

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. 11,671,702

Issued: June 6, 2023

Filed: Feb. 8, 2022

Inventor: Ishay Sivan

Title: Real Time Assessment of Picture Quality

Case IPR2025-TBD

**DECLARATION OF DAN SCHONFELD IN SUPPORT OF PETITION
FOR *INTER PARTES* REVIEW OF U.S. PATENT NO. 11,671,702 UNDER
35 U.S.C. § 312 AND 37 C.F.R. § 42.104**

TABLE OF CONTENTS

	<u>Page</u>
I. ASSIGNMENT	1
II. BACKGROUND AND QUALIFICATIONS.....	2
III. UNDERSTANDING OF PATENT LAW	8
IV. SUMMARY OF OPINIONS	13
V. OVERVIEW OF THE PRIOR ART	14
A. Anon.....	14
B. Suzuki.....	15
C. Kosaka.....	16
D. Walker.....	17
VI. THE '702 PATENT	18
A. Claims	18
B. Specification.....	20
C. Prosecution History.....	21
D. Person of Ordinary Skill in the Art	22
VII. CLAIM CONSTRUCTION	23
VIII. SPECIFIC GROUNDS FOR PETITION UNDER 37 C.F.R. § 42.104(B).....	23
A. Ground 1A: Claims 11-13 and 17-19 are Obvious in View of Anon, Suzuki and Garcia-Molina	23
B. Ground 1B: Claim 14 is Obvious in View of Anon, Suzuki, Garcia-Molina and Ramesh	40
C. Ground 1C: Claims 15 and 16 are Obvious in View of Anon, Suzuki, Garcia-Molina and Jasinski.....	42

Declaration of Dan Schonfeld in Support of Petition for *Inter Partes* Review of
U.S. Patent No. 11,671,702

D.	Ground 1D: Claim 20 is Obvious in View of Anon, Suzuki, Garcia-Molina, Jasinski, and Liu	43
E.	Ground 2A: Claims 1-3, 5, and 8-10 are Obvious in View of Anon, Walker, Kosaka, Jasinski, and Garcia-Molina	45
F.	Ground 2B: Claim 6 is Obvious in View of Anon, Walker, Kosaka, Jasinski, Garcia-Molina and Cheatle	69
G.	Ground 2C: Claim 6 is Obvious in View of Anon, Walker, Kosaka, Jasinski, Garcia-Molina and Ramesh.....	71
IX.	SECONDARY CONSIDERATIONS	72
X.	CONCLUSION	73

LIST OF EXHIBITS¹

Exhibit No.	Description
1001	U.S. Patent No. 11,671,702
1002	<i>Curriculum Vitae</i> of Dan Schonfeld
1003	Declaration of Dan Schonfeld in support of <i>Inter Partes</i> Review
1004	U.S. Patent No. 8,508,622 (“Anon”)
1005	AN-1057 Using an Accelerometer for Inclination Sensing
1006	U.S. Patent No. 5,831,670 (“Suzuki”)
1007	U.S. Pat. App. Pub. No. 2008/0192129 (“Walker”)
1008	U.S. Pat. App. Pub. No. 2004/0012682 (“Kosaka”)
1009	U.S. Pat. App. Pub. 2009/0296989 (“Ramesh”)
1010	U.S. Pat. App. Pub. 2012/0201427A1 (“Jasinski”)
1011	U.S. Pat. App. Pub. 2002/0110286A1 (“Cheatle”)
1012	Liu et al., “Image Quality Assessment Using Multi-Method Fusion” IEEE 2012 (“Liu”)
1013	U.S. Pat. App. Pub. No. 2010/0246939 (“Aisaka”)
1014	U.S. Pat. App. Pub. No. 2005/0270381 (“Owens”)
1015	Excerpts from Hector Garcia-Molina et al., “DATABASE SYSTEMS The Complete Book,” 2009 (“Garcia-Molina”)
1016	Che-Hua Yeh et al., “Personalized Photograph Ranking and Selection System,” 2010 (“Yeh”)
1017	Cavalcanti, et al., “A Survey on Automatic Techniques for Enhancement and Analysis of Digital Photography,” 2013 (“Cavalcanti”)

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

Declaration of Dan Schonfeld in Support of Petition for *Inter Partes* Review of
U.S. Patent No. 11,671,702

I, Dan Schonfeld, hereby certify as follows:

I. ASSIGNMENT

1. I have been retained as a technical expert on behalf of Petitioners Samsung Electronics Co., Ltd. and Samsung Electronics America, Inc. (“collectively, “Samsung” or “Petitioners”) to offer technical opinions regarding whether claims 1-20 (the “Challenged Claims”) of U.S. Patent No. 11,671,702 (“the ’702 patent”) (EX1001) would have been invalid to one of ordinary skill in the art as of October 23, 2012 in connection with the above-captioned Petition for *Inter Partes* Review (“IPR”).

2. For the purposes of this Declaration, I have been asked to assume that the priority date of the alleged invention recited in the ’702 patent is at the earliest October 23, 2012 (hereinafter, the “Priority Date”).

3. I am not currently, and never have been, an employee of Samsung, nor do I have any financial interest therein. I received no compensation for this Declaration beyond my normal hourly compensation for time actually spent analyzing the ’702 patent, the prior art cited below, and any related issues. My compensation is not dependent on the outcome of any IPR or other proceeding involving the ’702 patent.

4. In forming the opinions expressed in this Declaration, I have also relied on my academic and professional experience. I also considered the viewpoint

Declaration of Dan Schonfeld in Support of Petition for *Inter Partes* Review of U.S. Patent No. 11,671,702

of a person having ordinary skill in the art as of the Priority Date. I also relied on the '702 patent and its file history, the references cited in the Petition and in this Declaration, as well as on the exhibits in the exhibit list above.

II. BACKGROUND AND QUALIFICATIONS

5. My qualifications for forming the opinions set forth in this Declaration are summarized here and include my educational background, career history, publications, and other relevant qualifications. My full *curriculum vitae* is attached as EX1002 to this Declaration, and includes my detailed employment background, professional experience, and list of publications.

6. I received my B.S. degree in Electrical Engineering and Computer Science from the University of California, Berkeley, California, in 1986 with a concentration on Computer Engineering / Systems Engineering. I received my M.S. degree in Electrical and Computer Engineering from The Johns Hopkins University, Baltimore, Maryland, in 1988, with a concentration on Speech Processing / Biomedical Signal Processing. I received my Ph.D. degree in Electrical and Computer Engineering from The Johns Hopkins University, Baltimore, Maryland, in 1990, with a concentration on Nonlinear Signal Processing / Image Analysis.

7. In August 1990, I joined the Department of Electrical Engineering and Computer Science at the University of Illinois, Chicago, Illinois, where I am a Professor Emeritus in the Departments of Electrical and Computer Engineering,

Declaration of Dan Schonfeld in Support of Petition for *Inter Partes* Review of
U.S. Patent No. 11,671,702

Computer Science, and Biomedical Engineering. Before I joined the University of Illinois Chicago, I served as an instructor in the Department of Electrical and Computer Engineering at The Johns Hopkins University, Baltimore, Maryland.

8. At the University of Illinois Chicago, I have served as the Director of the University-Industry Engineering Research Center (UIERC), formerly the Manufacturing Research Center (MRC). I am also Co-Director of the Multimedia Communications Laboratory (MCL) and a member of the Signal and Image Research Laboratory (SIRL).

9. Over the past few decades, I have also served as a visiting professor in (a) the Advanced Analytics Institute (AAI) at the University of Technology, Sydney, Australia, (b) the Department of Information Engineering and Computer Science (“DISI”) at the University of Trento, Italy, (c) the School of Computer Engineering at the Nanyang Technological University, Singapore, and (d) the Department of Electrical Engineering—Systems at Tel-Aviv University, Israel.

10. I have been elected Fellow of the Institute of Electrical and Electronics Engineers (“IEEE”) “for contributions to image and video analysis” as well as Fellow of the International Society for Optics and Photonics (“SPIE”) “for specific achievements in morphological image processing and video analysis.” I have also been elected University Scholar of the University of Illinois. A complete list of my

Declaration of Dan Schonfeld in Support of Petition for *Inter Partes* Review of
U.S. Patent No. 11,671,702

publications, professional activities, and honors that I have received is fully set forth
in my *curriculum vitae*, attached hereto as EX1002.

11. I have previously served as Editor-in-Chief and Deputy Editor-in-Chief of the IEEE Transactions on Circuits and Systems for Video Technology. I have also previously served as Area Editor for special issues of the IEEE Signal Processing Magazine. I have served as Associate Editor of the IEEE Transactions on Image Processing (on image and video storage, retrieval and analysis), Associate Editor of the IEEE Transactions on Circuits and Systems for Video Technology (on video analysis), Associate Editor of the IEEE Transactions on Signal Processing (on multidimensional signal processing and multimedia signal processing), and Associate Editor of the IEEE Transactions on Image Processing (on nonlinear filtering). I have also served on the editorial board of the IEEE Signal Processing Magazine, EURASIP Journal of Image and Video Processing, Research Letters in Signal Processing, and Bentham Science Publishers, Ltd.'s "Recent Patents on Computer Science" and "Recent Patents on Electrical Engineering" publications. I have served as guest editor of numerous special issues in various journal publications in the area of multimedia systems.

12. I have previously served on the Conference Board of the IEEE Signal Processing Society. I have previously served as Technical Program Chair of the IEEE International Conference on Acoustics, Speech, and Signal Processing

Declaration of Dan Schonfeld in Support of Petition for *Inter Partes* Review of
U.S. Patent No. 11,671,702

(“ICASSP”) 2018 as well as Program Chair of the IEEE Conference on Visual Communications and Image Processing (“VCIP”) 2015. I have also previously served as General Co-Chair of the Workshop on Big Data in 3D Computer Vision 2013 and the IEEE International Conference on Multimedia and Expo (“ICME”) 2012. I have served as Chair of the IEEE Workshop on Video Mining 2008 and the SPIE Conference on Visual Communications and Image Processing 2007. I have also served on the organizing committees of various conferences, including the IEEE International Conference on Image Processing 1998, 2012, and 2020, the IEEE/SPIE International Conference on Visual Communications and Image Processing (VCIP) 2010, 2017, and the IEEE Workshop on Nonlinear Signal and Image Processing (NSIP) 1997. I was an organizer of the Thematic Symposium on Multimedia Search and Retrieval at the IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP) 2009.

13. I have authored and co-authored over 250 technical papers for various journals and conferences. I was the author of a book chapter, entitled: “Image and video communication networks,” and later editions entitled: “Video communication networks.” I was co-author (with Carlo Giulietti and Rashid Ansari) of a paper that won the Best Paper Award at the ACM Multimedia Workshop on Advanced Video Streaming Techniques for Peer-to-Peer Networks and Social Networking 2010. I was also co-author (with Junlan Yang) of a paper that won the Best Student Paper

Declaration of Dan Schonfeld in Support of Petition for *Inter Partes* Review of
U.S. Patent No. 11,671,702

Award at the IEEE International Conference on Image Processing 2007. I was also co-author (with Wei Qu) of a paper that won the Best Student Paper Award at the IEEE International Conference on Image Processing 2006. I was also co-author (with Nidhal Bouaynaya) of a paper that won the Best Student Paper Award in Visual Communications and Image Processing 2006. In addition, many of my publications relate to the broad topic of multimedia systems, which includes audio, image, and video processing. My publications in the area of multimedia systems date back to 1988. A list of my publications within the past ten years is included in EX1002.

14. I have been selected to be the keynote speaker at the IEEE International Conference on Computer, Electrical and Communication Engineering (ICCECE), Kolkata, India, in 2023. I was also the keynote speaker at the N-Brain Alliance Launch & Product Release Conference and the Think for Education Conference (TEC) AI+Education, both held in Beijing, China, in 2018. I was also the keynote speaker at the International Conference on Wireless Communications and Signal Processing (WCSP), Yangzhou, China, in 2016, and the International Conference on Intelligent Control and Information Processing (ICICIP) and International Conference on Brain Inspired Cognitive Systems (BICS), Beijing, China, in 2013. Further, I was a plenary speaker at the IEEE/IET International Conference on Audio, Language and Image Processing (ICALIP), Shanghai, China, in 2010, and at the

Declaration of Dan Schonfeld in Support of Petition for *Inter Partes* Review of
U.S. Patent No. 11,671,702

IEEE International Conference on Advanced Video and Signal Based Surveillance
(AVSS), Genoa, Italy, in 2009. I was also a plenary speaker at the INPT/ASME
International Conference on Communications, Signals, and Systems (ICCSS), Rabat
Morocco, in 1995 and 2001.

