

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

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**BEFORE THE PATENT TRIAL AND APPEAL BOARD**

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

Petitioners,

v.

SNAPAID, LTD.  
Patent Owner

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**U.S. PATENT NO. 12,250,452**

Case PGR2025-TBD

**DECLARATION OF DAN SCHONFELD IN SUPPORT OF PETITION  
FOR POST-GRANT REVIEW OF U.S. PATENT NO. 12,250,452**

**TABLE OF CONTENTS**

	<b><u>Page</u></b>
I. ASSIGNMENT .....	1
II. BACKGROUND AND QUALIFICATIONS.....	2
III. UNDERSTANDING OF PATENT LAW .....	5
IV. SUMMARY OF OPINIONS .....	11
V. THE '452 PATENT .....	12
A. Claims .....	12
B. Specification.....	13
C. Priority Date.....	14
D. Prosecution History.....	15
E. Person of Ordinary Skill in the Art .....	16
VI. CLAIM CONSTRUCTION .....	17
VII. OVERVIEW OF THE PRIOR ART.....	17
A. Anon.....	18
B. Takeuchi.....	19
C. Kosaka.....	19
D. Ramesh.....	20
E. Li .....	21
F. Bigioi.....	21
G. Liu .....	21
H. Yang.....	22
I. Wakabayashi .....	22

Declaration of Dan Schonfeld in Support of PGR of U.S. Patent No. 12,250,452

J.	Garcia-Molina .....	23
VIII.	THE CHALLENGED CLAIMS ARE INVALID .....	23
A.	Obviousness .....	23
B.	Ground II: Claims 5, 6, 7, and 8 are Invalid for Indefiniteness Under §112.....	57
C.	Ground III: Claim 4 Lacks Written Description .....	59
D.	Ground IV: The Challenged Claims Are Invalid for Failure to Claim Patentable Subject Matter under § 101 .....	59
IX.	SECONDARY CONSIDERATIONS.....	66
X.	CONCLUSION .....	66

**LIST OF EXHIBITS<sup>1</sup>**

<b>Exhibit No.</b>	<b>Description</b>
<b>1001</b>	U.S Patent No. 12,250,452
<b>1002</b>	File History of U.S Patent No. 12,250,452
<b>1003</b>	<i>Curriculum Vitae</i> of Dan Schonfeld
<b>1004</b>	Declaration of Dan Schonfeld
<b>1005</b>	U.S. Patent No. 8,508,622 (“Anon”)
<b>1006</b>	U.S. Pat. App. Pub. No. 2010/0149361 (“Takeuchi”)
<b>1007</b>	U.S. Pat. App. Pub. No. 2004/0012682 (“Kosaka”)
<b>1008</b>	U.S. Pat. App. Pub. No. 2009/0296989 (“Ramesh”)
<b>1009</b>	U.S. Pat. App. Pub. No. 2011/0150447 (“Li”)
<b>1010</b>	U.S. Pat. App. Pub. No. 2012/0133746 (“Bigioi”)
<b>1011</b>	Tsung-Jung Liu and Wei Lin, “ <i>Image Quality Assessment Using Multi-Method Fusion</i> ,” IEEE Transactions on Image Processing, Vol. 22, No. 5, May 2013 (“Liu”)
<b>1012</b>	U.S. Pat. App. Pub. 2011/0222724 (“Yang”)
<b>1013</b>	Provisional Application No. 61/717,216, filed on October 23, 2012
<b>1014</b>	Provisional Application No. 61/759,643, filed February 1, 2013
<b>1015</b>	U.S. Pat. App. Pub. 2013/0076856 (“Wakabayashi”)
<b>1016</b>	Excerpts from Hector Garcia-Molina et al., “DATABASE SYSTEMS The Complete Book,” 2009 (“Garcia-Molina”)
<b>1017</b>	U.S. Pat. App. Pub. No. 2005/0270381 (“Owens”)

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

I, Dan Schonfeld, hereby certify as follows:

**I. ASSIGNMENT**

1. I have been retained as a technical expert on behalf of Samsung Electronics Co., Ltd. and Samsung Electronics America, Inc. (“Samsung” or “Petitioner”) to offer technical opinions regarding whether one or more of claims 1-12 (the “Challenged Claims”) of U.S. Patent No. 12,250,452 (“the ’452 patent”) should be cancelled as obvious, indefinite, or for failing to claim patentable subject matter in connection with Samsung’s Petition for Post-Grant Review (“PGR”).

2. 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 ’452 patent, the prior art cited below, and any related issues. My compensation is not dependent on the outcome of any PGR or other proceeding involving the ’452 patent.

