly composed image often depend upon the type of image that is sought to be captured," specifically referencing "the subject's eyes are open, and the energy of the light, color, lines, and subject's position are in a middle range (so the image is not flat and boring or overwhelmingly detailed)." *Id.*, 8:15-31.

Takeuchi similarly teaches that the system "carries out the exposure computation taking into account the luminance of the main subject" and "calculates a speed change rate (relative movement state) of the main subject between the frames." *See* EX1005, ¶¶[0137] and [0162]. Given that Anon's CFE is designed to compute a composition measure based on "at least two of the plurality of image-based characteristics of the proposed image," it would have been routine and obvious for a POSA to use the exposure or movement of a detected face or main subject as input values, since these are directly tied to the perceived quality and usability of the resulting image. EX1003, ¶77. Given the established nature of these techniques and their direct relevance to image quality, a POSA would have reasonably expected that incorporating these values into Anon's CFE would function as intended and yield predictable, beneficial results. EX1003, ¶77.

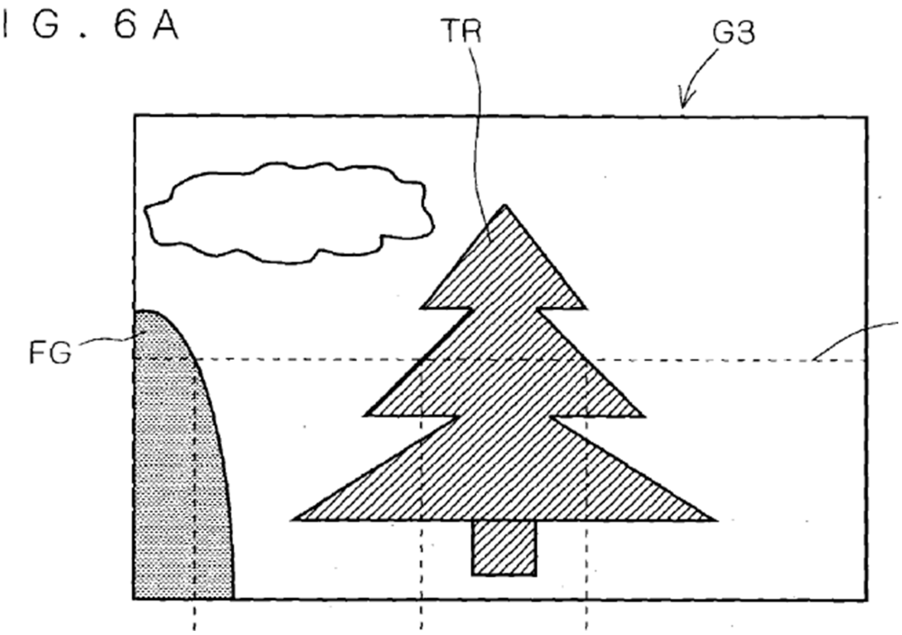
vii. *[1.f]*

Anon's engine "estimat[es] a third weight (c3) associated with the third value" as claimed. As discussed above in *supra* Section VI.A.1.iii, Anon expressly discloses, or with Jasinski renders obvious, estimating and assigning weights to each of Anon's quality-indicator inputs. Based on the teachings of Anon and Takeuchi discussed in the previous section—*supra* Section VI.A.1.vi—a POSA would have understood that this "weighted, combination of parameters," EX1004, 8:32-35, would include assigning a weight to apply to the third value QI3 (*e.g.*, the value related to face detection, exposure, movement analysis). EX1003, ¶78.

viii. *[1.g]*

Anon does not expressly teach obtaining a value responsive to obstruction of at least one optical lens. Kosaka, however, discloses a digital camera system that is designed to detect whether a user's finger is unintentionally obstructing the lens before an image is captured. *See e.g.*, EX1006, Fig. 6A.

FIG. 6A



The system operates by analyzing a series of live view images (or images for autofocus) in real time, prior to the actual image capture. The determination part of the camera examines changes over time in the position of low-brightness areas within these images. If a low-brightness area remains stationary while other areas shift due to camera shake or reframing, the system identifies this stationary area—especially if it is located at the periphery of the image—as a potential finger obstruction (*i.e.,* a lens obstruction). *See, e.g.*, EX1006, Figs. 4A–8, ¶¶[0074], [0075].

Kosaka further explains that the camera can notify the user of such an obstruction before the image is taken, allowing the user to correct the issue and avoid capturing an image with a finger or other object blocking the lens. In some embodiments, the system can even generate a corrected image by deleting the obstructed area or prevent the image from being recorded if an obstruction is detected. *See id.,* Figs. 9–10, 23–25, ¶[0089] ("Examples of the notifying operation are, concretely, indication of a note by characters of 'Note: finger is in' on the display 7 or a predetermined figure and output of sound of a note from a speaker or voice").

According to Kosaka, the system analyzes the brightness (luminance) of pixels along a line or within an area of the image. A "low-brightness area" is defined as a region where the pixel value is lower than a predetermined threshold (referred to as "TH1" by Kosaka). For example, in the description of FIG. 4B, the system identifies areas where the brightness is below threshold TH1 as potential obstructions (such as a finger or a tree). *Id.,* ¶[0069].

Anon, Takeuchi, and Kosaka are each concerned with improving the quality of captured images and automating the process of identifying and selecting "good" photographs. Kosaka's finger obstruction detection is a well-defined image defect that directly impacts perceived image quality. Anon's system is designed to accept a wide range of image-based characteristics as inputs to its quality/composition measure, and Takeuchi's system provides a subject-aware (i.e., object detection) evaluation. These approaches are complementary: Kosaka detects a specific, common image flaw; Takeuchi provides a robust technical and subject-aware score;

and Anon offers a flexible, extensible framework for integrating such inputs into a comprehensive quality assessment. EX1003, ¶80.

A POSA would have been motivated to use Kosaka's finger obstruction determination—the claimed "(QI4)"—as an input to Anon's CFE, especially in combination with Takeuchi, for several reasons. EX1003, ¶81. Kosaka teaches that finger obstruction is a significant and common cause of poor image quality, especially in small digital cameras. See EX1006, ¶¶[0006], [0007]. Anon's system is designed to identify images with technical or compositional flaws and integrating a finger obstruction detection signal from Kosaka would allow Anon's system to recommend to users to correct this defect, improving the quality of images.

A POSA would have had a reasonable expectation of success in implementing this combination for several reasons. First, Anon's system is designed to accept and combine multiple, diverse image-based inputs using weighted combinations. Kosaka's output is simply another input to be weighted alongside other quality factors (focus, exposure, subject detection, etc.). Both Anon and Takeuchi discuss combining multiple evaluation metrics to arrive at a final quality score. The addition of Kosaka's finger obstruction detection would have been a straightforward extension of this approach, and would have been expected to yield predictable, desirable results (*i.e.*, making recommendations to a user how to improve an image). EX1003, ¶82.

ix. *[1.h]*

Anon's engine "estimat[es] a forth weight (c4) associated with the forth value" as claimed. As discussed above in *supra* Section VI.A.1.iii*,* Anon expressly discloses, or with Jasinski renders obvious, estimating and assigning weights to each of Anon's quality-indicator inputs. Based on the above teachings of Anon, Takeuchi, and Kosaka, *supra* Section VI.A.1.viii, a POSA would have understood that this "weighted, combination of parameters," EX1004, 8:32-35, would include assigning a weight to apply to the value—QI4—responsive to obstruction of the optical lens. EX1003, ¶83.

x. *[1.i]*

Anon discloses the potential use of neural networks or fuzzy logic for evaluating image aesthetics based on training sets, but does not specifically describe the use of deep learning algorithms for object detection or recognition in the captured image. Takeuchi's methods are based on pattern matching, statistical analysis, and rule-based or user-driven learning, but Takuchi does not expressly teach analyzing the captured image via deep learning algorithms.