15. I have served as Representative of Regions 1-6 (North America) on the
Chapters Committee of the IEEE Signal Processing Society. I have also served as
Chairman of the IEEE Signal Processing Chicago Chapter. I have also served on
the IEEE Image, Video, and Multidimensional Signal Processing (IVMSP)
Technical Committee, formerly the IEEE Image and Multidimensional Signal
Processing (IMDSP) Technical Committee, Visual Signal Processing and
Communications (VSPC) Technical Committee, IEEE Signal and Image Processing
in Medicine Technical Committee, and the IEEE Multimedia Communications
Technical Committee. I currently serve on the American National Standards
Institute (ANSI) / Underwriters Laboratory (UL) Standards Technical Panel (“STP”)
on Multimedia Systems.

16. I have also taught various courses that relate to multimedia systems.
For example, since the late 1990s, I have introduced and taught an advanced
undergraduate-level / first-year graduate-level course on multimedia systems
(originally called multimedia communication networks), which focuses on audio,
image, and video processing and communications.

17. I have also served as a consultant in various engagements related to multimedia systems. For example, over the past decade, I have served as an expert witness in several cases related to multimedia systems. In 1997, I served as a consultant for Prairiecomm Corp. where, among other tasks, I developed and deployed multimedia systems. Since 2002, I have also served as a member of the American National Standards Institute (ANSI) / Underwriters Laboratory (UL) Standards Technical Panel (STP) on various standards related to multimedia systems.

18. Additional details of my education and work experience, professional activities, awards and honors, and publications that may be relevant to opinions I have formed are set forth in my *curriculum vitae*, which is attached as EX1002 to this Declaration. Additionally, I have consulted for several companies in the area of signal processing and multimedia systems.

III. UNDERSTANDING OF PATENT LAW

19. I am not an attorney, and I do not offer any legal opinions herein. In order to conduct my analysis, I have been provided by attorneys with an understanding of the patent law issues relevant to the analysis. My understanding of these issues is as follows.

20. I understand that patent claims are to be construed as they would have been understood by a person of ordinary skill in the art (“POSITA”) as of the time

Declaration of Dan Schonfeld in Support of Petition for *Inter Partes* Review of
U.S. Patent No. 11,671,702

of invention. I further understand that in this proceeding, terms are to be given their plain and ordinary meaning as understood by a POSITA, and that this standard would also apply in District Court litigation.

21. I understand that in a petition for *inter partes* review, claims are construed under the case *Phillips v. AWH Corp.*, 415 F.3d 1303, decided by the Federal Circuit in 2005, as I note further below in Section VII.

22. I understand that in a petition for *inter partes* review, claims are unpatentable if they are anticipated or obvious. I have been informed that anticipation requires all of a claim's elements to be disclosed expressly or inherently (*i.e.*, necessarily present in the reference) in a single prior art reference, and moreover to be arranged in that reference as they are arranged in the claim. I have been informed that obviousness requires only for the invention to have been obvious at the time of invention from the perspective of a POSITA.

23. I understand that in an IPR proceeding, the Board may only consider anticipation or obviousness based on prior printed publications or prior patents and patent applications. I understand that publications are prior art under § 102(a) if they were known or used by others in the U.S., or patented or published anywhere, prior to the date of invention of the '702 patent. I understand that publications are prior art under § 102(b) if they were patented or published anywhere, or in public use, on sale, or offered for sale in this country, more than one year prior to the earliest U.S.

Declaration of Dan Schonfeld in Support of Petition for *Inter Partes* Review of
U.S. Patent No. 11,671,702

filing date of the '702 patent. I understand that a patent or patent application is prior art under § 102(e) if it has an effective filing date that is prior to the date of invention of the '702 patent.

24. I have been informed and understand that the subject matter of a patent claim is obvious if the differences between the subject matter of the claim and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which the subject matter pertains. I have also been informed that the framework for determining obviousness involves considering the following factors: (i) the scope and content of the prior art; (ii) the differences between the prior art and the claimed subject matter; (iii) the level of ordinary skill in the art; and (iv) any objective evidence of non-obviousness.

25. I further understand that a claim can be found obvious if it unites old elements with no change to their respective functions or alters prior art by mere substitution of one element for another known in the field, with that combination yielding predictable results. I have been informed that common sense should guide such combinations, and there is no rigid requirement for a teaching, suggestion, or motivation to combine. I understand that when a product is available, design incentives and other market forces can prompt variations of it, either in the same field or different one. Additionally, I understand that if a POSITA can implement a

predictable variation, obviousness likely bars patentability, and that if a technique has been used to improve one device, and a POSITA would have recognized that the technique would improve similar devices in the same way, use of the technique is obvious. I further understand that a claim may be obvious if common sense directs one to combine multiple prior art references or add missing features to reproduce the alleged invention recited in the claims.

26. I also understand the following rationale may support a finding of obviousness:

- a. Combining prior art elements according to known methods to yield predictable results;
- b. Simple substitution of one known element for another to obtain predictable results;
- c. User of known technique to improve similar devices (methods, or products) in the same way;
- d. Applying a known technique to a known device (method, or product) ready for improvement to yield predictable results;
- e. “Obvious to try” — choosing from a finite number of identified, predictable solutions, with a reasonable expectation of success;
- f. Known work in one field of endeavor may prompt variations of it for use in either the same field or a different one based on design

incentives or other market forces if the variations are predictable to one of ordinary skill in the art;

g. Some teaching, suggestion, or motivation in the prior art that would have led one of ordinary skill to modify the prior art reference or to combine prior art reference teachings to arrive at the claimed invention.

27. I also understand that it is impermissible to use the claimed invention itself as a blueprint for piecing together elements in the art, or in other words, to use hindsight reconstruction to pick and choose among disclosures in the prior art to reconstruct the claimed invention.

28. I understand that so-called “secondary considerations of nonobviousness” are to be considered in an obviousness analysis. I understand that such an analysis helps to prevent the forbidden use of hindsight in determining whether a patent claim is obvious. I understand that secondary considerations of non-obviousness include, among others: (a) a long-felt but unresolved need for the invention; (b) commercial success of the invention; (c) copying of the invention; (d) praise and recognition of the invention by others; (e) licensing of the rights to the invention; and (f) unexpected results.

29. In rendering my opinions, I followed these guidelines.

IV. SUMMARY OF OPINIONS

30. It is my opinion that each and every Challenged Claim of the '702 patent would have been obvious to a person of ordinary skill in the art ("POSITA") as of the Priority Date in view of the knowledge of a POSITA and prior art cited and in this Declaration.

31. It is my opinion that claims 11-13 and 17-19 are obvious in view of Anon (EX1004), Suzuki (EX1006), and Garcia-Molina (EX1015) (Ground 1A).

32. It is my opinion that claim 14 is obvious in view of Anon (EX1004), Suzuki (EX1006), Garcia-Molina (EX1015), and Ramesh (EX1009) (Ground 1B).

33. It is my opinion that claims 15-16 are obvious in view of Anon (EX1004), Suzuki (EX1006), Garcia-Molina (EX1015), and Jasinski (EX1010) (Ground 1C).

34. It is my opinion that claim 20 is obvious in view of Anon (EX1004), Suzuki (EX1006), Garcia-Molina (EX1015), Jasinski (EX1010), and Liu (EX1012) (Ground 1D).

35. It is my opinion that claims 1-3, 5, and 7-10 are obvious in view of Anon (EX1004), Walker (EX1007), Kosaka (EX1008), Jasinski (EX1010), and Garcia-Molina (EX1015) (Ground 2A).

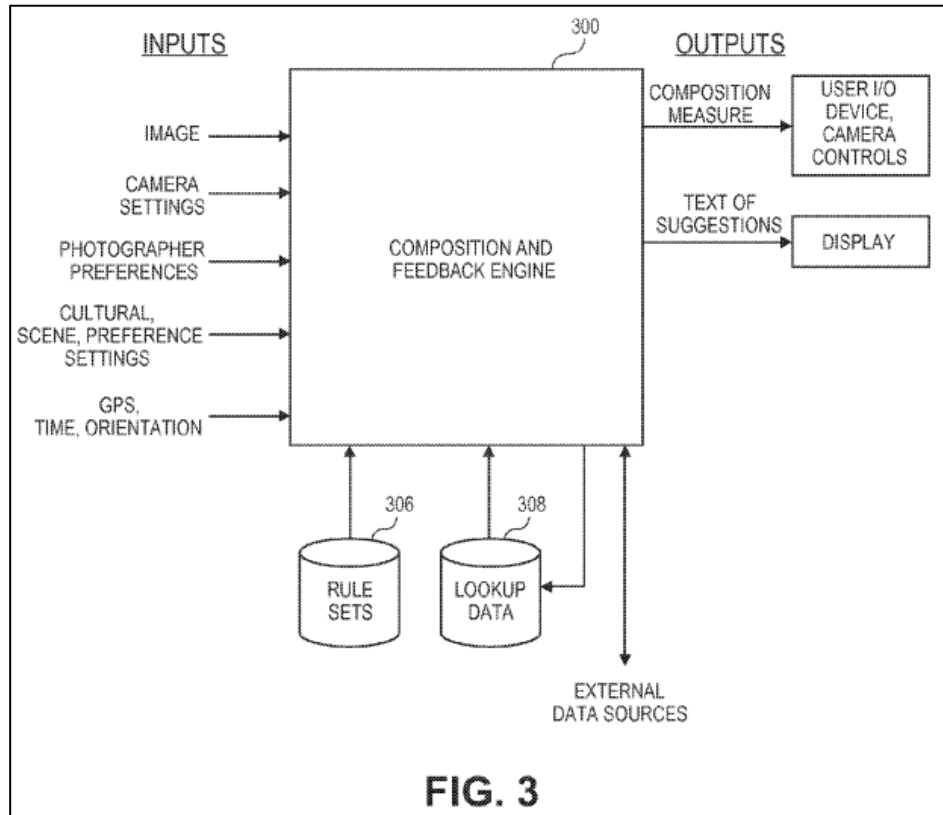
36. It is my opinion that claim 4 is obvious in view of Anon (EX1004), Walker (EX1007), Kosaka (EX1008), Jasinski (EX1010), Garcia-Molina (EX1015), and Cheatle (EX1011) (Ground 2B).

37. It is my opinion that claim 6 is obvious in view of Anon (EX1004), Walker (EX1007), Kosaka (EX1008), Jasinski (EX1010), Garcia-Molina (EX1015), and Ramesh (EX1009) (Ground 2C).

V. OVERVIEW OF THE PRIOR ART

A. Anon

38. 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 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 is illustrated below:



39. Anon has a composition and feedback engine that performs its evaluation using a “weighted, combination of parameters.” *Id.*, 8:32-35. Anon’s composition and feedback engine 300 can make use of inputs from the image capturing device, such as the image itself, the device settings, and metadata, combine it with rule sets 306 and lookup data 308, and output suggestions to the user of the camera to improve image quality. For example, one of those suggestions is taking the photograph at a different location.

B. Suzuki

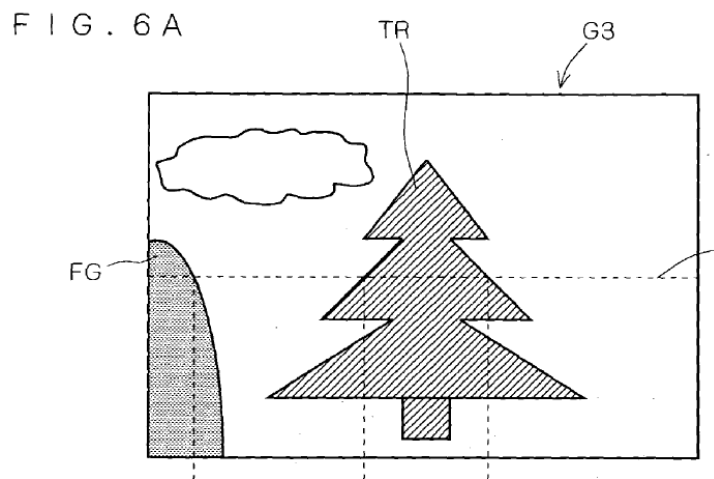
40. Suzuki discloses a camera system that evaluates composition quality based on various factors, including camera leveling, subject position, and the

presence of distracting elements (*e.g.*, tilted horizons, objects behind heads).