3. In forming the opinions expressed in this Declaration, I have also relied on my academic and professional experience. I also considered the viewpoint of a person having ordinary skill in the art as of the priority date, which as I discuss below I assumed to be October 22, 2013 (hereinafter, the “Priority Date”). I also relied on the ’452 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

4. I am an expert in the field of multimedia systems and signal processing, including image and video analysis and processing and have been an expert in that field since before the Priority Date of the '452 patent. A copy of my curriculum vitae is designated Exhibit 1003, and provides a comprehensive description of my relevant experience, including my academic and employment history, publications, professional activities, and speaking engagements. My current research interests are in signal processing, image and video analysis, video retrieval and communications, multimedia systems, computer vision, machine learning, medical imaging, and genomic signal processing.

5. I received a B.S. degree in Electrical Engineering and Computer Science from the University of California, Berkeley, California, and an M.S. and Ph.D. degrees in Electrical and Computer Engineering from The Johns Hopkins University, Baltimore, Maryland, in 1986, 1988, and 1990, respectively.

6. In August 1990, I joined the Department of Electrical Engineering and Computer Science at the University of Illinois, Chicago, Illinois, where I am Professor Emeritus in the Departments of Electrical and Computer Engineering, Computer Science, and Biomedical Engineering. I have also served as Director of the University-Industry Engineering Research Center (UIERC), also known as the Manufacturing Research Center (MRC), and as Co-Director of the Multimedia

Communications Laboratory (MCL) and member of the Signal and Image Research Laboratory (SIRL).

7. I am a Fellow of the IEEE for contributions to image and video analysis, and a Fellow of the SPIE for specific achievements in morphological image processing and video analysis.

8. I have served as editor for various publications, including Editor-in-Chief of the IEEE Transactions on Circuits and Systems for Video Technology, Deputy Editor-in-Chief of the IEEE Transactions on Circuits and Systems for Video Technology, Area Editor for Special Issues of the IEEE Signal Processing Magazine, 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 or as guest editor for various journal publications and special issues.

9. I have also organized numerous conferences. I have served on the Conference Board of the IEEE Signal Processing Society and as Technical Program Chair of the IEEE International Conference on Acoustics, Speech, and Signal

## Declaration of Dan Schonfeld in Support of PGR of U.S. Patent No. 12,250,452

Processing (ICASSP) 2018. I have organized the Thematic Symposium on Multimedia Search and Retrieval at the IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP) 2009. I was General Chair of the International Conference on Internet Multimedia Computing and Service (ICIMCS) 2018, the IEEE Conference on Visual Communication and Image Processing (VCIP) 2016, the Workshop on Big Data in 3D Computer Vision 2013, and the IEEE International Conference on Multimedia and Expo (ICME) 2012. I was Program Chair of the IEEE Conference on Visual Communication and Image Processing (VCIP) 2015. I was Technical Program Chair of the IEEE Workshop on Genomic Signal Processing and Statistics (GENSIPS) 2009 and Chair of the Workshop on Video Mining 2008. I served as Chair of the SPIE Conference on Visual Communication and Image Processing (VCIP) 2007. Finally, I was a member of the organizing committees of the IEEE International Conference on Image Processing (ICIP) 1998, 2012, 2018, and 2020, IEEE/SPIE International Conference on Visual Communications and Image Processing (VCIP) 2007, 2010, 2015, 2016, and 2017, and IEEE Workshop on Nonlinear Signal and Image Processing (NSIP) 1997.

10. I have served on numerous other committees. I served as Representative of Regions 1-6 (North America) in the Chapters Committee of the IEEE Signal Processing Society, as Chairman of the Chicago Chapter of the IEEE

Signal Processing Society, and currently, on the IEEE Multimedia Communications Technical Committee and IEEE Visual Signal Processing and Communications (VSPC) Technical Committee. I have served on the IEEE Image, Video, and Multidimensional Signal Processing (IVMSP) Technical Committee, formerly the IEEE Image and Multidimensional Signal Processing (IMDSP) Technical Committee. Finally, I served on the American National Standards Institute (ANSI) / Underwriters Laboratory (UL) Standards Technical Panel (“STP”) on Multimedia Systems.

11. I additionally run the Schonfeld Consulting Corporation, a company focused on technical support in computer science and engineering.

### **III. UNDERSTANDING OF PATENT LAW**

12. 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.

13. 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 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.

Declaration of Dan Schonfeld in Support of PGR of U.S. Patent No. 12,250,452

14. I understand that in a PGR proceeding, claims are construed under the case *Phillips v. AWH Corp.*, 415 F.3d 1303, decided by the Federal Circuit in 2005.

15. I understand that in a PGR proceeding, claims are unpatentable if it is more likely than not that 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.