Aisaka, however, teaches calculating, based on an artificial neural network employing deep learning algorithm, at least one of device motion, exposure/focus of an image, face/object recognition, and obstruction of the lens or the weights of these quality indicators: "These difference weights Wa, information weights Wb, and subject weight Wc used at the time of the generation of a subject map are determined using, for example, neural-network-based learning." EX1007, ¶[0269]. The weights discussed are used in a hierarchical, weighted combination process to generate information maps and ultimately a subject map. Aisaka teaches that "difference images obtained from pyramid images of these extracted pieces of information are subjected to weighted addition with difference weights Wa to produce information maps, and these information maps are subjected to weighted addition with information weights Wb." *Id.*, ¶[0268]. The information maps include "luminance," "color," "edge," "face," and "motion" information, which a POSA would have understood correspond to exposure/focus, face/object recognition, and device motion, and the neural-network-based learning is used to calculate the weights and, by extension, the quality indicators themselves. EX1003, ¶85.

A POSA would have been motivated to modify the combination of Anon and Takeuchi to analyze a captured image via deep learning algorithms for object or characteristic recognition because both references emphasize the importance of accurately identifying subjects and evaluating image quality based on subject features. EX1003, ¶86. As discussed above in Sections VI.A.1.ii, iv, and vi, Anon describes a system that provides composition feedback by analyzing image-based characteristics and external context, and Takeuchi details methods for estimating subject position and evaluating images using multiple features such as motion vectors, face detection, and color distribution. Integrating deep learning algorithms would have been a logical improvement, as these algorithms were well-known for their performance in object detection and feature extraction, enabling more robust and adaptable subject recognition and image evaluation—capabilities directly aligned with the goals of both Anon and Takeuchi. EX1003, ¶86.

A POSA would have had a reasonable expectation of success in making this modification because deep learning-based object recognition was already established in the art as an effective and reliable technique for analyzing image content, and both Anon and Takeuchi provide modular, feature-based frameworks readily adaptable to incorporate such advanced algorithms. EX1003, ¶86.

xi. *[1.j]*

As discussed above in Section VI.A.1.ii, Anon describes a camera system that evaluates a plurality of image-based characteristics to compute a composition measure for a proposed image. Further, the combination of Anon, Takeuchi, and Kosaka would have suggested the use of a pre-stored table (or database) of suggestions or rules for improving image quality in several ways. Anon explains that the engine "output[s] an indication of the composition measure to a user, in the form of simple indicators, more complex indicators/displays, and/or ***provide suggestions for altering at least one characteristic of the proposed image***." EX1004, Abstract; *see also id.*, 1:59-2:4. To determine suggestions that should be made, Anon discloses using rule sets 306, which are data structures that contain user suggestions for improving photographs. As Anon explains, the engine "can also take into account rule sets stored in rule set storage 306 and lookup data stored in lookup data storage 308. Examples of rules are used throughout this disclosure, and it should be understood that engine 300 operates on data structures that represent those rules, possibly in combination with lookup data 308 that may be relevant to a particular rule." EX1004, 7:15-24. Anon goes on to provide the following example: "a rule in rule set storage 306 might indicate that for landscape images of large bodies of water, adjust the camera settings so that a pleasing amount of light would come from the water relative to the sky, and another rule in ***rule set storage 306 might indicate that when standing close to a famous monument, suggest to the photographer where good viewing locations are***, and the lookup data 308 might include data for some commonly widely photographed monuments." *Id.*, 7:21-29; *see also id.*, 7:44-50.

Anon does not specifically disclose that its rules are organized as "tables," but does disclose that its rules are organized in "data structures." *Id.*, 7:15-21. A POSA would have understood and found obvious that a table, which is comprised of rows and columns, was an extremely common and easily implemented data structure that facilitated efficient storage, retrieval, and manipulation of data. Indeed, Garcia-Molina, a leading textbook on database design from 2009, confirms that the two-dimensional table is "the most important model of data." EX1013, 17; *see generally* *id.*, Chapter 2. Thus, it would have at least been obvious to store Anon's rule sets in table form, as it would have been use of a known technique to improve similar devices in the same way and applying a known technique to a known device ready for improvement to yield predictable results. EX1003, ¶¶87-90.

When a monitored value (*e.g.,* motion, exposure, face analysis, finger obstruction) is above or below a threshold, the system would consult the pre-stored table and selects the corresponding suggestion to present to the user. A POSA would have known that this is a predictable, modular approach that is explicitly taught and widely used in the art and would have implemented it with a reasonable expectation of success. *See* EX1003, ¶90.

2. <u>Claim 2</u>

Anon does not disclose the express text of these user suggestions as claimed. Anon does disclose, however, making textual suggestions to the user and that the lack of sharp edges in an image might indicate a lack of appropriate focus and further teaches that "[s]uggestions might be presented in a viewfinder display" for taking corrective action. EX1004, 6:4-8, see *id.*, 3:53-57. Thus, it would have been a matter of design choice to make the suggestion using the express textual suggestions recited in claim 2. EX1003, ¶91.

3. Claim 3

Anon discloses using a conventional weighted average value as recited by this claim: Anon teaches that input parameters can be weighted and combined, explaining that "these parameters may be input into a fuzzy logic set, or the like, and an evaluation, e.g. ***weighted, combination of parameters*** may be performed by the composition and feedback engine." EX1004, 8:32-35. Further, the resulting "composition measure"—the claimed total value—which "provides ***rating of the composition of an image*** that is a 'proposed' image not yet captured," *id.*, 6:42-45, is a measure "grading the image quality" as claimed. *See also id.*, 8:16 ("judge a properly composed image"); *see generally id.*, 8:14-35.

4. Claim 4

Anon expressly teaches that the estimation of one value (*e.g.,* face detection (QI3)) influences the determination of the weights attached to other characteristics (e.g., c1, c2, or c4).

> "Other inputs might include an indication of where in the image the subject is (e.g., find faces and draw a rectangle around the most prominent face in the image, find an object with a defined border that has a color distribution that is wildly different from the histogram of the rest of the image, …). ***This input can be used to influence how various characteristics are weighted***."

EX1004, 3:53-4:3. A POSA would have understood this disclosure from Anon as teaching that at least one weight is estimated responsive to at least one quality indicator input value, e.g., QI3. EX1003, ¶95.

5. **<u>Claim 7</u>**

Anon does not expressly teach this limitation. Jasinski, however, teaches that the reliability of motion estimates can fluctuate over time due to changes in scene content, lighting, camera movement, or subject motion. By capturing a sequence of images at different times and computing motion estimates for each, the system can observe how confidence in those estimates evolves. *See* EX1010, ¶¶[0030], [0088], [0122]. A POSA would have appreciated that weighting Anon's estimates according to their time-dependent confidence would have allowed the system to adapt to the most current and relevant scene conditions, rather than relying on outdated or less reliable data. EX1003, ¶98. As discussed above in Section VI.A.1.iii, a POSA would have been motivated to combining Anon and Jasinski with a reasonable expectation of success.

6. **<u>Claim 8</u>**

Anon does not expressly teach this limitation. Takeuchi's system, however, links object detection (such as face or main subject detection) to the calculation of exposure level, assigning greater importance to the detected subject area for exposure purposes. *See* EX1005, ¶[0137]; *see also id.*, ¶¶[0134]-[0136]. This approach ensures that the most important part of the image, as determined by object detection, is optimally exposed, and the weighting of image regions for exposure calculation is dynamically changed based on what is detected in the scene. EX1003, ¶100. As discussed above in Section VI.A.1.vi, a POSA would have been motivated to use Takeuchi's face detection and point system as an input to Anon's CFE.