EX1006, Abstract, 1:24-32, 1:49-57. For example, if the deviation of a horizontal edge (such as the horizon) from the true horizontal (*e.g.*, ΔY) is greater than a threshold, the system recognizes the horizon as tilted and triggers a recommendation for the user. *See id.*, 22:1-11. Suzuki further teaches the use of thresholds to evaluate image quality related values and to provide user feedback or recommendations when those factors are suboptimal. *Id.*, 7:34-43, Fig. 22.

C. Kosaka

41. Kosaka discloses a digital camera system that detects whether a user's finger (FG in the figure below) is unintentionally blocking the lens before a photograph is taken. *See, e.g.*, EX1008, Fig. 6A.



42. Kosaka's system notifies the user of the finger before the image is taken, allowing the user to move their finger before taking the photograph. *See id.*, Figs. 9-10, 23-25 and ¶ [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”).

D. Walker

43. Walker describes a system and method for automatic capture, management, and storage of images. EX1007, Abstract, ¶¶ [0020]-[0026]. Walker’s system evaluates image quality following capture on a digital camera and manages storage resources efficiently. It further uses a weighted combination of sensors and algorithms to increase image quality and optimize memory. *See id.*, Fig. 9.

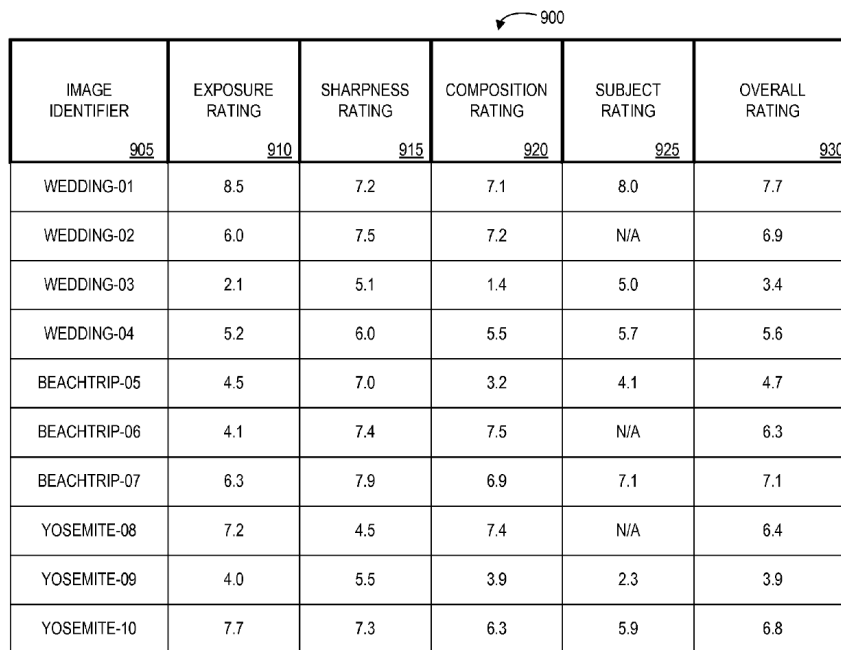


IMAGE IDENTIFIER 905	EXPOSURE RATING 910	SHARPNESS RATING 915	COMPOSITION RATING 920	SUBJECT RATING 925	OVERALL RATING 930
WEDDING-01	8.5	7.2	7.1	8.0	7.7
WEDDING-02	6.0	7.5	7.2	N/A	6.9
WEDDING-03	2.1	5.1	1.4	5.0	3.4
WEDDING-04	5.2	6.0	5.5	5.7	5.6
BEACHTRIP-05	4.5	7.0	3.2	4.1	4.7
BEACHTRIP-06	4.1	7.4	7.5	N/A	6.3
BEACHTRIP-07	6.3	7.9	6.9	7.1	7.1
YOSEMITE-08	7.2	4.5	7.4	N/A	6.4
YOSEMITE-09	4.0	5.5	3.9	2.3	3.9
YOSEMITE-10	7.7	7.3	6.3	5.9	6.8

FIG. 9

44. Walker’s system can automatically capture images based on predefined conditions including camera orientation, user behavior, or environmental factors. EX1007, ¶¶ [0262], [0267], and [0275-0286]. In the system, once images are acquired, image analysis software rates their quality based on factors including,

e.g., exposure, sharpness, composition, and subject/face detection. *Id.*, ¶¶ [0275]-[0286]. Finally, it is determined whether an image should be stored, compressed, or deleted, as well as its resolution and compression. *Id.*, ¶¶ [0271] and [0275].

VI. THE '702 PATENT

A. Claims

45. The '702 patent, titled “Real Time Assessment of Picture Quality,” discloses a method and system for assessing picture quality in camera devices from a plurality or stream of images. EX1001, Abstract, claims 1, 11. The disclosed methods and devices determine several quality indicators (QIs) for the images. *Id.*, 2:23-42. These QIs are then used to determine the “total” quality of captured images and image stills from videos, as well as to generate real-time suggestions for improving photo quality. *Id.*, 3:22-26.

46. The '702 patent has 20 claims of which claims 1 and 11 are independent claims. The two independent claims are directed to methods for estimating image quality. Dependent claims 2-10 and 12-20 further specify the calculation of image quality, including what variables may be considered and what those variables are responsive to, as well as providing specificity on the quality indicators used to determine image quality.

47. Independent claim 1 of the '702 patent claims a method of estimating an image's quality from a stream of images. Claim 1 is reproduced below:

Declaration of Dan Schonfeld in Support of Petition for *Inter Partes* Review of
U.S. Patent No. 11,671,702

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 from the following QI1 to QI4:

obtaining a first value (QI1) responsive to the device motion from at least one motion or location sensor;

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;

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);

obtaining a fo[u]rth value (QI4) responsive to obstruction of at least one optical lens; and

estimating a fo[u]rth weight (c4) associated with the fo[u]rth value;

to select, based on values QI1, QI2, QI3, QI4, at least one appropriate suggestion from a pre-stored table of suggestions of how a user of the system may cause at least on[e] said value to be above or below a threshold and to present said appropriate suggestion to the user.

EX1001, claim 1.

48. Independent claim 11 of the '702 patent claims a method of estimating an image's quality from a plurality of images. Claim 11 is reproduced below:

A method for estimating quality of at least one image from a plurality 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 the optical lens for capturing an image of the scene; a motion sensor for sensing the device motion; wherein the motion sensor consists of, or comprises, an accelerometer, a gyroscope or both, and a processor coupled to at least one 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:

obtaining a first value (QI1) responsive to device angle to the horizon; and

obtaining a second value (QI2) associated with aesthetic quality of image based on composition;

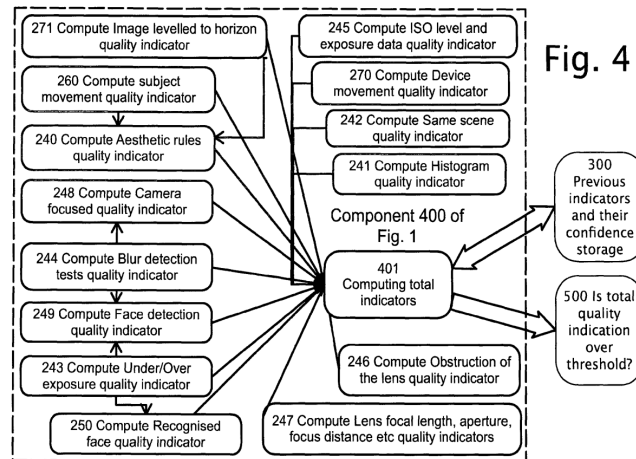
wherein at least one of the values is below a threshold, to select, at least one appropriate suggestion from a pre-stored table of suggestions of how a user of the system may cause at least one of QI1 or QI2, to be the threshold and to present the appropriate suggestion to the user.

EX1001, claim 11.

B. Specification

49. The '702 patent, entitled "Real Time Assessment of Picture Quality," describes a method and system for real-time assessment of picture quality in camera devices. EX1001, Abstract. To assess the "total" quality of captured images, the '702 patent determines quality indicators (QIs) using various sensors, such as

accelerometers and lens modules. *Id.*, 2:23-42. The process of combining these QIs is illustrated in Figure 4:



Id., Fig. 4. Based on the QIs, the system provides real-time feedback and suggestions to users for improving photo quality. *Id.*, 3:22-26.

50. As the '702 patent admits, “[p]rior art has used certain independent quality indicators” and “quantif[ed] the quality by means of a total quality indicator.” EX1001, 2:42-62. The '702 patent distinguishes its invention by stating that in the '702 patent, “the weight of one indicator will take into account data from other quality indicators.” *Id.*, 2:63-67. But QI weights that respond to other QIs are unrelated to most of the Challenged Claims, and were also known in the prior art. *See* Section VIII.E.1.vi below.

C. Prosecution History

51. The prosecution of the '702 patent was minimal. I understand that in prosecution, no prior art reference was substantively discussed, nor were any claims

rejected. Further, the prior art references discussed herein were not considered during prosecution.

D. Person of Ordinary Skill in the Art

52. I understand that there are multiple factors relevant to determining the level of a person having ordinary skill in the pertinent art, including the educational level of active workers in the field at the time of the alleged invention, the sophistication of the technology, the type of problems encountered in the art, and prior art solutions to those problems. In determining the characteristics of a hypothetical person of ordinary skill in the art of the '702 patent as of the Priority Date, I considered factors such as the type of problems encountered in this field, the swiftness with which innovations were made, the sophistication of the technology involved, and the educational background that would be necessary to understand the '702 patent. Finally, I placed myself back in the relevant period of time and considered the state of the art and the level of skill of those working in this field at those times.

53. In my opinion, taking all of the factors into account, a person of ordinary skill in the art related to the '702 patent as of the Priority Date would have had a bachelor's degree in electrical engineering, computer engineering, computer science, or a related field, and at least two years of experience with image processing and analysis. Individuals with different education and experience could still be of

ordinary skill in the art if additional experience compensates for a deficit in their education, and vice versa.

54. I also note that my opinions provided in this Declaration would not change in view of any minor modifications to this level of skill.

VII. CLAIM CONSTRUCTION

55. I understand that for the purposes of this *inter partes* review, claims are to be construed under the so-called *Phillips* standard, under which claim terms are given their ordinary and customary meaning as would be understood by a person of ordinary skill in the art in light of the specification and prosecution history, unless the inventor has set forth a special meaning for a term. I have been asked to assume that there is no need to construe any claim terms for my Declaration and that all that the claim terms of the Challenged Claims should be understood according to their plain and ordinary meaning from the perspective of a POSITA as of the Priority Date. I reserve the right to respond to claim construction positions as necessary in the future, should they be raised by Patent Owner SnapAid, Ltd. (“SnapAid” or “Patent Owner”).

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

56. In this section, I discuss the ’702 patent, the prior art, and why the prior art renders the ’702 patent obvious.

A. Ground 1A: Claims 11-13 and 17-19 are Obvious in View of

Anon, Suzuki and Garcia-Molina

57. As discussed in detail below, it is my opinion that a POSITA would have been motivated to combine Anon with Suzuki and Garcia-Molina, and that this combination discloses the Challenged Claims set forth in this section, or at least renders them obvious.

1. Independent Claim 11

- i. *[11.pre.] “A method for estimating quality of at least one image from a plurality 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 the optical lens for capturing an image of the scene; a motion sensor for sensing the device motion; wherein the motion sensor consists of, or comprises, an accelerometer, a gyroscope or both, and a processor coupled to at least one 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:”*

58. Anon discloses the preamble. In particular, Anon discloses a method for estimating image quality of at least one image from a plurality of images by analyzing several characteristics of the image, computing a composition measure (an image quality measure) based on data including those characteristics, and providing suggestions to a user in real time. *See* EX1004, 2:64-3:1 (“An improved composition and recommendation method and apparatus are described herein. Using this, a photographer (or videographer) is provided signals or indications of a likely

quality of a composition and/or recommendations for improvement usable while the image or video is being taken.”); *see also id.*, 2:9-14, 2:16-28, 2:33-38, 3:14-26. Anon also discloses analyzing a “plurality of images” with the invention. *Id.*, 10:8-26 (“engine might provide a filter to provide suggestions for images from a large body of images that are the more aesthetic image”), 2:45-48 (“plurality of images”), 3:2-10 (“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, or possibly also 3D photography and 3d videography”), cl. 10 (“determining a respective plurality of image-based characteristics using the processor in response to the plurality of images”). In my opinion, a POSITA would have found it obvious in light of these disclosures that Anon’s device comprises a *method for estimating quality of at least one image from a plurality of images*.