16. I understand that in an PGR proceeding, the Board may only consider anticipation or obviousness based on prior printed publications or prior patents and patent applications. All of the references I discussed herein a prior patents, patent application, textbooks, and journal articles that were published prior to the Priority Date of the '452 patent.

17. 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 (herein, a POSITA). 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.

18. 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.

19. 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.

20. 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.

21. 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.

22. I also understand that other grounds for invalidity may be considered in a PGR proceeding, including indefiniteness, lack of written description, and failure to claim patentable subject matter.

23. I have been informed that a claim is invalid for indefiniteness if the claim, when read in light of the specification and the prosecution history, fails to inform those skilled in the art about the scope of the invention with reasonable certainty.

24. I have been informed that for a patent claim to satisfy the written description requirement, the disclosure must reasonably convey to a POSITA that the inventor had possession of the claimed subject matter as of the filing date.

25. I have been informed that a patent claim is invalid if it fails to claim patentable subject matter. I understand that in determining whether a claim claims patentable subject matter, the two-step framework in *Alice Corp. Pty. v. CLS Bank Int'l*, 573 U.S. 208 (2014) is applied. I understand that under the Alice framework, it must first be determined whether a claim is directed to an abstract idea. Then, if the claim is directed to an abstract idea, it must be determined whether the claim includes an inventive concept, which I understand is some additional element or combination of elements sufficient to ensure that the patent in practice amounts to significantly more than a patent upon the ineligible concept itself. If the claim lacks an inventive concept sufficient to transform the claimed abstract idea into a patent-eligible application, I understand it is invalid.

26. In rendering my opinions, I followed the above guidelines.

#### IV. SUMMARY OF OPINIONS

27. It is my opinion that all Challenged Claims would have been obvious to a POSITA based on the following prior art combinations and references:

Ground	Claims	Basis for Obviousness
I.A	1, 2	Obvious in view of Anon, Takeuchi, and Garcia-Molina
I.B	3	Obvious in view of Anon, Takeuchi, Kosaka, and Garcia-Molina
I.C	4	Obvious in view of Anon, Takeuchi, Li, and Garcia-Molina
I.D	5, 10	Obvious in view of Anon, Takeuchi, Bigioi, Wakabayashi, and Garcia-Molina
I.E	6	Obvious in view of Anon, Takeuchi, Ramesh, and Garcia-Molina
I.F	7	Obvious in view of Anon, Takeuchi, Ramesh, Bigioi, Wakabayashi, and Garcia-Molina
I.G	8	Obvious in view of Anon, Takeuchi, Ramesh, Bigioi, Wakabayashi, Kosaka, and Garcia-Molina
I.H	9	Obvious in view of Anon, Takeuchi, Liu, and Garcia-Molina
I.I	11, 12	Obvious in view of Anon, Takeuchi, Yang, and Garcia-Molina

28. It is also my opinion that claims 5-8 are invalid as indefinite. Each of these claims contain terms that are grammatically incorrect or that lack antecedent

basis, rendering them unintelligible such that their scope lacks reasonable certainty, even when read in light of the specification and prosecution history.

29. It is also my opinion that claim 4 is invalid for failure to satisfy the written description requirement. The '452 patent's specification contains no disclosure or indication that the inventors had possession of the claimed subject matter of that claim as of the Priority Date.

30. It is also my opinion that all of the Challenged Claims are invalid for failure to claim patentable subject matter under the *Alice* framework that I reference in Section III above. As discussed below, all Challenged Claims are directed to the abstract idea of assessing picture quality and suggesting that the photographer take another picture from a different location. And the Challenged Claims do not contain any inventive concept, instead reciting only conventional camera components.

## **V. THE '452 PATENT**

### **A. Claims**

31. The '452 patent is entitled "Real Time Assessment of Picture Quality." The '452 patent was filed as U.S. Patent Application No. 18/139,368 ("368 application") on April 26, 2023.

32. The '452 patent contains 12 claims, of which claim 1 is independent. Claim 1 reads as follows:

A method for presenting suggestion to a user of a device to move the device to a different location, where the device comprises at least one digital camera module that comprises at least one optical lens and an image sensor coupled to said optical lens for capturing an image, and at least one processor coupled to the image sensor or digital camera for receiving data therefrom, the method by the processor comprising:

calculating from an image received by at least one sensor and lens, a quality indicator QI1 of a face or object, and calculating an aesthetic quality indicator QI2 that uses a background blurring test of said face or object, and calculating a total quality indicator that is based at least partially on at least one of QI1 and QI2;

selecting based on the total quality indicator at least one appropriate suggestion from a pre-stored table of suggestions,