7. <u>Claim 9</u>

Anon discloses that an image capturing device can use inputs such as geographic location, time of day, camera orientation (*i.e.*, location sensor output), and image-based characteristics (including object detection) to influence camera settings and composition recommendations. *See, e.g.,* EX1004, 4:24-33. Anon's CFE can automatically adjust or suggest changes to camera parameters such as focus, aperture, and exposure (which includes ISO), based on these inputs. *Id.*, 2:29–36 ("the image capturing device will ***automatically make the change***"); 1:42-49 ("most cameras can analyze an image and automatically focus the lens, so that the user is freed from having to estimate distances or manually set the focus" and "[m]ost cameras can also set the shutter speed appropriately for a given amount of light that is falling on the camera"). For example, the CFE may recommend or directly change the focus point if a subject is detected in a particular area, adjust ISO or aperture in response to external conditions like location or lighting, and optimize settings to improve image quality according to contextual and sensor data before capturing an image. *See* EX1004, 8:36-43, 2:29–36, 1:42-49.

Takeuchi also teaches "automatically correct[ing] the photographic conditions during photography" including "exposure conditions such as the aperture value, shutter speed and the like, focus adjustment, and photographic sensitivity," which a POSA would understand includes focus point, ISO, and the aperture. EX1005, ¶¶[0281]-[0283] (describing "Self-Correction of Photographic Conditions" including "aperture," "focus adjustment," and "photographic sensitivity."). A POSA would have recognized that Takeuchi's automatic correction of focus and ISO is beneficial because it does not require a user to manually change settings and is thus more convenient for the user. EX1004, 1:42-49. Consumer cameras have long had automatic adjustment of focus, ISO, and aperture settings, as Anon recognizes. EX1003, ¶103; EX1004, 1:42-49. Thus, to the extent PO argues Anon alone fails to disclose this limitation, a POSA would have been motivated to include Takeuchi's automatic correction of focus and photographic sensitivity in Anon's camera system with a reasonable expectation of success. EX1003, ¶103; *supra* Section VI.A.1.iv.

8. <u>Claim 10</u>

Anon teaches that input parameters can be weighted and combined, explaining that "these parameters may be input into a fuzzy logic set, or the like, and an evaluation, e.g. weighted, combination of parameters may be performed by the composition and feedback engine." EX1004, 8:32-35. Anon teaches that the calculated composition measure (*i.e.,* combined value) can be compared to a threshold to determine subsequent actions such as user feedback, as discussed above at Section VI.A.1.xi. Anon also discloses a "post-processing" engine that selects images to be stored in an album (i.e., user persistent memory) based on Anon's "composition judging techniques." EX1004, 10:1–25. A POSA would have understood that in Anon an image is also saved in memory if it is deemed to be a quality image because the system uses its CFE to evaluate an image in real-time based on multiple characteristics and outputs an indication of the composition measure to the user. If the user responds to this indication by capturing the image, the device receives the captured image and stores it in memory. *See* EX1004, 2:6–8, 3:10-12. This process ensures that only images meeting certain quality criteria, as determined by the CFE, are saved.

B. Ground 1B: Claims 11, 14-17, and 20 are Obvious in View of Anon, Takeuchi, Aisaka, Jasinski, and Cheatle

1. Independent Claim 11

i. *[11.pre.]*

Claim 11's preamble allows for the use of "at least one" motion or location sensor while claim 1's preamble recites a single sensor. To the extent that the preamble is limiting, Anon discloses the subject matter recited in claim 11's preamble for the same reasons that it discloses the subject matter recited in claim 1's preamble. *See §VI.A.1.i, supra*.

ii. *[11.a]*

Anon discloses this limitation for the same reasons that it discloses the subject matter recited in limitation [1.a]. *See §VI.A.1.ii, supra*.

iii. *[11.b]*

Anon discloses this limitation for the same reasons that it discloses the subject matter recited in limitation [1.b]. *See §VI.A.1.iii, supra*.

iv. [11.c]

Both Anon and Takeuchi teach obtaining a measurement value that is a function of lens focus. Anon describes that "the plurality of image-based characteristics include a color characteristic, a focus characteristic, a brightness characteristic, etc." and further explains that "parameters from the camera may be used to make the judgment, such as the orientation of the camera, where the camera is focused-upon, where within the scene is a face recognized, and the like." EX1004, 2:9-11 and 8:27-31. Takeuchi similarly discloses that "image information stored in the buffer 25 may be, evaluated as a characteristic amount of the defocus amount generated between frames of each block when segmenting the photographed images into a plurality of blocks." EX1005, ¶[0298].

Anon does not expressly disclose obtaining a measurement value that is a combination of lens focus, whether an overall image is under or over exposed, and whether a face in the image is under or over exposed. Takeuchi, however, teaches obtaining a measurement value that is a combination of lens focus, overall image exposure, and face exposure by disclosing that "[t]he body side microcomputer 21, in the focus/blurring evaluation, applies a differential filter to the photographed image and detects the edges…." *Id.,* ¶[0142]. Takeuchi further performs "[t]he exposure evaluation... for the items below. The body side microcomputer 21 judges whether there is underexposure (blackout) or overexposure (whiteout) at the position of the main subject estimated to be a face. Further, the body side microcomputer 21 seeks regions where there is underexposure (blackout) or overexposure (whiteout) with respect to the overall picture, and judges whether their proportion is below a predetermined value. Further, the body side microcomputer 21 judges whether it is within a preferable density scope of a face at the main subject position." *Id.,* ¶[0147].

Takeuchi's evaluations are combined such that "[t]he body side microcomputer 21 carries out the comprehensive evaluation of the photographed image by calculating a total value or average value of the points from the evaluations based on the position of the main subject described above, and the points from the evaluation of the motion vector or the defocus amount or the like as the characteristic amount in the previous Step S105," thereby determining a single measurement value that reflects the combination of lens focus, overall image exposure, and face exposure. *Id.* ¶[0149].

Both Anon and Takeuchi are directed to the problem of evaluating and improving the quality of digital images, albeit with different emphases. Takeuchi's system provides a comprehensive evaluation of image quality, including explicit detection and quantification of overexposure and underexposure, and offers feedback or correction suggestions to the user. *See e.g.,* EX1005, ¶¶[0147], [0290]. Anon's system, on the other hand, is focused on real-time feedback regarding image composition and overall quality, using a variety of image-based characteristics (such as color, focus, brightness, and energy) to compute a "composition measure". *See* EX1004, 1:59-2:8.