59. Anon discloses “[a]n image capturing device includ[ing] an image sensing device, a processor, and a memory,” as well as “lens 102” and “CCD 104” (an image sensor) via which light creates a “digital, electronically readable image[.]” *Id.*, Abstract, 1:59-2:8; 5:54-56. Anon further discloses “[c]amera 100 [] equipped with a processor 106 ... and a composition and feedback engine (‘engine’) 108.” *Id.*, 1:56-59. In my opinion, a POSITA would have found it obvious in light of these disclosures that Anon’s device *comprises at least one optical lens for focusing*

received light from a scene and an image sensor coupled to the optical lens for capturing an image of the scene.

60. Moreover, Anon describes that its disclosed device contains its modules in a single unit, noting 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)[.]” *Id.*, 3:14-17; *see also id.*, 3:17-20 (“The photographer uses a device ... to stage a shot ... and then capturing the image[.]”). In my opinion and in light of this discussion, a POSITA would have found it obvious that the camera components are housed *in a single enclosure* in Anon’s invention, which would have been standard as of the Priority Date. *See, e.g., id.*, Fig. 1, 3:11-14.

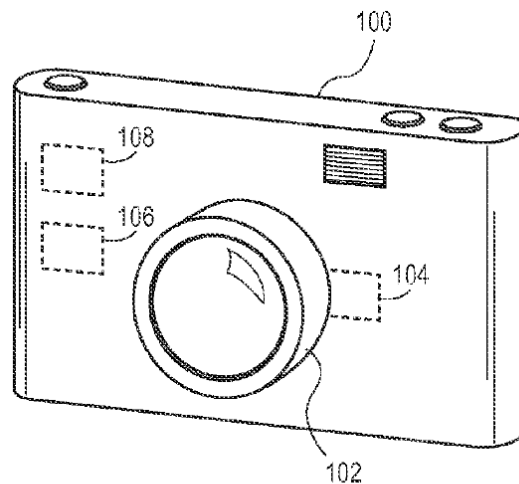


FIG. 1

61. Finally, Anon describes the use of motion sensors (e.g., an “accelerometer for orientation”). *Id.*, 4:24-33 (“Camera-specific external inputs

might include the camera's current geographic location, time of day, orientation and the like.”); *see also id.*, 7:4-7. In my opinion, a POSITA would have found it obvious in light of these disclosures that Anon’s device comprises *a motion sensor for sensing the device motion; wherein the motion sensor consists of, or comprises, an accelerometer.*

62. Anon further describes the use of “engine 108” that “might be coupled to processor 106 to alter how processor 106 manages its inputs and provide outputs for the photographer,” and which “could be implemented as ... software elements executed on **a processor**” *Id.*, 5:62-64, 6:33-41. A POSITA would have found it obvious that engine 108, which includes images as inputs, may be coupled to processor 106, CCD 104 and camera 100. *See id.*, 3:53-60, cl. 9. The inputs of this engine are illustrated in Figure 3 below:

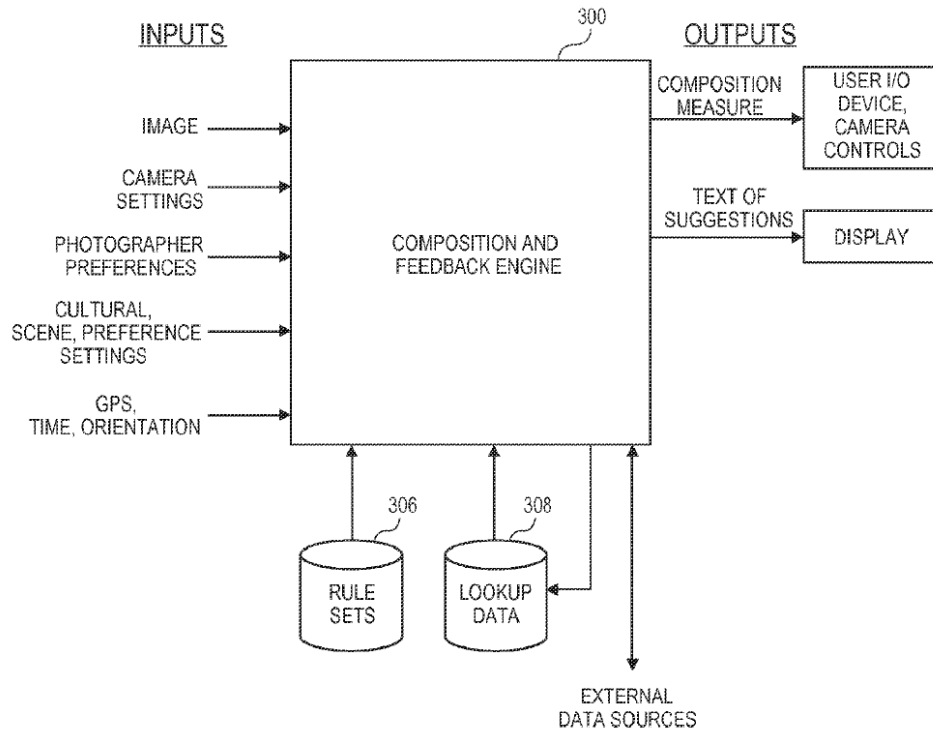


FIG. 3

In my opinion, a POSITA would have found it obvious in light of these disclosures that Anon’s device comprises *a processor coupled to at least one image sensor and to the digital camera for receiving data therefrom.*

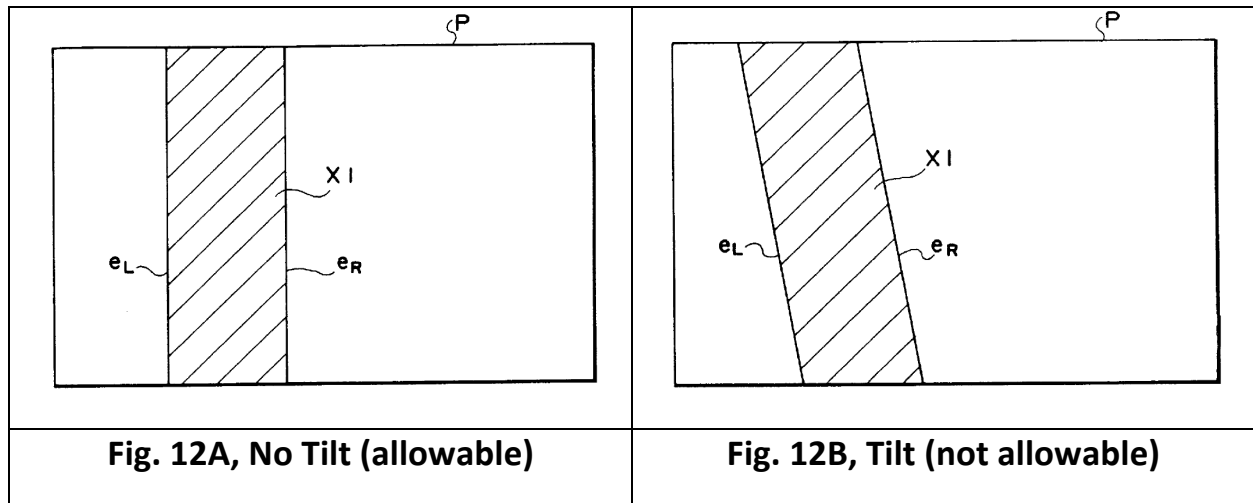
63. Furthermore, Anon’s device renders obvious that engine 108 performs a method comprising *use of at least one value and weight* as described in detail in the elements below.

- ii. [11.a] “*obtaining a first value (QII) responsive to device angle to the horizon*”

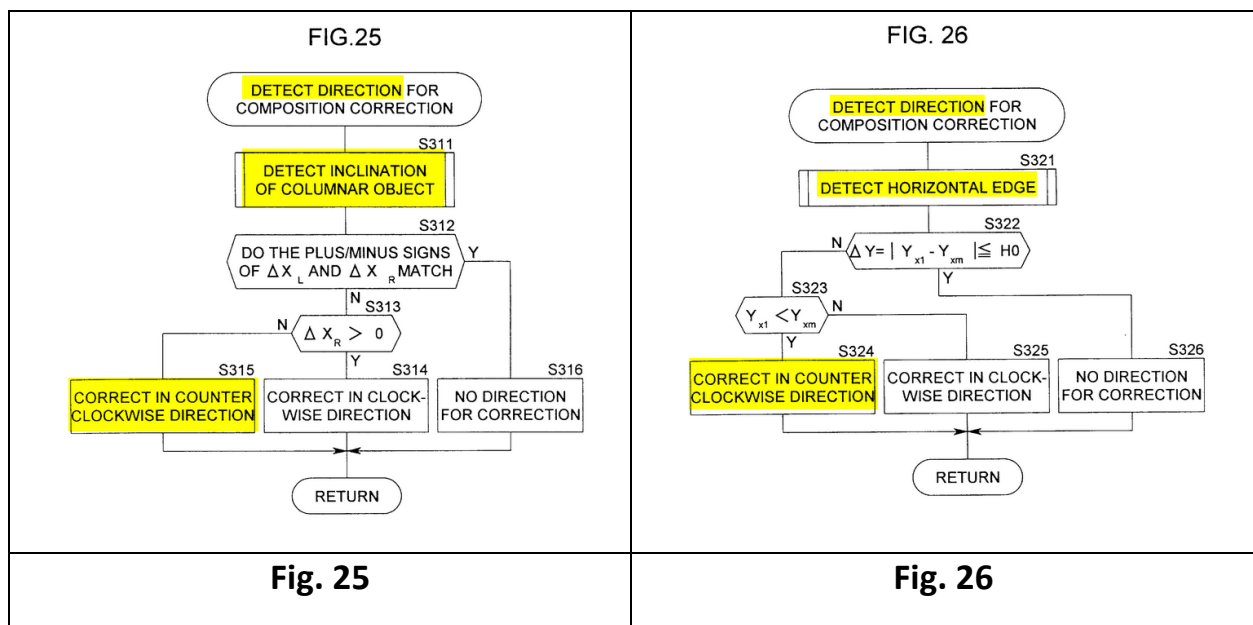
64. Anon notes that engine 108 has inputs including the “orientation of the camera.” EX1004, 4:24–33, 7:4–7 (“orientation inputs”), 8:27–44, 9:40–46 (“orientation of the camera”). Anon notes, for example, that in judging the

composition of an image, parameters including “the orientation of the camera” (*id.*, 8:28-31) and “[c]amera-specific external inputs might include the camera's current geographic location, time of day, orientation and the like” are considered. *See id.*, 4:24-26; *see also id.*, 9:35-50 (“check the sky-to-land ratio and if the sky takes up too much of the frame, suggest aiming the camera lower.”). In my view, given the repeated express disclosures of accounting for camera orientation and similar factors, it would have been obvious to a POSITA that a *first value responsive to the device angle to the horizon* is considered by Anon’s device. For instance, a POSITA would have understood that Anon discloses considering an input Q1 responsive to the horizon line: “the engine might consider that the mode is set to ‘landscape image’ mode, the focal-length of the lens, and the horizon line of in the image.” *Id.*, 7:50-54. A POSITA would have understood that using an accelerometer to determine camera orientation is a standard way to determine a value for the angle of a device relative to gravity, and by proxy, to the horizon (which is directly perpendicular to the angle of gravity). *See* EX1005 at 1 (“an accelerometer can be used to measure the static angle of tilt or inclination” where “the net acceleration or force on a system over time is gravity” in applications such as “horizon detection in digital cameras.”).

65. Other prior art references, including Suzuki, analyze the tilt of a camera by detecting its orientation and applying this to the vertical and horizontal axes. *See*, EX1006, Figs. 12A and 12B.



In Suzuki, deviation values are used to determine the tilt of the camera, then the user is provided with feedback to correct the camera's tilt: "If the amount of deviation ΔX_R is a negative value [less than 0], the direction for correction is set to the counter clockwise direction." See EX1006, 21:40-56, Figs. 25-26.



66. In my view, to the extent that Anon does not disclose or render this claim element obvious, Anon in view of Suzuki does. Moreover, a POSITA would

have been motivated to combine Anon with Suzuki to use Suzuki's method of leveling a camera relative to the horizon, for several well-established technical and practical reasons.