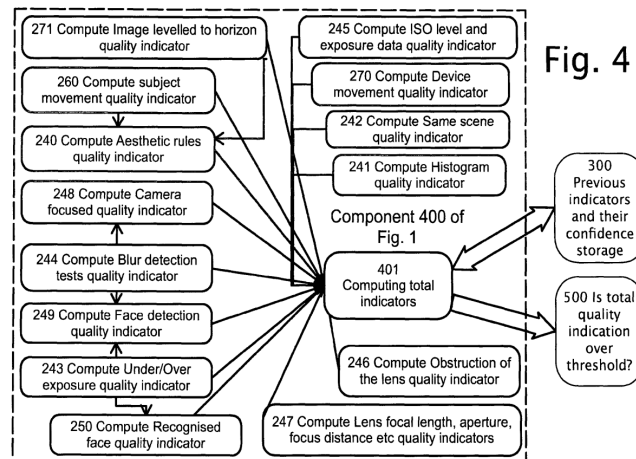
suggesting to the user to move the device to different location; and

presenting the suggestion to the user.

EX1001, claim 1.

## **B. Specification**

33. The '452 patent describes a method and system for on-board assessment of picture quality in camera devices. EX1001, Abstract. The quality of captured images is evaluated by combining various quality indicators (QIs) that are determined from the image, as shown below in Figure 4.



The system offers suggestions for improving photo quality based on the quality indicators. *Id.*, 3:28-32.

34. The '452 patent admits that the “[p]rior art has used certain independent quality indicators” and “quantif[ed] the quality by means of a total quality indicator.” EX1001, 2:47-65. Thus, the use of quality indicators to determine a total image quality was not new, and is disclosed in references such as Anon and Takeuchi discussed below.

### C. Priority Date

35. The '452 patent claims priority to Provisional Application No. 61/717,216, filed on October 23, 2012, and Provisional Application No. 61/759,643, filed February 1, 2013. EX1013 and EX1014. I understand that in order for a claim in a patent to obtain the benefit of the filing date of a provisional patent application, the provisional patent claim must provide support for all elements in the claim.

36. I have reviewed these provisional applications, and neither of them provides support for all the elements of any Challenged Claim. Most notably, neither provisional application discloses or otherwise supports “selecting based on the total quality indicator at least one appropriate suggestion from a pre-stored table of suggestions,” which is required by all Challenged Claims. There is no disclosure or suggestion of a “pre-stored table of suggestions” in either provisional application.

37. The provisional applications also do not disclose or even suggest “calculating an aesthetic quality indicator QI2 that uses a background blurring test of said face or object.” Nor do they disclose many of the dependent claims, including claims 5, 9, and 10.

38. In view of the foregoing, in my opinion, the '452 patent is not entitled to either an October 23, 2012, or February 1, 2013, priority date. I have therefore assumed for purposes of this Declaration that the earliest possible priority date for the '452 patent is October 22, 2013, which is the date of the third priority claim on the face of the '452 patent.

#### **D. Prosecution History**

39. I have reviewed the prosecution history of the '452 patent. The prosecution contained one prior-art rejection, and the Applicant amended the claims significantly to overcome the rejection. As discussed below, however, in my

opinion, the amended claims are nonetheless obvious in view of the prior art references I discuss below.

**E. Person of Ordinary Skill in the Art**

40. 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 '452 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 '452 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.

41. In my opinion, taking all of the factors into account, a person of ordinary skill in the art related to the '452 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.

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

## **VI. CLAIM CONSTRUCTION**

43. I understand that for the purposes of this post grant 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 the Patent Owner SnapAid, Ltd. (“SnapAid” or “Patent Owner”).