A POSA would have recognized that exposure quality—specifically, the presence of overexposed or underexposed regions—is a fundamental aspect of overall image quality. Poor exposure can result in loss of detail, which directly impacts the aesthetic and technical value of a photograph. Anon's system is designed to provide feedback and suggestions to improve image quality, and explicitly contemplates using multiple image-based characteristics, including brightness, as part of its composition measure. *Id.,* 2:9-15. A POSA would have been motivated to combine Takeuchi's exposure determination with Anon's composition feedback system and would have had a reasonable expectation of doing so for the reasons discussed in *§VI.A.1.iii supra*.

v. *[11.d]*

Anon's engine "estimat[es] a first weight (c2) associated with the second value" as claimed. As discussed above in *supra* Section VI.A.1.iii, Anon expressly discloses, or with Jasinski renders obvious, estimating and assigning weights to each of Anon's quality-indicator inputs. Based on the teachings of Anon and Takeuchi discussed in the previous section—*supra* Section VI.B.1.iv—a POSA would have understood that this "weighted, combination of parameters," EX1004, 8:32-35, would include assigning a weight to the combination of lens focus, overall image exposure, and face exposure measure of Takeuchi in combination with Anon. EX1003, ¶116.

vi. *[11.e]*

Anon discusses the potential use of neural networks or fuzzy logic for evaluating image aesthetics based on training sets, but does not specifically describe the use of deep learning algorithms for object detection or recognition in the captured image. Takeuchi's methods are based on pattern matching, statistical analysis, and rule-based or user-driven learning, but Takuchi does not expressly teach analyzing the captured image via deep learning algorithms. Aisaka, however, discloses an image processing apparatus and method that leverage neural-network-based learning to enhance the detection and evaluation of subjects within captured images. EX1007, ¶[0020].

Aisaka's system is designed to generate a "subject map" that specifies the region of a subject in an input image by extracting and combining multiple feature values, such as luminance, color, edge, face, and motion information. *Id.* Aisaka explains that "[t]he subject extraction unit 21 detects the subject from the supplied input image, generates a subject map that is information for specifying a region including the subject in the input image, and supplies the subject map to the determination unit 22." *Id.* ¶[0058]. The apparatus employs a learning process in which "difference weights Wa, information weights Wb, and subject weight Wc used at the time of the generation of a subject map are determined using, for example, neural-network-based learning." *Id.* ¶[0269]. This learning is performed by comparing the generated subject map to an "image label that is determined in advance and that represents the region of the subject in the learning image," allowing the system to iteratively update the weights and improve subject detection accuracy. *Id.,* ¶[0020].

Aisaka emphasizes that this approach enables "more reliable detection of the subject from an image using this subject map," and is not limited to human subjects, but can also detect "a general object such as an animal, a plant, or a building." *Id.,* ¶¶[0301] and [0267]. Furthermore, the system evaluates image quality by focusing on the sharpness of the detected subject, stating, "the blur determination unit 51 calculates the blur degree representing the blur extent of the region of the subject on the input image from the input image and the subject map." *Id.* ¶[0256]. This comprehensive, learning-based approach allows for robust and adaptable subject detection and evaluation across a wide range of image types. EX1003, ¶118.

Aisaka's deep learning analysis outputs a value because the system is designed to generate quantitative indicators—specifically, "information maps" and "subject maps"—that numerically represent features or characteristics detected in an image. Aisaka's process involves extracting feature values from the input image, generating information maps for each feature, and then performing "weighted addition of the plurality of information maps" to produce a subject map, which is used for further evaluation. EX1007*,* ¶¶[0015], [0268]. Aisaka's final output is a "score" or "index for evaluating the degree to which the subject appears sharp in the input image." *Id.,* Abstract, ¶¶[0055]-[0057]. This value is calculated based on the detected features and their learned weights: "The determination unit 22 calculates a score serving as an index for evaluating the input image using the supplied input image and the subject map." *Id.,* ¶[0065]. Thus, the deep learning analysis is structured to output a value that quantitatively reflects the quality or sharpness of the subject in the image.

A POSA would have been motivated to modify the combination of Anon and Takeuchi to analyze a captured image via deep learning algorithms for object or characteristic recognition because both references emphasize the importance of accurately identifying subjects and evaluating image quality based on subject features. EX1003, ¶121. As discussed above Sections VI.A.1.ii, iv, and vi, Anon describes a system that provides composition feedback by analyzing image-based characteristics and external context, and Takeuchi details methods for estimating subject position and evaluating images using multiple features such as motion vectors, face detection, and color distribution. Integrating deep learning algorithms would have been a logical improvement, as these algorithms were well-known for their performance in object detection and feature extraction, enabling more robust and adaptable subject recognition and image evaluation—capabilities directly aligned with the goals of both Anon and Takeuchi. EX1003, ¶121.

A POSA would have had a reasonable expectation of success in making this modification because deep learning-based object recognition was already established in the art as an effective and reliable technique for analyzing image content, and both Anon and Takeuchi provide modular, feature-based frameworks readily adaptable to incorporate such advanced algorithms. EX1003, ¶121.

vii. *[11.f]*

Anon discloses this limitation for the same reasons that it discloses the subject matter recited in limitation [1.e]. *See §VI.A.1.vi, supra*.

viii. *[11.g]*

Anon does not expressly disclose that QI4 may be based on a recognition value of at least one of said faces as a known face or unknown face, based on a pre-stored list of configured faces. However, Cheatle discloses a system that determines whether a face in a captured image is known or unknown by comparing detected facial features to a pre-stored list (database) of configured faces, explaining that: "the quality factor might be determined according to recognition of facial subject area(s) of interest, the composition quality increasing if there is a facial subject area in the image which is identified as being present in a database of previously-stored facial features" and further explains, "[b]y keeping a database of facial features, a comparison could be made with the subject area of the captured key frame 15." EX1008, ¶¶[0012], [0042].

A POSA would have been motivated to modify Anon in view of Cheatle because both references address improving image quality and selection by analyzing facial features and leveraging recognition of known faces to enhance user experience. Anon teaches that the system can "determin[e] image features to classify a subject of the proposed image; and using the classification to modify the indication of composition measure," including "the classification of the subject is one of a person's face." EX1004, Cls. 5 and 6. Cheatle, on the other hand, explicitly teaches using face recognition to identify known faces from a database: "Taking this a stage further, the quality factor might be determined according to recognition of facial subject area(s) of interest, the composition quality increasing if there is a facial subject area in the image which is identified as being present in a database of previously-stored facial features." EX1008, ¶[0012]. Thus, a POSA would have recognized that combining Anon's analysis of facial properties with Cheatle's use of a pre-stored list of configured faces to determine whether a face is known or unknown would have resulted in a more robust and user-relevant image evaluation system, motivating the combination to obtain a fo[u]rth value (QI4) based on both facial properties and recognition status. EX1003, ¶124.

A POSA would have had a reasonable expectation of success in combining Anon's analysis of facial properties with Cheatle's use of a pre-stored list of configured faces because both references provide clear, compatible teachings on facial detection and recognition, and each describes standard image processing techniques that are well-known and routinely implemented in the field. Since both references rely on established methods of face detection and recognition—such as "identifying at least one subject area of interest" and "recognition of facial subject area(s) of interest"—a POSA would have reasonably expected that integrating Anon's facial property analysis with Cheatle's database-driven recognition of known faces would be achieved using conventional image processing and pattern recognition techniques, yielding predictable results. EX1003, ¶124.

ix. *[11.h]*

Anon discloses this limitation for the same reasons that it discloses the subject matter recited in limitation [1.f]. *See §VI.A.1.vii, supra*.

x. *[11.i]*

Anon, Takeuchi, Aisaka, and Cheatle would have collectively taught a POSA to calculate a total quality value of an image according to multiple quality indicators (QIs), each reflecting an aspect of image quality. EX1003, ¶126. This is Anon's composition measure. Anon discusses the use of motion sensors "that can provide the engine with inputs as to how the camera is moving." EX1004, 10:26-35. Anon further discusses that the system can use "inputs that the engine has to work with [] includ[ing]...the lack of sharp edges that might indicate a lack of appropriate focus," and "an indication of where in the image the subject is," which can be affected by motion blur. *Id.,* 3:53-64. Takeuchi discloses that "image information stored in the buffer 25 may be, evaluated as a characteristic amount of the defocus amount generated between frames of each block when segmenting the photographed images into a plurality of blocks." EX1005, ¶[0298]. Aisaka teaches the use of deep learning algorithms to analyze image content, stating that "a subject map is generated through the extraction of pieces of information such as luminance, colors, edges, a face, and a motion from an input image," and that these are combined using neural-network-based learning to detect and score objects or characteristics in the image. EX1007,

¶¶[0268]-[0270]. Cheatle, meanwhile, discloses a system that determines whether a face in a captured image is known or unknown by comparing detected facial features to a pre-stored list (database) of configured faces. EX1008, ¶[0012] and [0042]. Thus, the combination of these references teaches calculating a total quality value based on QI1 (device motion), QI2 (exposure/focus/over-under exposure), QI3 (deep learning-based object/characteristic recognition) and QI4 (a comparison of detected facial features to a pre-stored list (database) of configured faces).