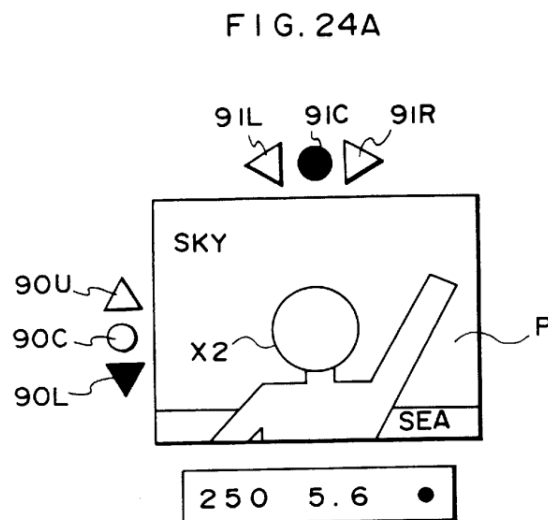
67. **First**, a POSITA would have understood the tilt of a camera, and in general difficulties in leveling a camera, to be well-known elements of determining an image's composition. Suzuki identifies this problem explicitly and notes its effects, including slanted horizons and skewed verticals. *See* EX1006, 1:33-39.

68. **Second**, a POSITA would have found it obvious to use additional factors—such as the “orientation,” “location,” and “horizon” data used by Anon—with Suzuki's system. Such characteristics and the relevant sensors would have been well suited for use with Suzuki's system, as Suzuki details the practical use for those inputs. Moreover, algorithmic systems can and do incorporate personal and contextual factors, and such systems were state-of-the-art in the field during the relevant time period. For instance, a system described by C.-H. Yeh et al., in the paper titled “Personalized Photograph Ranking and Selection System,” allows for “personalized ranking user interfaces,” including both feature-based and example-based re-ranking, and incorporates features such as “texture, RGB color, portrait (through face detection), and black-and-white, ... for individual preferences.” EX1016 (Yeh), Abstract. The paper also describes the use of machine learning

Declaration of Dan Schonfeld in Support of Petition for *Inter Partes* Review of U.S. Patent No. 11,671,702

(ListNet) to learn feature weights based on user preferences, and demonstrates that the “system can re-rank the list closer to user preference.” *Id.*, 2, 6-8.

69. **Third**, a POSITA would have found Suzuki to be a natural extension of Anon’s invention. Anon’s system assesses image composition and provides real-time feedback to the user, including how to place subjects and move the camera. A POSITA would have recognized that using data on the orientation of the camera—already an input in Anon—to do the same, and particularly to level the camera for a better image composition, would have been a natural extension. Suzuki describes providing such feedback to the user to level the camera and improve image quality. EX1006, Fig. 24A (indicator 90L), Abstract (“warning device that issues a warning when the signal indicating poor composition has been issued”), 1:12-46, 1:49–58, 4:27-33, 6:19-56, 7:34-43, 9:27-47, 19:7-42.



This aligns with and is a natural extension of Anon's disclosures of providing feedback to the user to improve image composition.

70. Indeed, multi-feature, modular systems were the norm as of the Priority Date, and a POSITA would not have found combining features for quality assessment to be novel. For instance, a 2013 survey discussing pre-2013 technologies discusses the use of multiple features for both image enhancement and analysis. EX1017 (Cavalcanti 2013), Abstract. It describes how assessment algorithms analyze photos using a variety of features, such as sharpness, brightness, contrast, composition rules (*e.g.*, rule of thirds), face detection, and color harmony. *Id.*, 346-348. The survey also highlights the use of machine learning techniques (*e.g.*, SVM, decision trees, PCA) to combine these features for ranking and classification. *Id.*, 348-349.

71. **Finally**, Suzuki's methods for tilt detection and providing feedback would have been readily implemented by a POSITA in Anon's feedback engine. Both Anon and Suzuki process sensor data and use the data to provide user guidance, and combining them would not require undue experimentation or inventive skill. Indeed, Anon already includes the necessary inputs (*e.g.*, device orientation) and structure to implement Suzuki's methods, making Suzuki uniquely compatible with the architecture of Anon's feedback engine. As such, a POSITA would have found modifying Anon to be straightforward from an engineering perspective. Further,

combining Suzuki with Anon would be a matter of combining prior art elements—combining Suzuki’s tilt detection and correction with Anon’s image composition determination and feedback engine—according to known methods to yield predictable results. This would simply be the use of Suzuki’s known technique to improve similar devices in the same way.

- iii. [11.b] “obtaining a second value (QI2) associated with aesthetic quality of image based on composition”

72. As noted elsewhere, Anon describes its engine receiving an image, determining a plurality of image characteristics (such as color, focus, brightness, and compositional elements), and computing a composition measure for the image given particular settings. See EX1004, 3:43-4:51, 5:26-30, 6:42-50. The composition measure is *associated with an aesthetic quality of image based on the composition*, accounting for various aesthetic values and compositional guidelines, such as the “energy” of an image (*id.*, 4:7-16), aesthetic quality (*id.*, 3:43-4:23), the “rule of thirds,” and balance of luminance (*id.*, 10:41-46). Similarly, Suzuki obtains a value associated with an aesthetic quality of an image based on the composition in the form of, *e.g.*, the degree of dispersion of a photographer’s view points across an image’s frame, which a POSITA would have understood to be an aesthetic consideration indicative of the image’s composition quality. See EX1006, FIG. 5, 6:12-16 (“the **dispersion index number E** is the total of the products that result

from multiplying the present times of the view points $t(1, 1) \sim t(u, v)$ of each area $W(1, 1) \sim W(u, v)$, shown in FIG. 3C, by the area coefficient $a(i, j)$ of each area $W(i, j)$ shown in FIG. 3B”).

73. A POSITA would have been motivated to combine Suzuki with Anon, including for the reasons noted in with respect to the preamble above, and would have been motivated to use the dispersion quality indicator (“dispersion index number E”) with Anon’s composition and feedback engine, and would have had a reasonable expectation of success in implementing it based on Anon’s disclosure of using various characteristics to judge the image. EX1004, 8:14–35, 10:48-50 (“what characteristics are used to determine what is a ‘good’ image are very flexible and can be enhanced or changed completely over time”). This combination of prior art elements would have been according to known methods and would yield predictable results, and would have used a known technique—Suzuki’s analysis of the dispersion quality indicator—to improve Anon’s similar device in the same way. Further, as noted above with respect to claim element [11.a], multi-feature, modular systems were the norm as of the Priority Date, and a POSITA would not have found combining features for quality assessment to be novel. *See* EX1017 (Cavalcanti 2013), Abstract, 346-349.

- iv. [11.c] “wherein at least one of the values is below a threshold, to select, at least one appropriate suggestion from a pre-stored table of suggestions of how a user of the system may cause at least one

*of QI1 or QI2, to be the threshold and to present
the appropriate suggestion to the user.”*

74. Anon uses thresholds to determine ways in which a user may adjust the values of QI1 and QI2, and present suggestions accordingly (e.g., “the camera viewfinder might have three lights (e.g., red, yellow, green) to signal to the photographer a rating of the photograph that would result if a photograph was taken at that time, with those settings, in that location. The photographer might, seeing a red light, move the camera or make other adjustments to see if a yellow or green light could be obtained”). See EX1004, 3:27-33, 5:64-6:8. Suzuki similarly evaluates image quality based on a plurality of factors and recommends changes to the user. For example, when the deviation from the horizon, ΔY , exceeds a threshold, Suzuki’s system will recommend to the user tilting the device. See EX1006, 22:1-11. In my view, a POSITA would have been motivated to combine Anon’s and Suzuki’s disclosures of thresholds informing feedback to a user.

75. **First**, both systems are designed to improve image quality by notifying and suggesting corrections to the user.

76. **Second**, Anon’s system is designed to allow for incorporation of additional evaluation factors, such as those discussed in Suzuki and including threshold comparisons.

77. A POSITA would have found using such thresholds to trigger user feedback a predictable and well-understood method for providing users with

actionable feedback. A POSITA would further have had a reasonable expectation of success in implementing Suzuki's thresholds in Anon to improve the measured image quality. Both Anon and Suzuki disclose using thresholds to provide feedback to users—combining them would have been nothing more than a straightforward, predictable, and technically-compatible way to enhance these complementary methods.

78. As such, a POSITA would have found it obvious to determine if at least one of the input values, associated with an aesthetic quality of image based on the composition, is below a threshold, and to provide suggestions to the user from a pre-stored table on how to improve image quality. Not only would the combination of Anon and Suzuki suggest the use of such a table via Anon's "rule set" (EX1004, 7:15-29), but Anon also references its rules to generate the feedback sent to the user to improve image quality. *See, e.g.*, EX1004, 7:15-29. In short, both systems have the same purpose of offering real-time suggestions to the user, allowing for better-composed images. Note that Anon does not disclose organizing its rules with "tables," but pre-stored tables were also well established in the art. *See* EX1014, Owens (U.S. Pat. App. Pub. No. 2005/0270381) (disclosing use of decision tables and GUI strings). Further, Anon *does* disclose that its rules are organized in "data structures." EX1004, 7:15-21. A POSITA would have found it obvious that tables are a "data structure" that is efficient, common, and easily implemented in this

context. For instance, Garcia-Molina, in a database design textbook, calls tables “the most important model of data.” EX1015 (Garcia-Molina), 17; *see generally id.*, Chapter 2. A POSITA would have found it obvious to use tables to store Anon’s disclosed rule sets, and this 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.

2. Claim 12

79. Claim 12 depends from claim 11 and further recites “wherein the suggestion may suggest to the user to move to another location.”

80. Anon describes suggestions to the user following determining image quality, where one such suggestion includes the user moving to another location. *See, e.g.*, EX1004, 7:55-63 (“the feedback can be a simple visual, audio or vibratory indication...but might also include suggestions for improvement, in the form of arrows, icons, text, etc.”), 9:29-32 (“For example, the engine might optimize a suggestion for changing a camera location to one where the color mix is less desirable, but where the composition is better.”). Likewise, Anon describes the use of camera location settings as well as orientation and scene types as inputs to its engine. EX1004, 2:16-27, 4:24-34, 4:56-5:25, 7:4-14, Fig. 3.

3. Claim 13

81. Claim 13 depends from claim 11 and further requires “calculating a total image quality according to, or based on, the total value, and wherein the total value is calculated based on, QI1 and QI2, and when the total quality is above or below the threshold, give the user feedback or save image to a user storage.”

82. In Anon’s system, input values “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. It would have been obvious to a POSITA that this weight combination is an example of the claimed total image quality. The combined value, or composition measure, is then compared to thresholds, following which the user receives feedback: “[t]he camera might provide more detailed feedback” and the composition measure may prevent a photo from being taken when it is below a certain threshold. *Id.*, 3:33-42, 5:64-6:8.

4. Claims 17, 18, and 19

83. Claims 17, 18, and 19 depend from claims 11, 12, and 13, respectively, and further require “analyzing the captured image for detecting or recognizing one or more objects in the image, wherein the second value (QI2) associated with the aesthetic quality is partially based on detected objects.”

84. Anon analyzes a captured image *for detecting or recognizing one or more objects in the image*, which is an input to Anon’s image composition

determination. EX1004, 3:53–60, 8:15-31, 8:65-9:25, cl. 6 (“classification of the subject is one of a person's face, an animal, a landscape object, a primary object of interest, a building or a landmark”); *see also id.*, 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”).

B. Ground 1B: Claim 14 is Obvious in View of Anon, Suzuki, Garcia-Molina and Ramesh

85. As discussed in detail below, it is my opinion that a POSITA would have been motivated to combine Anon with Suzuki, Garcia-Molina, and Ramesh, and that this combination discloses the Challenged Claims set forth in this section, or at least renders them obvious.

1. Claim 14

86. Claim 14 depends from claim 11 and further recites “wherein the first, or second value is respectively associated with an estimated error in the first or second values.”

87. Anon does not expressly disclose this claim; however, Ramesh discloses the use of a computer vision system that uses a probabilistic framework to track multiple objects such as people. EX1009, Abstract, Fig. 1, ¶ [0039]. Ramesh uses a “weighted sum of partial evidences” for its estimation of people in a crowd,

and an “online uncertainty estimation” such that “less certain guesses”—with a higher estimated error—“are weighted less.” *Id.*, ¶¶ [0034], [0025], and [0030].