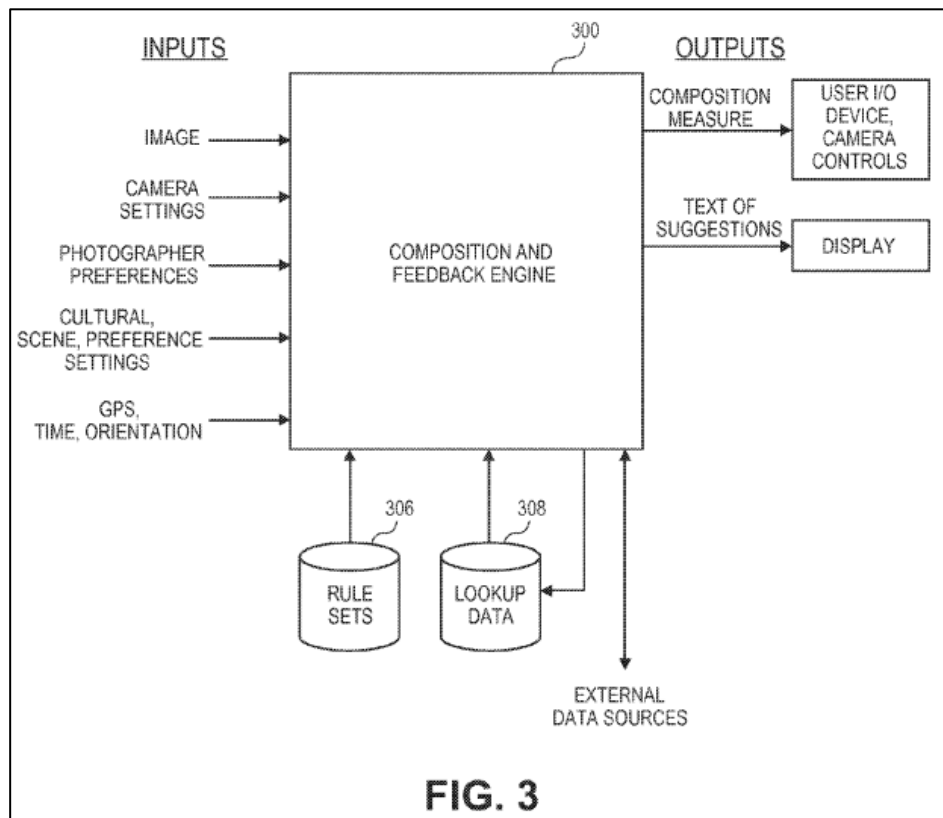
## **VII. OVERVIEW OF THE PRIOR ART**

44. In this section, I briefly discuss the prior art references that render the Challenged Claims obvious.

**A. Anon**

45. 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.” EX1005, 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:



46. Anon has a composition and feedback engine that performs its evaluation using a “weighted, combination of parameters.” *Id.*, 8:32-35. Anon’s

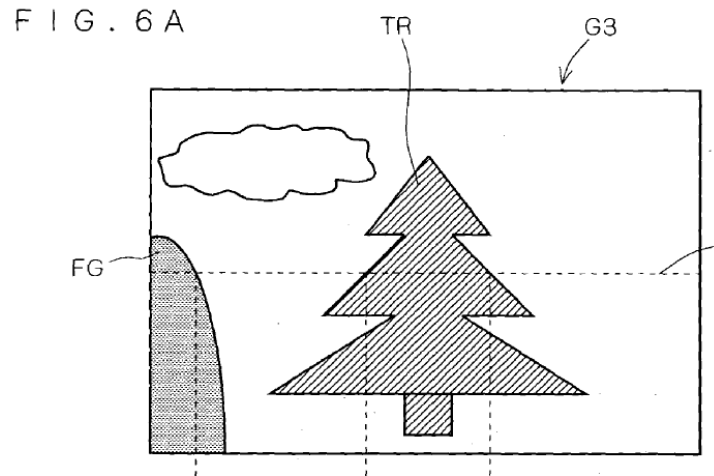
composition and feedback engine 300 can make use of inputs from the image capturing device, such as the image itself, the device settings, and metadata, combine it with rule sets 306 and lookup data 308, and output suggestions to the user of the camera to improve image quality. For example, one of those suggestions is taking the photograph at a different location.

**B. Takeuchi**

47. Takeuchi discloses an “image evaluation apparatus and camera which are capable of evaluating an image which is comprehensively good.” EX1006, Abstract. As part of that image evaluation, Takeuchi teaches the use of background focus/blur analysis. *See, e.g., id.*, ¶¶ [0142]-[0145] and [0291]. Takeuchi also teaches using a “total evaluation result” for an image using a weighted combination of different quality evaluation methods. *Id.*, ¶ [0269].

**C. Kosaka**

48. 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., EX1007, Fig. 6A.*



49. 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. Ramesh

50. Ramesh describes a computer vision system that uses a probabilistic framework to detect and track multiple objects (*e.g.*, people in crowds). EX1008, Abstract; Fig. 1; ¶ [0039]. Ramesh estimates the number of people in a scene by using a "weighted sum of partial evidences." *Id.*, ¶ [0034]. Ramesh teaches that the estimate may be described by a "probability distribution function" that takes into account uncertainties in the estimates. *Id.*, ¶ [0039]. The "objects location and

attributes are updated using online uncertainty estimation 110.” *Id.*, ¶ [0025].

Ramesh teaches that “less certain guesses are weighted less.” *Id.*, ¶ [0030].