In computing the composition value, Anon additionally uses "previous" values and previous weights in the context of analyzing the composition value for an image that is a frame from a video. Anon explains that, "unless otherwise indicated, what is explained about a photographer using a camera to capture a photograph can equally apply, unless otherwise indicated, to a videographer using a video camera to capture a video sequence…." EX1004, 3:2-10. Anon further notes that "the video camera might include a motion sensor that can provide the engine with inputs as to how the camera is moving ... it might be a preference when a subject is moving quickly in a scene to frame more of the scene in front of the subject than in back of the subject and this could be suggested by the engine to a videographer." EX1004, 8:28-31, 10:27-35. Thus, a POSA would have understood that Anon explicitly contemplates using values regarding image data from previous frames (*e.g.*, data on a subject's recent position in an image that indicates how fast the subject is moving) in calculating its composition value. EX1003, 127.

Cheatle likewise uses previous values in that it compares faces to a pre-stored list. EX1008, ¶¶[0012], [0042]. Cheatle uses data about a pre-stored list of faces (*i.e.*, previous values relating to previous inputs) to analyze current faces in a frame. *Id.* As such, it *uses* previous values in its calculation of image quality. EX1003, 128.

The combination would have used weights for QI1, QI2, QI3, and QI4 to reflect the relative importance, reliability, or context-specific relevance of each indicator in the overall quality assessment. Anon describes that the system may use "a weighted, combination of parameters" to evaluate image quality, and that "parameters may be input into a fuzzy logic set, or the like, and an evaluation, e.g. weighted, combination of parameters may be performed by the composition and feedback engine." EX1004, 8:15-35. Aisaka's deep learning approach also uses weights, as "difference images obtained from pyramid images...are subjected to weighted addition with difference weights Wa to produce information maps, and these information maps are subjected to weighted addition with information weights Wb. Then, furthermore, the resulting images (maps) are multiplied by a subject weight Wc to produce a subject map." EX1007, ¶[0268]. These teachings show that weighting enables flexibility and accurately combining QI1, QI2, QI3, and QI4 into a single, context-sensitive total quality value, allowing the system to adapt to different photographic scenarios and user preferences.

A POSA would have been motivated to combine the teachings of Anon, Takeuchi, Aisaka, and Cheatle because each reference addresses complementary aspects of automated image quality assessment, and their integration promises a more robust and comprehensive evaluation system. EX1003, ¶130. Anon teaches the value of aggregating multiple image-based and external characteristics—including motion, exposure, and content analysis—into a unified quality measure, noting that "a pleasing image is often not simply obtained by optimizing each characteristic" and advocating for a system that "compute[s] a composition measure...that depends from at least two of the plurality of image-based characteristics." EX1004, 1:50-55 and 1:59-67. Given the clear, modular nature of these approaches and their shared emphasis on weighted, multi-factor analysis, a POSA would have reasonably expected that combining them would yield a system capable of more accurate, context-sensitive, and user-adaptive image quality assessment, with no technical barriers to such integration. EX1003, ¶130.

xi. *[11.j]*

Anon assists users in managing large sets of images by automatically identifying those with higher aesthetic or compositional value. EX1004, 10:8-20. Takeuchi explicitly discloses that a processor "evaluates the image information stored in the photographed image storage area of the buffer 25 based on a characteristic amount which changes in a chronological sequence in the photographic frame when images of a plurality of frames are imaged," and then "selects at least one image whose image evaluation points are equal to or greater than a predetermined threshold value, from among the plurality of images stored... and deletes from the buffer 25 the [other] images and their evaluation results." EX1005, ¶¶[0121], [0157], [0221]. Accordingly, Anon and Takeuchi teach or suggest using a digital camera processor to select an image from a stream based on a calculated total quality value. Thus, a POSA would have recognized the benefit of using a processor to select at least one image from a plurality of images "at least partly on said total quality value," as both references teach evaluating images based on multiple quality metrics and using those evaluations to guide image selection or output. EX1003, ¶131.

A POSA would have had a reasonable expectation of success in combining Anon and Takeuchi to select, using a processor, at least one image from a plurality of images at least partly on a calculated total quality value because both references explicitly teach automated, processor-based evaluation and selection of images based on composite quality metrics. Both references provide detailed algorithms and system architectures for calculating and applying total quality values to image selection, demonstrating that their combination would have been straightforward and predictable for a POSA, with a clear expectation that the combined system would function as intended. EX1003, ¶132.

2. Claim 14

Anon does not expressly teach this limitation. Jasinski, however, teaches that the reliability of motion estimates can fluctuate over time due to changes in scene content, lighting, camera movement, or subject motion, as discussed in *supra* Section VI.A.5. *See* EX1010, ¶¶[0030], [0088], [0122]. A POSA would have appreciated that weighting Anon's estimates according to their time-dependent confidence would have allowed the system to adapt to the most current and relevant scene conditions, rather than relying on outdated or less reliable data. EX1003, ¶98, 141. As discussed in *supra* Section VI.A.1.iii, a POSA would have been motivated to combine Anon and Jasinski with a reasonable expectation of success.

3. Claim 15

Anon does not expressly teach this limitation. Takeuchi's system, however, links object detection (such as face or main subject detection) to the calculation of exposure level, as discussed in *supra* Section VI.A.6. *See* EX1005, ¶[0137]; *see also id.*, ¶¶[0134]-[0136]. Thus, the most important part of the image is optimally exposed, and the weighting of image regions is dynamically changed based on what is detected in the scene. EX1003, ¶135. As discussed above in Section VI.A.1.vi, a

POSA would have been motivated to use Takeuchi's object detection and point system as an input to Anon's CFE.

4. Claim 16

Anon discloses that an image capturing device can use various inputs to its CFE to automatically adjust/suggest changes to parameters including focus, aperture, and exposure for the reasons discussed in *supra* Section VI.A.7. *See, e.g.,* EX1004, 4:24-33, 2:29–36, 1:42-49, 8:36-43.

A POSA would understand Takeuchi also teaches automatic corrections to focus point, ISO, and the aperture, as discussed in *supra* Section VI.A.7. EX1005, ¶¶[0281]-[0283]. A POSA would have recognized that Takeuchi's automatic correction of focus and ISO is beneficial because it does not require a user to manually change settings and is thus more convenient for the user. EX1004, 1:42-49. Consumer cameras have long had automatic adjustment of focus, ISO, and aperture settings, as Anon recognizes. EX1003, ¶138; EX1004, 1:42-49. Thus, to the extent PO argues Anon alone fails to disclose this limitation, a POSA would have been motivated to include Takeuchi's automatic correction of focus and photographic sensitivity in Anon's camera system with a reasonable expectation of success. EX1003, ¶138; *supra* Section VI.A.1.iv.