88. Various of Anon’s features can have ambiguous or changing conditions such that they would benefit from a probability estimation. *See, e.g.*, EX1009, 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.”). A POSITA would have found this obvious and would have understood Anon’s composition engine to be naturally improvable using Ramesh’s probability estimations. This approach would allow Anon’s calculations to define and deal with error, a natural and necessary part of such calculations, as well as standard deviations and confidence intervals. All these estimations would improve the reliability of Anon’s system and its ability to adaptively adjust weights (*e.g.*, by weighing less-certain inputs lower), which is one of its features. *See, e.g.*, EX1004, 3:53-4:3 (“The inputs that the engine has to work with can include image inputs, ... as well as camera settings In addition to these intrinsic camera inputs, the engine might work with camera-specific, photographer-specific, or cultural-specific external inputs. 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, as might be the case when

photographing a red and yellow bird with a background of green and brown of the surrounding trees). *This input can be used to influence how various characteristics are weighted.*”). A POSITA would thus have found it obvious that Anon and Ramesh in combination would have a more accurate estimation of image quality than Anon alone. This combination would have been the application of a known technique—Ramesh’s probabilistic approach and weighing uncertain parameters lower—to a known device ready for improvement to yield predictable results.

C. Ground 1C: Claims 15 and 16 are Obvious in View of Anon, Suzuki, Garcia-Molina and Jasinski

89. As discussed in detail below, it is my opinion that a POSITA would have been motivated to combine Anon with Suzuki, Garcia-Molina, and Ramesh, and that this combination discloses the Challenged Claims set forth in this section, or at least renders them obvious.

1. Claims 15 and 16

90. Claims 15 and 16 depend from claim 11 and 13, respectively, and further recite “wherein at least one of the values are defined at least partially over a time-dependent confidence level defined over at least one of the values QI1, QI2.”

91. Anon does not disclose these claims, but Jasinski describes the fluctuation over time of confidence in measures of motion estimates in the context of photography, including because of changes in lighting, camera movement, or motion. *See* EX1010, ¶¶ [0030], [0088], and [0122]. A POSITA would have found

obvious that the use of time-dependent confidence levels, discussed in Jasinski, would pair well with Anon's weighted parameters, including because this would account for changes in the reliability of the parameters over time. It would have been obvious to a POSITA that weighing Anon's estimates differently over time would allow for adaptation to any scene conditions, especially in light of Anon's need for real-time accurate feedback to the user. This combination would have been the use of a known technique, a time-dependence confidence level as discussed in Jasinski, to improve similar devices in the same way. As such, a POSITA would have been motivated to combine Anon with Jasinski and would have had a reasonable expectation of success.

D. Ground 1D: Claim 20 is Obvious in View of Anon, Suzuki, Garcia-Molina, Jasinski, and Liu

92. As discussed in detail below, it is my opinion that a POSITA would have been motivated to combine Anon with Suzuki, Garcia-Molina, Jasinski, and Liu, and that this combination discloses the Challenged Claims set forth in this section, or at least renders them obvious.

1. Claim 20

93. Claim 20 depends from claim 16 and further recites "wherein the analyzing of the captured image comprises applying multiple algorithms selected from a group consisting of an aesthetic algorithm, an artificial neural network employing deep learning algorithm, a corner detection algorithm, a blur detecting

algorithm, and Peak Signal-to-Noise Ratio (PSNR) calculation, and the method further comprising obtaining a respective second value (QI2i) associated with each of multiple algorithms, and calculating or estimating the third [sic] value (QI2) based on the multiple third [sic] values (QI2i) from the multiple algorithms.”

94. As noted above, Anon determines a measure of the overall composition measure of an image using inputs associated with aesthetic quality of the image. Liu, meanwhile, describes the use of a number of algorithms for determining aesthetic quality. EX1012 at 1793. Liu describes one such algorithm as the “Peak Signal-to-Noise Ratio” calculation, and notes that it is “possible to achieve significantly better performance by fusing multiple methods.” *Id.* One such method of fusing multiple methods is the Multi-Method Function approach, by which “a regression approach (e.g., support vector regression (SVR))” is used, then “a number of image quality evaluation methods” are collected, before finally “we set the new MMF score to be the nonlinear combination of scores from multiple methods with suitable weighting coefficients. Clearly, these weights can be obtained by the regression approach.” EX1012 at 1793. A POSITA would have found it obvious that these image quality evaluation methods are *respective second value (QI2i) associated with each of multiple algorithms* and that the MMF score disclosed is a quality indicator, *e.g., QI2*.

95. A POSITA would have been motivated to combine Liu's MMF method with the combination of Anon and Suzuki. Liu already describes using a combination of quality indices, and how a single quality index does not outperform others. EX1012 at 1793. Liu further describes how "the idea of multi-method fusion (MMF) arises naturally." *Id.* A POSITA would have found it obvious that based on Liu's disclosure, Anon and Suzuki would naturally benefit from the use of Liu's MMF approach, and would have been motivated to combine the three references to achieve a better measure of image quality. This is especially true given that a POSITA would have understood Anon's image composition engine to be modular and readily improvable by developments such as Liu's MMF approach. As noted above in Section VIII.A.1 with respect to claim element [11.a], multi-feature, modular systems were the norm as of the Priority Date, and a POSITA would not have found combining features for quality assessment to be novel. *See* EX1017 (Cavalcanti 2013), Abstract, 346-349.

E. Ground 2A: Claims 1-3, 5, and 8-10 are Obvious in View of Anon, Walker, Kosaka, Jasinski, and Garcia-Molina

96. As discussed in detail below, it is my opinion that a POSITA would have been motivated to combine Anon with Walker, Kosaka, Jasinski, and Garcia-Molina, and that this combination discloses the Challenged Claims set forth in this section, or at least renders them obvious.

1. Independent Claim 1

- i. *[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 from the following QI1 to QI4”*

97. For the reasons discussed in Section VIII.A.1.i with respect to the preamble of claim 11, and the reasons discussed below in Section VIII.E.1.ii with respect to element [1.a], in my view, a POSITA would have found that Anon’s device renders the preamble obvious. In particular, a POSITA would have found it obvious that (a) Anon’s device *comprises at least one optical lens for focusing received light from a scene and an image sensor coupled to the optical lens for capturing an image of the scene*, (b) the camera components are housed *in a single enclosure* in Anon’s invention, and (c) Anon’s engine, which includes images as inputs, may be coupled to the image sensor and the camera, and perform a method *comprising use of at least one value from the following QI1 to QI4*. Moreover, Anon discloses that its quality of a composition method is for image or “video,” which a POSITA would have understood to be a stream of images. *See, e.g., EX1004, 2:64-*

3:1 (“An improved composition and recommendation method and apparatus are described herein. Using this, a photographer (or videographer) is provided signals or indications of a likely quality of a composition and/or recommendations for improvement usable while the image or video is being taken.”), 3:2-10 (“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....”). In my opinion, a POSITA would have found it obvious in light of these disclosures that Anon’s device comprises a *method for estimating quality of at least one image from a stream of images*.

- ii. [1.a] “obtaining a first value (*QII*) responsive to the device motion from at least one motion or location sensor”

98. Anon teaches that its engine has inputs including camera settings, photographer preferences, various settings for cultural preferences, scene preferences and the like, location, time, and orientation inputs. EX1004, Fig. 3, 4:24-34, 7:4-29. Parameters “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) as well as “[c]amera-specific external inputs” like “the camera’s current geographic location, time of day, orientation and the like” (*id.*, 4:24-26) determine how the image quality is judged. For example, Anon describes the use of the location sensor: “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. It would have been obvious to a POSITA that such “GPS coordinates” are a *first value*, as they include longitude and latitude coordinate values. The same is true of motion sensors, which Anon notes “can provide the engine with inputs as to how the camera is moving” (*id.*, 10:26-35) and which Anon describes the use of: “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] “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”

99. Anon does not describe the use of a *measurement of under or over exposure of at least one of a part of image* as one of its quality indicators. That said, Walker uses “exposure of specific portions of an image” including “whether a person’s face in an image is correctly exposed” in evaluating image quality. EX1007, ¶¶ [0275]-[0277] and [0280]; *see also id.*, ¶¶ [0023], [0151]-[0152], [0157], [0174]-[0181], [0262], [0276], [0290], [0294], [0295], [0321], [0326], and [0430]. For example, Walker describes that “a camera may determine whether to store and/or how to store an image based on the image . . . by evaluating the quality of the image or one or more characteristics of the image.” *Id.*, ¶ [0275]. Walker

further notes that “[i]f the image is high quality (e.g., well-exposed ...), then the image may be stored by the camera in secondary memory, [but i]f the image is low quality (e.g., underexposed, ...), then the image may be compressed and stored or just deleted or overwritten,” and that “‘quality’ . . . may be used to refer to a variety of different factors that affect whether an image is (or is likely to be) desirable to a user.” *Id.*, ¶ [0276]. Walker explicitly states that image quality is determined using **“exposure of the image—**For example, the camera may determine if an image is exposed correctly. Images that are exposed correctly may be considered higher quality, whereas images that are over-exposed or under-exposed may be deemed to be of lower quality. In a second example, **the camera may determine the exposure of specific portions of an image.** For example, the quality of an image may depend on **whether a person's face in an image is correctly exposed.**” *Id.*, ¶ [0280]. As such, Walker’s discussion of exposure constitutes the claimed *a second value (QI2)*. *See also id.*, ¶¶ [0151]-[0152], [0176]-[0177], and [0280].

100. In my view, Anon and Walker are directed to the same problem of evaluating and improving digital image quality. *See, e.g.,* EX1007, ¶¶ [0275]-[0290]. Although Walker involves a comprehensive evaluation of image quality whereas Anon focuses on real-time feedback regarding image composition, a POSITA would have found it obvious that exposure data was fundamentally relevant to the overall image quality, in part because poor exposure can reduce detail. *See*

Declaration of Dan Schonfeld in Support of Petition for *Inter Partes* Review of
U.S. Patent No. 11,671,702

EX1007, ¶¶ [0151]-[0152], [0176]-[0177] (“An exposure rating 910 preferably indicates the relative quality of the exposure of an acquired image”), and ¶ [0280]. Anon aims to improve overall image quality, and even does so by offering suggestions related to image brightness, which is directly related to image exposure. EX1004, 2:9-15; *see* EX1004, 1:59-2:8.

101. A POSITA would have been motivated to combine Anon with Walker by implementing Walker’s determination of exposure for image quality in Anon’s system for several reasons. **First**, Anon’s framework has a clear need for a reliable exposure input given its evaluation of total image quality, and this need would have been filled by Walker’s exposure analysis. **Second**, Anon describes the use of various different characteristics to evaluate an image. EX1004, 8:14–35, 10:48-50 (“what characteristics are used to determine what is a ‘good’ image are very flexible and can be enhanced or changed completely over time”). **Finally**, exposure is a well-known key determinant of image quality, and a POSITA would have found it obvious to analyze exposure in evaluating image quality. This would include knowledge of prior art systems doing the same. *See, e.g.*, EX1013, U.S. Pat. App. Pub. No. 2010/0246939 to Aisaka, EX1007, U.S. Pat. App. Pub. No. 2008/0192129 to Walker, and EX1014, U.S. Pat. App. Pub. No. 2005/0270381 to Owens.

102. Moreover, a POSITA would have had a reasonable expectation of success in the combination of Anon and Walker. **First**, Walker’s exposure

evaluation, which produces quantitative exposure ratings (EX1007, ¶¶ [0176]-[0177], [0174], [0181], and [0294]), would have been easily imported in Anon’s system, which readily uses such quantities to evaluate image composition. **Second**, both Anon’s system and Walker’s system describe using modular quality indicators to determine user feedback, and inputting one more “module” (Walker’s exposure data) into Anon’s system would have been a straightforward extension of Anon. Indeed, as noted above with respect to element [11.a] in Section VIII.A.1, multi-feature, modular systems were the norm as of the Priority Date, and a POSITA would not have found combining features for quality assessment to be novel. *See* EX1017 (Cavalcanti 2013), Abstract, 346-349.

- iv. *[1.c] “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)”*

103. It would have been obvious to a POSITA that Anon teaches facial detection and recognition within an image. EX1004, 3:62-4:3 (“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, as might be the case when photographing a red and yellow

bird with a background of green and brown of the surrounding trees). This input can be used to influence how various characteristics are weighted.”). A POSITA would further have found it obvious that this “indication of where in the image the subject is” is a third value (QI3). A POSITA would further have found it obvious that detecting smiles or closed smiles in these “most prominent face[s]” is the sort of characteristic Anon would use as *a third value (QI3)*. *Id.*, 3:53-4:3, 7:4-7, Fig. 3. To the extent Anon does not explicitly disclose using inputs such as *looking at camera* or *smiling*, a POSITA would have found it obvious to use such inputs in view of Anon’s disclosures. EX1004, 1:47-55; 3:53-4:3. Anon discusses that “what characteristics are used to determine what is a ‘good’ image are very flexible and can be enhanced or changed completely over time.” EX1004, 10:47-50. A POSITA would have found it obvious that this means Anon’s engine is meant to be modified and improved. Note further that Anon discloses that eye contact and smile detection were well known in the art. *Id.*, 1:47-55.