**E. Li**

51. Li discloses an autofocus system that determines depth of field. Li explains that the “depth of field increases as the focusing moves from intermediate distances out toward ‘infinity’ (e.g., capturing images of distant mountains, clouds and so forth).” EX1009, ¶ [0015]. Li’s system estimates depth of field by capturing images at different focus distances by moving the lens (and typically the camera) in the direction of the subject of the photograph (*i.e.*, the Z axis). *Id.*, ¶ [0026]. The focus distances at which the pictures are taken and the amount of blur difference between two pictures can be used to estimate the actual subject distance, or depth. *Id.*, ¶ [0062].

**F. Bigioi**

52. Bigioi discloses a digital camera that performs 3D face detection and provides a 3D portrait mode. Bigioi contemplates the use of two lenses and sensor modules to create a 3D portrait. Bigioi uses stereographic images to create the 3D portrait. EX1010, ¶¶ [0016] and [0023].

**G. Liu**

53. Liu discloses a methodology for image quality assessment that it refers to as multi-method fusion, or MMF. MMF uses a combination of multiple image

assessment algorithms to assess image quality. As Li explains, image quality is determined based on “the nonlinear combination of scores from multiple methods with suitable weights obtained by a training process.” EX1011, 1793.

#### **H. Yang**

54. Yang discloses a computer implemented method that determines personal characteristics from an image using one or more convolutional neural networks, or CNNs. EX1012, ¶ [0006]. As Yang explains, “[c]onvolutional neural networks are a class of deep learning approaches in which multiple stages of learned feature extractors are applied directly to the raw input images and the entire system can be trained end-to-end in a supervised manner.” *Id.*, ¶ [0014].

#### **I. Wakabayashi**

55. Wakabayashi discloses an image capture device for capturing 3D images using stereoscopic techniques. To capture stereoscopic images, Wakabayashi’s device includes left and right lens/image sensor pairs: “as with the first imaging unit L, the second imaging unit R is provided with a shooting optical system including a second focus lens FLB, a second focus lens driving unit (hereinafter referred to as a second F lens driving unit) 104B for moving the second focus lens FLB in a direction of an optical axis, and a second imaging element 111B for receiving subject light obtained by forming an image of the subject in the second

shooting optical system and creating an image signal representing that subject.”

EX1015, ¶ [0094].

**J. Garcia-Molina**

56. Garcia-Molina is a textbook on database design, which asserts that tables were the prevalent database structure prior to the filing of the '452 patent. Garcia-Molina states that the table is “the most important model of data.” EX1016, 17.

**VIII. THE CHALLENGED CLAIMS ARE INVALID**

**A. Obviousness**

57. In this section, I discuss the '452 patent, the prior art, and why the prior art renders the '452 patent obvious.

**1. Ground I.A: Claims 1 and 2 are Obvious under § 103 in view of Anon, Takeuchi, and Garcia-Molina**

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

**a. Claim 1**

- i. *[1.pre.] “A method for presenting suggestion to a user of a device to move the device to a different location, where the device comprises at least one digital camera module that comprises at least one optical lens and an image sensor coupled to said*

*optical lens for capturing an image, and at least one processor coupled to the image sensor or digital camera for receiving data therefrom, the method by the processor comprising:*”

59. In my opinion, Anon clearly teaches the preamble of claim 1. Anon discloses a digital camera module in the form of a self-contained digital camera with a lens and charge-coupled device (CCD) image sensor. A POSITA would have understood that a CCD sensor is a type of image sensor. A CCD sensor is an integrated circuit that has a two-dimensional light sensitive array of capacitors used to represent pixels. When the light from a lens hits the sensors on the CCD array, photons are converted to an electrical charge at each of the pixels, which is then processed to form a two-dimensional digital image.

60. 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[,]” all in a single housing, which a POSITA would have understood to constitute a module. *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.*, 5:56-59. In my opinion, a POSITA would have found it obvious in light of these disclosures that Anon’s device *comprises at least one digital camera module*

that comprises at least one optical lens and an image sensor coupled to the optical lens for capturing an image.

61. Anon further describes the use of “[e]ngine 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. The inputs of this engine are illustrated in Figure 3 below:

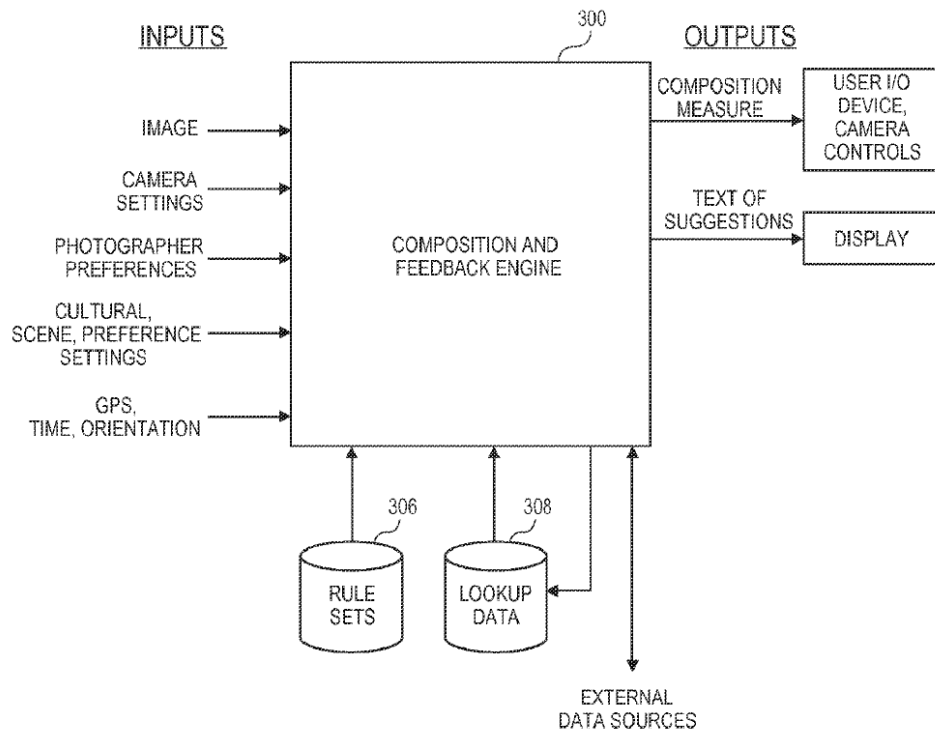


FIG. 3

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

62. Anon's digital camera runs a composition feedback engine (CFE) that evaluates proposed photographs that have been digitized by the CCD sensor, and based on various inputs, calculates an overall composition measure. EX1005, Fig. 1, 3:11-17; 5:53-61, 6:33-41. Anon's CFE then uses that composition measure to make suggestions to the camera user, including moving to a different location to take the photograph. EX1005, 3:32-34 ("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."), 5:47-51 ("Continuing this example, the camera can just provide a rough indication (red, yellow, and green) of the value at the current location in the n-dimensional space, but might also provide 'arrows' to indicate how to 'walk' to a higher location."), 7:25-27 ("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"), 8:12-13 ("Other suggestions might be to move or reorient the camera."), and 10:38-41 ("For example, if a scene contains bright and dark areas that are moving rapidly, optimizing for just the ideal overall brightness might provide recommendations that would provide a jarring movement of the video

camera.”); *see also id.*, 2:9-14, 2:16-28, 2:33-38, 3:14-26, 7:21-29, 7:44-50, 7:64-8:13, 9:19-22, and 9:29-34.

63. Anon explains that the CFE “could be implemented as ... software elements executed on a processor ....” *Id.*, 6:33-41. Anon’s Figure 3 also shows that the CFE’s inputs include an image, showing that when the CFE is implemented on a processor, which could be processor 106, that processor is coupled to both the image sensor and the digital camera. *Id.*, 3:53-60, cl. 9 (“a processor, coupled to the image sensor”). The processor running the CFE also performs the claimed steps discussed below.

- ii. [1.a] *“calculating from an image received by at least one sensor and lens, a quality indicator QI1 of a face or object, and calculating an aesthetic quality indicator QI2 that uses a background blurring test of said face or object, and calculating a total quality indicator that is based at least partially on at least one of QI1 and QI2;”*

64. As I discuss above, Anon’s processor calculates a composition measure for an image received by the CCD sensor in Anon’s camera. EX1005, 5:54-56. Anon describes the weighing and combination of its parameters during calculation of an image composition measure, 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.” EX1005, Abstract; 6:42-45; 8:32-35. A POSITA would have understood that

Anon's composition measure is a "total quality indicator" as claimed, because it provides an indication of the overall quality of the proposed photograph.

65. Anon's CFE uses a *quality indicator QI1 of a face or object*, which is an input to Anon's image composition measure. EX1005, 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"). For instance, the Eiffel Tower example in Anon uses a calculation of where in the proposed photograph a face is recognized as an input into the CFE. EX1005, 8:19-31. This is a quality indicator of a face because it provides an evaluation of whether the face is located in an eye-pleasing location.