5. <u>**Claim 17**</u>

Anon teaches that input parameters can be weighted and combined, as discussed in *supra* Section VI.A.8. EX1004, 8:32-35. Anon teaches that the calculated composition measure (*i.e.,* combined value), the claimed "total value," can be compared to a threshold to determine subsequent actions such as user feedback, as discussed above at *supra* Section VI.A.1.xi. Anon also discloses a "post-processing" engine as discussed in *supra* Section VI.A.8. EX1004, 10:1–25. A POSA would have understood that in Anon an image is also saved in memory if it is deemed to be a quality image as discussed in *supra* Section VI.A.8. *See* EX1004, 2:6–8, 3:10-12.

6. <u>**Claim 20**</u>

Anon describes the use of GPS as an external input to the CFE, allowing the camera to obtain a value responsive to its location: "Camera-specific external inputs might include the camera's current geographic location, time of day, orientation and the like. These external inputs might actually be provided by circuits and/or sensors inside the camera (such as an internal real-time clock) or in combination with other systems (such as a GPS receiver that receives GPS satellite signals in order to determine a location of the camera)." EX1004, 4:24-33. Anon uses this location information to influence composition feedback, for example: "if the engine is aware of the camera location and has access to a data set of rules (e.g., 'when located at the

GPS coordinates of the front of Cinderella's Castle™ in Disneyland, suggest centering on the castle rather than rule of thirds')." *Id.,* 5:3-7. Thus, Anon uses GPS to obtain a first value (QI1) that is directly responsive to the camera's geographic location, which is then used in the composition evaluation process. Anon also discloses an "accelerometer." *Id*., 4:28-31.

C. Ground 1C: Claim 5 is Obvious in View of Anon, Takeuchi, Kosaka, Jasinski, Aisaka, Garcia-Molina, and Cheatle

1. Claim 5

Anon does not expressly disclose that (c3) is estimated based on a recognition value of at least one of said faces as a known face or unknown face, based on a pre-stored list of configured faces. However, Cheatle discloses a system that determines whether a face in a captured image is known or unknown by comparing detected facial features to a pre-stored list (database) of configured faces, explaining that: "the quality factor might be determined according to recognition of facial subject area(s) of interest, the composition quality increasing if there is a facial subject area in the image which is identified as being present in a database of previously-stored facial features" and further explains, "[b]y keeping a database of facial features, a comparison could be made with the subject area of the captured key frame 15." EX1008, ¶¶[0012] and [0042].

A POSA would have been motivated to combine Anon and Cheatle and would have had a reasonable expectation of success in doing so for the reasons discussed above in §VI.B.1.vii. See also EX1003, ¶144.

D. Ground 1D: Claim 6 is Obvious in View of Anon, Takeuchi, Kosaka, Jasinski, Aisaka, Garcia-Molina and Ramesh

1. <u>Claim 6</u>

Anon does not expressly disclose estimating a third weight (c3) based on an estimated error in the analyzing of the captured image for detecting or recognizing objects in the image. Ramesh, however, describes a computer vision system for detecting and tracking multiple objects (*e.g.,* people in crowds) using a probabilistic framework. Ramesh estimates the number of a people in a scene by using a "weighted sum of partial evidences." EX1009*,* ¶[0034]. An "objects location and attributes are updated using online uncertainty estimation 110." *Id*., ¶[0025]. Ramesh teaches that "less certain guesses" (*i.e.*, guesses with greater error) "are weighted less." *Id*., ¶[0030]. In Anon's real-time image evaluation, the reliability of different features (such as object detection) can vary due to noise, ambiguous scenes, or changing conditions. Ramesh's probabilistic approach provides a principled way to quantify and propagate uncertainty (error) in such situations. Associating an estimated error (e.g., standard deviation, confidence interval) with weighted factors would allow Anon's system to adaptively adjust the weight of each characteristic based on its reliability and combine output values from multiple sources in a statistically optimal way. In other words, less certain quality indicators would be weighed less than more certain quality indicators. A POSA would understand this results in a more accurate image quality assessment. EX1003, ¶147. The combination of Anon and Ramesh is thus the application of a known technique (weighting parameters with error/uncertainly relatively less, as disclosed by Ramesh) to a known device (Anon) ready for improvement to yield predictable results (an optimized composition engine). EX1003, ¶147.

E. Ground 1E: Claim 12 is Obvious in View of Anon, Takeuchi, Aisaka, Jasinski, Cheatle, and Alhadef

1. <u>Claim 12</u>

Anon does not expressly teach this feature. However, Alhadef addresses the need to compensate for sensor inaccuracies and drift in the process of determining camera position and orientation. Alhadef teaches that:

> It is also useful, if not necessary, to correct for errors derived from drift related to the inertial character of the measuring equipment.
>
> It is known that the values coming from the gyrometers drift over time as a function of temperature and of magnetic field. Therefore, it is necessary to regularly recalibrate the gyrometers, both statically and dynamically.

> It is also known that the values provided by the accelerometers drift, with an oscillation of about 84 minutes. This drift is known as 'Shuler's law.'

EX1011, 10:35-44.

Furthermore, Alhadef describes the use of GPS and other auxiliary sensors to "permit redundant determinations and, thereby, improve the accuracy of the measurements," and details the use of "predictive modeling... based upon the use of so-called 'Kalman' filters" to compensate for sensor drift and error. *Id.,* 9:35-39, 11:4-6. These passages demonstrate Alhadef accounts for the precision error, resolution, and temporal drift of motion or location sensors (including accelerometers, gyroscopes, and GPS), and that such error characteristics are used to adjust or weight the contribution of each sensor in the overall position estimation, thereby teaching the estimation of a first weight (c1) based on these sensor-specific error metrics. EX1003, ¶149.

It would have been obvious to modify the instant combination in view of Alhadef's teachings to incorporate a first weight (c1) estimated according to, or based on, the precision error, reading resolution, or drift in time of a motion or location sensor—such as an accelerometer, gyroscope, GPS, or step counter—because Alhadef explicitly addresses the need to compensate for sensor inaccuracies and temporal drift in determining camera position and orientation. EX1011, 9:35-39, 11:4-6. A POSA would have recognized that integrating sensor-specific error metrics as weighting factors would have improved the reliability and accuracy of motion or location estimates in camera systems, especially since both Anon and Takeuchi already contemplate the use of sensor data for image evaluation and feedback. EX1003, ¶150.

Given the well-established practice of sensor fusion and error compensation in the field, as well as Alhadef's detailed guidance on how to quantify and correct for sensor errors, a POSA would have had a reasonable expectation of success in implementing such a modification, as it would simply require, for example, assigning lower weights to less reliable sensor data and higher weights to more accurate readings, thereby enhancing the overall system performance in a predictable manner. EX1003, ¶150.

F. Ground 1F: Claim 13 is Obvious in View of Anon, Takeuchi, Aisaka, Jasinski, Cheatle, and Ramesh

1. Claim 13

Anon does not expressly disclose estimating a weight based on an estimated error in the analyzing of the captured image for detecting or recognizing objects in the image. Ramesh, however, describes a computer vision system for detecting and tracking multiple objects (*e.g.,* people in crowds) using a probabilistic framework. Ramesh estimates the number of a people in a scene by using a "weighted sum of partial evidences." EX1009, ¶[0034]. An "objects location and attributes are updated using online uncertainty estimation 110." *Id.*, ¶[0025]. Ramesh teaches that "less certain guesses" (*i.e.*, guesses with greater error) "are weighted less." *Id.*, ¶[0030]. In Anon's real-time image evaluation, the reliability of different features (such as object detection) can vary due to noise, ambiguous scenes, or changing conditions. Ramesh's probabilistic approach provides a principled way to quantify and propagate uncertainty (error) in such situations. Associating an estimated error (e.g., standard deviation, confidence interval) with weighted factors would allow Anon's system to adaptively adjust the weight of each characteristic based on its reliability and combine output values from multiple sources in a statistically optimal way. As discussed above in Section VI.D.1, a POSA would have been motivated to modify Anon in view of Ramesh with a reasonable expectation of success. EX1003, ¶153.