104. The combination of Anon and Walker further discloses this element. Anon and Walker both use object detection, including faces, in their image quality evaluations: Walker’s system “may use face recognition software to identify a person in an image.” EX1007, ¶ [0286]; *see also id.*, ¶¶ [0096] (“may use the user’s personalized database of images for reference in identifying people, objects, and/or scenes in an image captured by the user”), [0186], claim 30 (“wherein the

characteristic of the image comprises at least one of . . . subject of the image [or] face recognition.”). Further, Walker’s system “may determine whether anybody . . . **looked away** (i.e., somebody is not looking at the camera),” by which the camera may “determine that the image is lower quality.” EX1007, ¶¶ [0275]-[0286]. Further, Walker notes that facial recognition is a quality indicator, a “characteristic[] of an image that may be indicative of the quality of an image,” which is used to determine image quality. *Id.*, ¶¶ [0275]-[0278] and [0284]-[0286]. Therefore, Walker’s facial recognition constitutes the claimed *third value*. Further, Walker’s system uses this facial recognition value to calculate an image’s “overall rating” that “indicates a quality of the image” and is “based on one or more of a plurality of ratings.” *Id.*, ¶¶ [0171]-[0172] and [0296], Figs. 8-9. Specifically, “the overall rating of an image may be determined as the weighted average of the image’s categorical ratings.” *Id.*, ¶ [0296].

Declaration of Dan Schonfeld in Support of Petition for *Inter Partes* Review of
U.S. Patent No. 11,671,702

↖ 900

IMAGE IDENTIFIER 905	EXPOSURE RATING 910	SHARPNESS RATING 915	COMPOSITION RATING 920	SUBJECT RATING 925	OVERALL RATING 930
WEDDING-01	8.5	7.2	7.1	8.0	7.7
WEDDING-02	6.0	7.5	7.2	N/A	6.9
WEDDING-03	2.1	5.1	1.4	5.0	3.4
WEDDING-04	5.2	6.0	5.5	5.7	5.6
BEACHTRIP-05	4.5	7.0	3.2	4.1	4.7
BEACHTRIP-06	4.1	7.4	7.5	N/A	6.3
BEACHTRIP-07	6.3	7.9	6.9	7.1	7.1
YOSEMITE-08	7.2	4.5	7.4	N/A	6.4
YOSEMITE-09	4.0	5.5	3.9	2.3	3.9
YOSEMITE-10	7.7	7.3	6.3	5.9	6.8

FIG. 9

EX1007, Fig. 9.

105. In my view, a POSITA would have been motivated to combine Anon with Walker by using Walker’s facial recognition and eye contact determination as an input for Anon’s image quality determination. **First**, Anon describes that a “good” image often has a single subject in focus, and Walker quantifies whether a single subject makes an image “high quality” in the subject’s eye contact with the camera. EX1004, 8:19-26; *see e.g.*, EX1007, ¶¶ [0284]-[0286]. **Second**, Anon aims to evaluate images using a plurality of image-based characteristics, and Walker details one such characteristic—an “overall rating” based on several technical factors, including facial recognition. *See* EX1004, 3:53-59 (“the engine has to work with... higher-level aspects of the image being sensed (*e.g.*, the lack of sharp edges

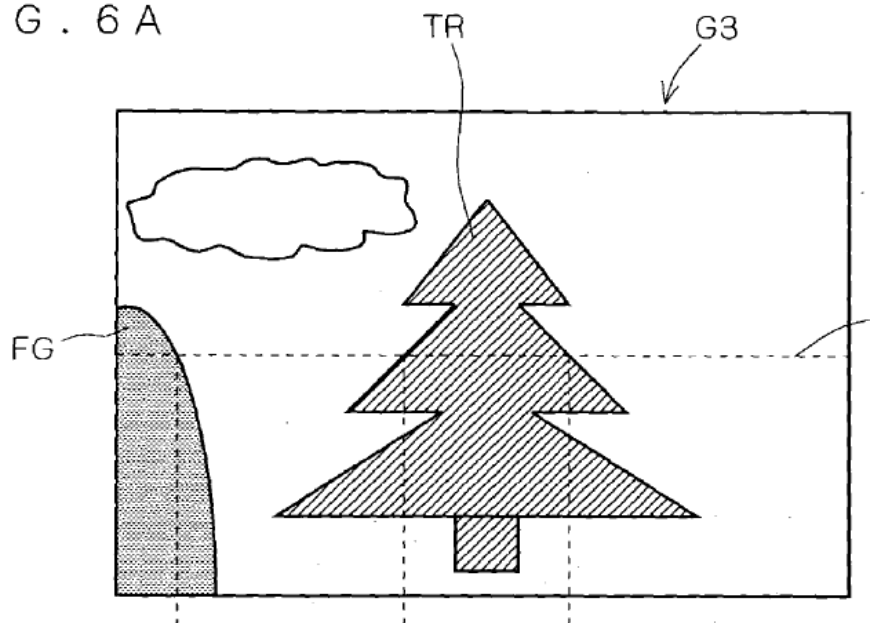
that might indicate a lack of appropriate focus) as well as camera settings”); EX1007,
¶¶ [0171]-[0172], [0275]-[0278], [0284]-[0286], and [0296].

106. Given the above, a POSITA would have had a reasonable expectation of success in combining Anon’s composition and feedback with Walker’s object-based scoring. Using Walker’s system, Anon’s system would have been able to more accurately identify images with a well-captured subject, which is in line with the goals of each system.

v. [1.d] “obtaining a fourth value (QI4) responsive to obstruction of at least one optical lens”

107. Anon does not describe the use of an *obstruction of at least one optical lens* as one of its quality indicators. However, Kosaka detects such obstructions to evaluate image quality. *See, e.g.*, EX1008, Fig. 6A.

F I G . 6 A



Kosaka's system analyzes images in real time, before capture, and identifies low-brightness areas remaining stationary while other images shake or reframe. *See, e.g.*, EX1008, Figs. 4A–8, ¶¶ [0074] and [0075]; *see also id.*, Abstract, Figs. 9, 24, ¶¶ [0047] and [0098]. Thus, in Kosaka's system, changes over time based on the movement of low-brightness areas are detected, and if they remain stationary, they are marked as obstructions. *Id.*; *see also id.*, Abstract, ¶¶ [0089] and [0141]. It would have been obvious to a POSITA that this analysis generates a *fourth value (QI4) responsive to obstruction* as claimed.

108. Kosaka describes how the camera provides feedback to the user before an image is taken when 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”). Anon, Walker, and Kosaka each aim to improve image quality and automate the process of selecting such images. The approaches of each are complementary; where Anon accepts various image characteristics as inputs to its engine, Walker provides a subject-aware object detection evaluation (a score), and Kosaka identifies a specific image defect that lowers image quality.

109. A POSITA would have been motivated to combine Anon with Kosaka by implementing Kosaka's obstruction determination in Anon's image quality

determination engine, including in combination with Walker. **First**, Kosaka describes the ubiquitousness of finger obstructions causing poor image quality, and Anon’s system is designed to detect and fix image quality flaws. *See* EX1008, ¶¶ [0006] and [0007]; *see, e.g.*, EX1004, 2:64–3:1. Using Kosaka’s obstruction signal as an input in Anon’s engine would thus have allowed Anon’s system to provide user feedback and remediate the issue addressed in Kosaka. **Second**, Anon’s system accepts a variety of inputs to its engine, such as “higher-level aspects of the image being sensed” and “image-based characteristics”. *See, e.g.*, EX1004, 2:9-15, 3:53-57. Kosaka’s output regarding an obstruction would have been a natural fit as one such input, *e.g.*, as a binary signal (with a variable weight). **Third**, Anon’s system would naturally benefit from the addition of both Walker and Kosaka, as Walker provides a subject-aware object detection evaluation (a score), whereas Kosaka measures specific defects such as finger obstructions. EX1007, ¶¶ [0275]-[0286].

110. A POSITA would have had a reasonable expectation of success in implementing the combination of Anon, Walker, and Kosaka. Anon accepts and combines various inputs in various combinations, and Kosaka’s output would naturally fit as one such input. And because Anon and Walker both score the quality of an image using evaluation metrics, Kosaka would have been a straightforward addition in that it discloses finger obstructions as one such evaluation metric. The

addition of Kosaka would further yield predictable and desired results in yielding recommendations to a user following the combination.

- vi. [1.e] “*estimating a fo[u]rth weight (c4) associated with the fo[u]rth value.*”

111. Anon describes determining a plurality of image-based characteristics (*i.e.*, QIs) for an image and using them to “compute 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. It would thus have been obvious to a POSITA that this computation does not use merely one of the image-based characteristics, but multiple (“at least two”) of them, each of which may contribute differently to the composition measure.

112. Anon’s engine further uses both intrinsic characteristics (*e.g.*, color, focus, brightness, energy) and external characteristics (*e.g.*, geographic location, time of day, user preferences, cultural rules) to determine image composition, noting that the 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. A POSITA would therefore have found it obvious that Anon’s system weighs different characteristics differently, given that it considers what would be optimal for a particular characteristic and makes tradeoffs between what is optimal for one characteristic and what improves the image composition.

113. Walker similarly discloses that the “overall rating of an image may be determined as the weighted average of the image’s categorical ratings (*e.g.*, exposure may be weighted more than subject).” EX1007, ¶ [0296]. And as discussed above with respect to element [1.d], a POSITA would have been motivated to combine Kosaka and Walker as weighted inputs in Anon.

114. To the extent “estimating” is narrowly construed to require a real-time and context-dependent determination of a value’s weight, this is disclosed by Anon. EX1004, 3:53-4:3 (“***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, as might be the case when photographing a red and yellow bird with a background of green and brown of the surrounding trees). This input can be used to influence how various characteristics are weighted.***”). And to the extent Anon is found not to disclose this element, Jasinski remedies this. For instance, Jasinski dynamically calculates weights for each region of an image, and then recalculates for every image or sequence such that the system can adapt to changing scene conditions. *See, e.g.*, EX1010, ¶¶ [0119]-[0122]. Jasinski states that “[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]. Moreover, various of the attributes disclosed by Jasinski may be considered in the determination of importance (*i.e.*, weight) of other attributes, such as image detail, scene brightness, region position, important features in a region, and confidence. *Id.*, ¶¶ [0120], [0121] (“image regions 365 with high levels of image detail can be weighted more highly than image regions 365 with lower levels of image detail”), [0114] (“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”), [0120] (“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 ... Likewise, image regions 365 located in the periphery ... can be deemed to be of lower relative importance than those which are centrally located”), [0120] (“image regions 365 in a face zone or an autofocus zone can be weighted more highly”), and [0122] (“the shape of the fitting function 475 can provide an indication of the relative confidence level”). Further, Jasinski’s dynamic weighting system may be used to determine image capture settings. *See id.*, ¶ [0031].

115. It would have been obvious to a POSITA that using Jasinski’s dynamic weighting system in Anon’s weighted image quality evaluation would make the system more adaptive to change in the various parameters analyzed by Anon over

time or in different regions of the image. Jasinski would fit naturally as an extension of Anon's teaching, and the combination would have been the use of a known technique (Jasinski's dynamic weighting) to improve similar devices in the same way. As such, a POSITA would have been motivated to combine the complementary teachings of Anon and Jasinski with a reasonable expectation of success.

- vii. *[1.f] "to select, based on values QI1, QI2, QI3, QI4, at least one appropriate suggestion from a pre-stored table of suggestions of how a user of the system may cause at least on[e] said value to be above or below a threshold and to present said appropriate suggestion to the user."*

116. Anon evaluates inputs based on an image, or quality indicators, and then computes an overall image quality measure and suggests ways to improve an image to a user. These suggestions relate to whether characteristics meet a threshold, as discussed above with reference to claim element [11.c]. See Section VIII.A.1; EX1004, 4:13-16. It would have been obvious to a POSITA that the combination of Anon, Walker, Kosaka, and Garcia-Molina describes using a pre-stored table of suggestions to improve image quality.

117. Anon, for example, relies on various pre-defined rules and criteria to analyze an image, including in the form of a "rule set," as after the engine "compute[s] a composition measure for the proposed image," it "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, 7:15-29; *see also id.*, 1:59-2:4. It then uses these rules to generate suggestions for a user based on image composition. *See, e.g., id.*, 5:53-6:8, 6:42-7:14. Anon’s 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.” *Id.*, 7:15-21. For 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.*, 7:44-54.