G. Ground 1G: Claim 18 is Obvious in View of Anon, Takeuchi, Aisaka, Jasinski, Cheatle and Garcia-Molina

1. Claim 18

A POSA considering the teachings of Anon, Takeuchi, Aisaka, Jasinski and Cheatle, and further in view of Garcia-Molina, would have been motivated to use a pre-stored table of suggestions for the reasons discussed in Section VI.A.1.xi *supra*. The combination would have resulted in a system that monitors various image and camera parameters, compare them to thresholds, and provide feedback or suggestions to the user. A POSA would have selected at least one appropriate suggestion from a pre-stored table and presented it to the user for the following reasons (EX1003, ¶156):

• Anon describes computing a composition measure based on multiple image-based characteristics and external context, and outputting indications or suggestions (*e.g.,* "red[/]yellow[/]green" lights, arrows, or text suggestions). *See* EX1004, 5:26-51.

• Takeuchi teaches evaluating images using multiple methods, assigning scores, and displaying correction information or hints when evaluation items fall below a threshold. *See e.g.,* EX1005, ¶¶[0290]–[0295], Fig. 25.

• Anon describes rule sets and lookup data for generating context-sensitive suggestions based on detected image/camera parameters. *See* EX1004, 7:15-29. In particular, Anon discloses a pre-stored table in the form of a "rule set" stored in a data structure that includes suggestions for image improvement. *Id.*, 7:15-29.

When a monitored value is above or below a threshold, the system would consult the pre-stored table and selects the corresponding suggestion to present to the user. A POSA would have known that this is a predictable, modular approach that is explicitly taught and widely used in the art and would have implemented it with a reasonable expectation of success. *See* EX1003, ¶157 citing EX1015 ¶[0018].

H. Ground 1H: Claim 19 is Obvious in View of Anon, Takeuchi,

Aisaka, Jasinski, Cheatle and Staudacher

1. <u>Claim 19</u>

Anon does not expressly teach this limitation. However, Staudacher teaches that a value or weight can be a combination of multiple face quality or weights and can be based on the percentage of faces with individual values above some threshold, explaining that "[t]he pose metric calculator 18 can combine the results from such separately analyzed metrics to derive the value of the pose metric signal MET. The pose metric calculator 18 can combine such results, for example, in either equal contributions or individually weighted contributions." EX1012, ¶¶[0010] and [0020].

Furthermore, Staudacher explains, "[w]hen a scene contains multiple subjects, the pose analyzer can generate the value of the pose metric signal MET according to a percentage of the multiple subjects that satisfy each of the pose metrics 16." It also notes, "the value of the pose metric signal MET can vary based on the number of subjects that satisfy the one or more pose characteristics 16." *Id.* ¶[0022]. A POSA would have understood from Staudacher that the overall value or weight is derived from a combination of individual face quality metrics and would be determined by the proportion of faces meeting specified criteria. EX1003, ¶159.

A POSA would have been motivated to modify Anon in view of Staudacher because both references teach evaluating image quality or composition by aggregating multiple characteristics or metrics, including those related to faces, and suggest using combinations or weighted contributions to derive an overall value. Anon explains that "[o]ther inputs might include an indication of where in the image the subject is (e.g., find faces and draw a rectangle around the most prominent face in the image." EX1004, 3:62-64. Staudacher explicitly teaches that "[t]he pose metric calculator 18 can combine the results from such separately analyzed metrics to derive the value of the pose metric signal MET," and that "[w]hen a scene contains multiple subjects, the pose analyzer can generate the value of the pose metric signal MET according to a percentage of the multiple subjects that satisfy each of the pose metrics 16." EX1012, ¶¶[0010], [0022]. Thus, both references motivate combining individual face quality metrics into an aggregate value or weight, and Staudacher further teaches basing this on the percentage of faces meeting a threshold, providing clear rationale for a POSA to combine these teachings.

A POSA would have had a reasonable expectation of success in modifying Anon to use a combination of multiple face quality or weights based on the percentage of faces with individual values above a threshold, as taught by Staudacher. Since Anon's system is designed to process and combine multiple subject-related inputs and apply weighted measures for image quality, a POSA would have recognized that incorporating Staudacher's approach of weighting and thresholding individual face metrics is a straightforward and predictable separately analyzed metrics to derive the value of the pose metric signal MET extension of Anon's existing framework. EX1003, ¶160.

VII. SECONDARY CONSIDERATIONS

Petitioner is unaware of any evidence of alleged secondary indicia that would support non-obviousness of the '325 Patent. To the extent Patent Owner subsequently presents such evidence, Petitioner respectfully requests the right to respond.

VIII. MANDATORY NOTICES

As set forth below and pursuant to 37 C.F.R. § 42.8(a)(1), the following mandatory notices are provided.

A. Real Party in Interest Under 37 C.F.R. § 42.8(b)(1)

Samsung Electronics Co., Ltd., Samsung Electronics America, Inc.

B. Related Matters

SnapAid, Ltd. v. Samsung Electronics Co., Ltd. et al., No. 2-25-cv-00378 (E.D. Tex.) (alleging infringement of the '325 Patent).

C. Lead and Back-Up Counsel Under 37 C.F.R. § 42.8(b)(3)

Lead Counsel	Back-Up Counsel
Robert A. Appleby (Reg. No. 40,897) Kirkland & Ellis LLP, 601 Lexington Avenue, New York, NY 10022, Telephone: 212.446.4800 Facsimile: 212.446.4900	W. Todd Baker (Reg. No. 45,265) Kirkland & Ellis LLP, 1301 Pennsylvania Avenue, N.W., Washington, D.C. 20004 Telephone: 202.389.3135 Facsimile: 202.389.5200

D. Service Information Under 37 C.F.R. § 42.8(b)(4)

Petitioner concurrently submits a Power of Attorney, 37 C.F.R. § 42.10(b), and consents to electronic service by email at Samsung-IPR-SnapAid@kirkland.com.

IX. PAYMENT OF FEES UNDER 37 C.F.R. § 42.103

The undersigned authorizes the Office to charge the fee set forth in 37 C.F.R. § 42.15(a)(1) for this Petition to Deposit Account No. 506092, consistent with the requested review of twenty claims, and any additional fees that may be due in connection with this Petition to be charged to the above-referenced deposit account.

X. GROUNDS FOR STANDING UNDER 37 C.F.R. § 42.104(A)

Petitioner certifies pursuant to 37 C.F.R. §42.104(a) that the '325 Patent is available for IPR and that Petitioner is not barred or estopped from requesting an IPR of the Challenged Claims on the grounds identified herein.

XI. CONCLUSION

Petitioner requests institution of IPR and cancellation of the Challenged Claims.

Dated: September 5, 2025

Respectfully submitted,

/s/ Robert A. Appleby

Robert A. Appleby
Counsel For Petitioner
Reg. No. 40,897

APPENDIX – CLAIM LISTING

Claim [Element]	Claim Language
1 [1.pre]	A method for estimating quality of at least one image from a stream of images, for use with a device that comprises in a single enclosure a digital camera module or functionality that comprises at least one optical lens for focusing received light from a scene and an image sensor coupled to at least one optical lens for capturing an image of the scene; a motion or location sensor for sensing the device motion; and a processor coupled to the image sensor and to the digital camera for receiving data therefrom, the method by the processor comprising use of at least one value and weight;
1 [1.a]	obtaining a first value (QI1) responsive to the device motion from at least one motion or location sensor;
1 [1.b]	estimating a first weight (c1) associated with the first;
1 [1.c]	obtaining a second value (QI2), where value is a measurement of under or over exposure of at least one of a part of image or face exposure;
1 [1.d]	estimating a second weight (c2) associated with the second value;
1 [1.e]	analyzing the captured image for detecting or recognizing zero or more faces in the picture, calculates properties of at least one of said faces if exist, where said properties are at least one of: looking at camera, smiling, crying, face detection quality, face exposure or subject movement to obtain a third value (QI3);
1 [1.f]	estimating a third weight (c3) associated with the third value;
1 [1.g]	obtaining a forth value (QI4) responsive to obstruction of at least one optical lens; and
1 [1.h]	estimating a forth weight (c4) associated with the forth value;
1 [1.i]	wherein at least one of the values QI1, QI2, QI3, QI4 or the weights c1, c2, c3, c4 are calculated based on an

Claim [Element]	**Claim Language**
	artificial neural network employing deep learning algorithm
1 [1.j]	to select, based on values QI1, QI2, QI3, QI4 and weights c1, c2, c3, c4, at least one appropriate suggestion from a pre-stored table of suggestions of how a user of the system may cause at least on said value to be above or below a threshold and to present said appropriate suggestion to the user.
2	The method according to claim 1, where suggestions to the user can be "blurred image due to camera shake", or "blurred subject due to subject movement", or "Image dynamic range is beyond the sensor dynamic abilities—choose area of interest or take a high dynamic range (HDR) shot".
3	The method according to claim 1, further comprising grading the image quality according to, or based on, the total value, and wherein the total value is calculated as a weighted average value according to, or based on, c1*QI1+c2*QI2+c3*QI3+c4*QI4, where c1>0, c2>0, c3>0 and c4>0.
4	The method according to claim 1, wherein the estimating of the one of weights (c1, c2, c3, c4) is responsive to at least on of values (QI1, QI2, QI3, QI4) other than its respectively associated one.
5	The method according to claim 1, wherein third value (c3) is estimated according to, or based on, the recognition value of at least one of said faces as a known face or unknown face, based on a pre-stored list of configured faces.
6	The method according to claim 1, wherein the third weight (c3) is estimated according to, or based on, the estimated error in the analyzing the captured image for detecting or recognizing objects in the image.
7	The method according to claim 1, wherein at least one of said weights are defined at least partially over a time-

Claim [Element]	Claim Language
	dependent confidence level defined over at least one of said values QI1, QI2, QI3, QI4.
8	The method according to claim 1, where second value (QI2) is further based on object recognition done for third value (QI3), where object recognition can change importance of certain areas in the image for the purpose calculation of said second value (QI2): over or under exposure value.
9	The method according to claim 1, wherein at least one of said values (QI1, QI2, QI3, QI4, total value) causes change of one of focus point, ISO or aperture of at least of lens module.
10	The method according to claim 1, wherein total value is the threshold, and the image is saved into the user persistent memory.
11 [11.pre]	A method for estimating quality of at least one image from a stream of images, for use with a device that comprises in a single enclosure a digital camera module or functionality that comprises at least one optical lens for focusing received light from a scene and an image sensor coupled to at least one optical lens for capturing an image of the scene; at least one motion or location sensor for sensing the device motion; and a processor coupled to the image sensor and to the digital camera for receiving data therefrom, the method by the processor comprising use of at least one value and weight;
11 [11.a]	obtaining a first value (QI1) responsive to the device motion from at least one motion or location sensor;
11 [11.b]	estimating a first weight (c1) associated with the first;
11 [11.c]	obtaining a second value (QI2) value is a combination of at least one of: digital camera exposure, lens focus, under or over exposure of the image or its part or face exposure;
11 [11.d]	estimating a second weight (c2) associated with the second value;

Claim [Element]	Claim Language
11 [11.e]	analyzing the captured image via deep learning algorithms for detecting or recognizing one or more objects in, or one or more characteristics of the image or at least one of object characteristics to obtain a third value (QI3) associated with the analysis; and
11 [11.f]	analyzing the captured image for detecting or recognizing zero or more faces in the picture, calculates properties of at least one of said faces, where said properties are at least one of: looking at camera, smiling, crying, face detection quality, face exposure or subject movement to obtain a forth value (QI4);
11 [11.g]	where the forth value (QI4) may be based on the recognition value of at least one of said faces as a known face or unknown face, based on a pre-stored list of configured faces;
11 [11.h]	estimating a forth weight (c4) associated with the forth value;
11 [11.i]	calculating a total quality value according to, or based on values QI1, QI2, QI3, QI4 and weights c1, c2, c3, c4 and previous values QI1, QI2, QI3, QI4 and previous weights c1, c2, c3, c4 in the image stream; and
11 [11.j]	selecting by said processor at least one image from the plurality of images at least partly on said total quality value.
12	The method according to claim 11, wherein the first weight (c1) is estimated according to, or based on, a precision error, reading resolution, or drift in time, of the motion or location sensor, and wherein the motion or location sensor consists of, or comprises, an accelerometer, a gyroscope, a Global Positioning System (GPS), or a step counter.
13	The method according to claim 11, wherein at least one of said weights is estimated according to, or based on, the estimated error in the analyzing the captured image for detecting or recognizing objects in the image.

Claim [Element]	Claim Language
14	The method according to claim 11, wherein at least one of said weights are defined at least partially over a time-dependent confidence level defined over at least one of said values QI1, QI2, QI3, QI4.
15	The method according to claim 11, where second value (QI2) is further based on object recognition done for third value (QI3), where object recognition can change importance of certain areas in the image for the purpose calculation of said second value (QI2): over or under exposure value.
16	The method according to claim 11, wherein at least one of said values (QI1, QI2, QI3, QI4, total value) causes change of one of focus point, ISO or aperture of at least of lens module.
17	The method according to claim 11, wherein the total value is a threshold, and the image is saved into a user persistent memory.
18	The method according to claim 11, to select, based on values QI1, QI2, QI3, QI4 and weights c1, c2, c3, c4, at least one appropriate suggestion from a pre-stored table of suggestions of how a user of the system may cause at least on the value to be above or below a threshold and to present said appropriate suggestion to the user.
19	The method according to claim 11, where forth value (QI4) or forth weight (c4) can be a combination of multiple face quality or weights and based on the percentage of faces above with individual value above some threshold.
20	The method according to claim 11, where the first value (QI1) is based on image stabilization-sensor shift, lens stabilization, gyroscope, accelerometer, Global Positioning System (GPS), 9 Degrees of Freedom (DOF) sensing component or 10 Degrees of Freedom (DOF) sensing component.

CERTIFICATE OF COMPLIANCE

This Petition complies with the type-volume limitations as mandated in 37 C.F.R. § 42.24, totaling 13,727 words. Counsel has relied upon the word count feature provided by Microsoft Word.

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CERTIFICATE OF SERVICE

The undersigned hereby certifies that a copy of the foregoing document with accompanying exhibits was served on September 5, 2025, via overnight delivery directed to Patent Owners, SnapAid, Ltd., at the following address:

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A copy was also served via electronic mail on the attorneys of record listed below for the following related matters:

SnapAid, Ltd. v. Samsung Electronics Co., Ltd., and Samsung Electronics America, Inc. (Case 2:25-cv-00378-RWS-RSP, E.D. Tex)

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