118. While Anon does not explicitly state that it uses “tables” to organize rule sets, it does use “data structures.” *Id.*, 7:15-21. A POSITA would have found it obvious that tables are a “data structure” that is efficient, common, and easily implemented for data manipulation in this context. For instance, Garcia-Molina, in a database design textbook, calls tables “the most important model of data.” EX1015

(Garcia-Molina), 17; *see generally id.*, Chapter 2. A POSITA would have found it obvious to use tables to store Anon’s disclosed rule sets, and this 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.

119. A POSITA would have been motivated to combine Anon, Walker, Kosaka, and Garcia-Molina to select a suggestion from a pre-stored table and present it to the user, resulting in a system that monitors image and camera parameters, compares them to thresholds, and provides feedback to the user. Anon computes an image quality measure using image-based characteristics and context, which it then uses to output suggestions to the user. *See* EX1004, 5:26-51. Anon further teaches using thresholds based on that image quality measure, as well as the inputs, to trigger a suggestion to the user. *See id.*, 4:13-16, 5:64-6:8. Walker similarly gives images an “overall rating” based on multiple methods and assigned scores for an evaluated image, which it then compares to thresholds to determine whether an image has a high quality. *See e.g.*, EX1007, ¶¶ [0275] and [0286], Figs. 8-9; *id.*, ¶¶ [0030]-[0031] (“Evaluating may comprise determining if an image is of a predetermined quality (e.g., ‘high’ quality, or the image has an **associated rating greater than a threshold value**)”), [0188], [0313] (“images that receive ratings of higher than a threshold value may be stored in the camera’s secondary memory”), and [0319]-

[0320] (“a camera may compare a rating of an image to a threshold value (e.g., to determine if the rating is better or worse than the threshold value)”). Kosaka teaches detecting finger obstructions and, once again, offering feedback to the user conditional on that detection, when a value exceeds a threshold (indicating that an obstruction was detected). *See* EX1008, ¶¶ [0008] and [0098].

120. Given the above, the combined system would respond to a value’s deviation across a threshold, then consult a pre-stored table to generate a suggestion for the user. A POSITA would have found this an obvious, predictable, and modular approach, would have agreed that this approach is widely used in the art, and would have implemented it in this combination with a reasonable expectation of success. *See* EX1014, ¶ [0018].

2. Claim 2

121. Claim 2 depends from claim 1 and further recites “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.’” Although Anon does not expressly disclose such suggestions, it does disclose suggestions to the user which “might be presented in a viewfinder display,” as well as the fact that a lack of sharp edges might indicate a lack of inappropriate focus.

EX1004, 3:53-57, 6:4-8. It would have been a simple matter of design choice to make such suggestions in the manner recited in claim 2.

3. Claim 3

122. Claim 3 depends from claim 1 and further requires “grading the image quality according to, or based on, the total value, and wherein the total value is calculated based on at least one of QI1, QI2, QI3, QI4.” Anon discusses weighting and combining input parameters to calculate a total image quality value in a process by which “these [individual] 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’s composition measure of an image may also rate uncaptured (proposed) images and is a measure of grading image quality. *Id.*, 6:42-45, *see also id.*, 8:16 (“judge a properly composed image”); *see generally id.*, 8:14-35.

4. Claim 5

123. Claim 5 depends from claim 1 and further recites “wherein QI1 is estimated according to, or based on, the detection value of at least one face detection.” This element is disclosed for the same reasons discussed with respect to claim element [1.c]. *See supra* in Section VIII.E.1.iv.

5. Claim 7

124. Claim 7 depends from claim 1 and further recites “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.” Anon does not explicitly disclose this element. Jasinski discusses fluctuations in reliability of motion estimates caused by factors including changes in content, lighting, and movement. *See* EX1010, ¶¶ [0007] and [0017]. Thus, Jasinski’s system may track confidence levels in a sequence of images by comparing its motion estimates. *See id.*, ¶¶ [0030], [0088], and [0122]. Jasinski further teaches weighting coefficients according to the confidence level determined. *Id.*, ¶ [0122] (“Another factor that determine the weighting coefficients w_i is a relative confidence level associated with the local motion velocity 375.”). It would have been obvious to a POSITA that weighting Anon’s estimates using Jasinski’s confidence-based weighting over time would make Anon’s system more adaptive, reliable, and up-to-date in its estimations and calculations. Finally, for the reasons discussed above with respect to claims 15 and 16, a POSITA would have been motivated to combine Anon with Jasinski and would have a reasonable expectation of success. *See* Section VIII.C.1.

6. Claim 8

125. Claim 8 depends from claim 1 and further recites “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 image for the purpose calculation of said second value (QI2): over or under exposure value.” A POSITA

would have found this claim obvious for the reasons discussed with respect to claim elements [1.b] and [1.c] above. *See supra* Sections VIII.E.1.iii, VIII.E.1.iv.

7. Claim 9

126. Claim 9 depends from claim 1 and further recites “wherein at least one of the values (QI1, QI2, QI3, QI4, total value) causes change of one of focus point, ISO or aperture of at least of lens module.”

127. Anon describes the use of various inputs in its image quality estimation system, including geographic location, time of day, camera orientation, and image-based characteristics. *See, e.g.,* EX1004, 4:24-33. These inputs are used to automatically adjust or suggest to the user various changes to, *e.g.,* focus, aperture, and exposure. *Id.*, 2:16-41 (“the image capturing device will ***automatically make the change***”), 6:42-47 (“[t]he [composition] measure is provided to user input output devices or elements, as explained elsewhere herein or ***to camera controls as appropriate***”), 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”); *see also id.*, 8:36-43, 2:29–36, 1:42-49.

128. A POSITA would have recognized and found obvious that automatic correction is more convenient for the user, as described in Anon. *Id.*, 1:42-49 (“so

that the user is freed from having to estimate distances or manually set the focus”).

I note that consumer cameras have long had such automatic adjustment optionality (including for focus, ISO, and aperture), and this is by no means new or unique, as discussed in Anon. *Id.*, 1:42-49.

8. Claim 10

129. Claim 20 depends from claim 13 and further recites “wherein the total value is above threshold, an image is saved into user persistent memory.”

130. Anon describes the weighing and combination of its parameters during calculation of an image composition value, stating “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 further describes how the ultimate combined value is compared to a threshold. *See, e.g., id.*, 5:64-6:8; *see supra* in Section VIII.E.1.vii. Additional “post-processing” occurs based on this calculation, which is then saved in user persistent memory. *Id.*, 10:1–25. It would have been obvious to a POSITA that a quality image is then saved in user persistent memory, as Anon’s invention allows a user to capture the image immediately following Anon’s output of a composition measure—which naturally results in the image being saved in user persistent memory. *See* EX1004, 2:6–8, 3:10-12. Thus, the purpose of Anon is accomplished in only saving high quality images.

131. To the extent Patent Owner contends Anon alone does not disclose this element, Walker remedies any deficiency. In Walker's system, "images that receive ratings of higher than a threshold value may be stored in the camera's secondary memory" and "an image that receives a rating of less than a threshold value may be deleted from the camera's memory." EX1007, ¶ [0313]; *see also id.*, ¶¶ [0319]-[0320], [0323]-[0327], [0373]-[0374], [0428], [0030]-[0031], [0188], [0068] ("secondary memory will typically refer herein to memory that is non-volatile"), and [0122]. This is in part because it was well known in the art that digital cameras may run low on space. *Id.*, ¶ [0322]. A POSITA would have been motivated to combine and would have had a reasonable expectation of success in combining Anon, Walker, and Kosaka to save images in user persistent memory based on comparisons to a threshold. It would have been obvious to a POSITA that such a process would be a more efficient use of limited storage space.

F. Ground 2B: Claim 6 is Obvious in View of Anon, Walker, Kosaka, Jasinski, Garcia-Molina and Cheatle

132. As discussed in detail below, it is my opinion that a POSITA would have been motivated to combine Anon with Walker, Kosaka, Jasinski, Garcia-Molina, and Cheatle, and that this combination discloses the Challenged Claims set forth in this section, or at least renders them obvious.

1. Claim 4

133. Claim 4 depends from claim 1 and further requires “wherein the first value QI1 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.” Anon discloses facial recognition, but does not explicitly disclose it *based on a pre-stored list of configured faces*. See *supra* in Section VIII.E.1.iv. Walker discloses that “the camera may use face recognition software to identify a person in an image (e.g., ‘Alice’).” EX1007, ¶ [0286]. It would have been obvious to a POSITA that this feature would be based on a pre-stored list of configured faces to allow the camera to make such a determination without first prompting the user. A POSITA would have motivated to combine Walker with Anon for the reasons discussed with respect to claim element [1.c]. See Section VIII.E.1.iv. For the same reasons, a POSITA would have found it obvious that QI1 is both *responsive to the device motion from at least one motion or location sensor*, as recited in claim 1, and *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*, as recited in claim 4.

134. To the extent it is argued that this element is not rendered obvious by the combination of Anon and Walker, it is rendered obvious in further view of Cheatle. Cheatle discusses how Walker’s facial recognition techniques, noted

above, may be implemented, such as “analysis tests” that are “customized to deal with faces,” wherein “images where the face is known to the user might be preferred.” EX1011, ¶ [0042]. Cheatle further notes the technique may be implemented to “keep[] a database of facial features [so] a comparison could be made with the subject area of the captured key frame.” *Id.* A POSITA would have been motivated to use Cheatle’s pre-stored list of configured faces to implement Walker’s facial recognition system, and would have had a reasonable expectation of success in doing so. This would be using Cheatle’s known technique to improve similar devices (Cheatle and Walker’s facial detection and recognition) in the same way. It would be a simple substitution of a known element (Cheatle’s facial recognition) for another (Walker’s implementation of the same) to obtain predictable results (a camera using facial recognition with Cheatle’s pre-stored list of configured faces).

G. Ground 2C: Claim 6 is Obvious in View of Anon, Walker, Kosaka, Jasinski, Garcia-Molina and Ramesh

135. As discussed in detail below, it is my opinion that a POSITA would have been motivated to combine Anon with Walker, Kosaka, Jasinski, Garcia-Molina, and Ramesh, and that this combination discloses the Challenged Claims set forth in this section, or at least renders them obvious.

1. Claim 6

136. Claim 6 depends from claim 1 and further recites “wherein the third value is estimated according to, or based on, the estimated error in the analyzing the captured image for detecting or recognizing objects in the image.”

137. Anon does not explicitly disclose this claim. Ramesh, however, discloses a computer vision system which uses computer vision to detect and track objects in a photo, such as people in crowds, using a probabilistic framework. EX1009, Abstract, Fig. 1, ¶ [0039]. Ramesh’s system uses a “weighted sum of partial evidences” and “online uncertainty estimation” to evaluate the number of objects in a scene, and ensures that guesses with higher error estimates “are weighted less.” *Id.*, ¶¶ [0034], [0025], and [0030]. Moreover, Anon describes using varying inputs that would benefit from Ramesh’s probabilistic approach, given the presence of noise and ambiguity in the image. This would allow for estimating error for a value, such as a standard deviation and confidence interval, which would allow Anon to adjust weights of unreliable values accordingly.

138. A POSITA would have been motivated to combine Anon with Ramesh as discussed above in Section VIII.B.1, which I incorporate herein.

IX. SECONDARY CONSIDERATIONS

139. I am not aware of any evidence of secondary considerations that have a nexus to the claimed inventions that would overcome the demonstration of

Declaration of Dan Schonfeld in Support of Petition for *Inter Partes* Review of
U.S. Patent No. 11,671,702

obviousness of the claims of the '702 patent in light of the combinations of prior art
discussed above, given the volume of independent and simultaneously developed
inventions, but I reserve the right to respond to any such secondary considerations
of non-obviousness put forth by Patent Owner.

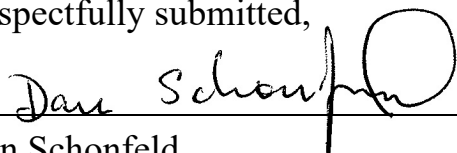
X. CONCLUSION

140. For the reasons set forth above, it is my opinion that every claim of the
'702 patent is invalid.

141. I hereby declare under penalty of perjury under the laws of the United
States of America that the foregoing is true and correct, and that all statements made
of my own knowledge are true and that all statements made on information and belief
are believed to be true. I understand that willful false statements are punishable by
fine or imprisonment or both. *See* 18 U.S.C. §1001.

Dated: September 5, 2025

Respectfully submitted,



Dan Schonfeld