66. Anon also calculates an *aesthetic quality indicator QI2 that uses a test of said face*. The composition measure accounts 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. In the Eiffel Tower example, "where the camera is focused-upon" is an example of an aesthetic quality indicator. EX1005, 8:27-31; *see also id.*, 2:10 (one input to CFE

is “focus characteristic”). This parameter is an aesthetic quality indicator QI2 because it evaluates whether the camera properly focused on the subject of the image, such that the photograph will be aesthetically pleasing to the user. Anon explains that, in the Eiffel Tower example, a good shot is when “the subject is in focus” and the subject’s position is “in a middle range (so the image is not flat and boring or overwhelmingly detailed).” *Id.*, 8:21-27.

67. Because these quality indicators are determined by the processor including the CFE, a POSITA would have understood that they are calculated by the processor. A POSITA would have understood that a processor works by performing calculations on data through hardware and/or software. Anon confirms that the composition measure is “computed,” *i.e.*, calculated, from the quality indicators by the CFE on the processor. *See, e.g.*, EX1005, Abstract, 1:59-65. A POSITA would have understood that the inputs to the CFE are numerical values that are also calculated, and that these numerical values are fed into the CFE to calculate the composition measure.

68. Anon does not specifically disclose that this quality indicator *uses a background blurring test of said face or object*. Anon discloses a blur test to determine if the subject of the photograph is in focus. Ex.1005, 3:53-57. Anon, however, does not specifically disclose a background blur test. But Takeuchi does.

In my opinion, a POSITA would have been motivated to incorporate Takeuchi's background blur test into Anon's CFE.

69. Takeuchi discloses testing for background focus/blur. *See, e.g.*, EX1006, ¶¶ [0140]-[0145]. Focus and blur are closely related because ensuring that an image is in focus is often used to reduce blur in images. Background focus refers to the background of a photograph being in focus. When taking a high-quality photograph, it is generally desirable that the subject of the photograph be in focus, not the background. In fact, it is often desirable that the background be out of focus when compared to the subject of the photograph, because it will make the subject stand out, as recognized by the '452 patent, which tests for "background blurring" and indicates that this attribute "may sometimes actually be desired." EX1001, 14:1-2. A common example of improved image quality by having an out-of-focus region such as the background of a face or object is known as the Bokeh effect, which is sometimes generated by using a wide aperture lens.

70. Takeuchi teaches that when the background is in focus, *i.e.*, not blurred, it lowers the quality of the photograph because no quality points are added for focus. EX1006, ¶ [0145]. A POSITA would have recognized the converse: when the background is blurred, the quality of the photograph is higher.

71. In my opinion, a POSITA would have been motivated to combine Takeuchi's background blur test into Anon's composition measure via the CFE. Both Anon and Takeuchi are directed to evaluating and improving the quality of digital images. Takeuchi's system provides a comprehensive evaluation of image quality, including detection of focus/blur such as background blur/focus, and offers feedback or correction suggestions to the user. *See, e.g.*, EX1006, ¶¶ [0147] and [0290]. Anon's system, is focused on real-time feedback for image composition and overall image quality, using a variety of image-based characteristics—including focus—to compute a "composition measure." *See* EX1005, 1:59-2:8.

72. A POSITA would have recognized that focus/blur, including background focus/blur, is an important component of a quality image. Poor focus results in lack of detail of the subject of the photograph, whereas excessive background focus degrades results in a photograph of low aesthetic quality.

73. Furthermore, Anon's system is designed to provide feedback and suggestions to improve image quality, and teaches using focus as part its composition measure. Given the importance of focus in taking high-quality photographs and Anon's recognition of that fact, in my opinion, a POSITA would have been motivated to combine Takeuchi's background blur/focus test into Anon's composition measure in order to improve Anon's system. Both Anon and Takeuchi

are designed to provide actionable feedback to the user, and a POSITA would have naturally looked to Takeuchi for ways to improve Anon's system. In my opinion, use of Takeuchi's blur/focus test would have been nothing more than 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.

74. A POSITA would also have had a reasonable expectation of success in implementing Takeuchi's background focus/blur test into Anon's system, which would have involved routine software programming. Anon's CFE already performs sophisticated image analysis, and adding Takeuchi's background focus/blur test would have simply involved adding another quality indicator to the CFE. Takeuchi's focus evaluation also produces quantitative results (*e.g.*, scores or flags for focus/blur including background blur/focus), that are readily usable as input into Anon's CFE. *See* Ex, 1006, ¶ [0090]; EX1005, 5:40-47.

- iii. [1.b] *“selecting based on the total quality indicator at least one appropriate suggestion from a pre-stored table of suggestions;”*

75. Anon's CFE provides suggestions to the camera user on how a photograph can be improved based on calculation of Anon's composition measure. Those suggestions are determined by consulting rule set 306 and look up data 308. EX1005, Abstract; *see also id.*, 1:59-2:4; 4:13-16, 5:53-6:8, 6:42-7:21. Anon and

Takeuchi similarly communicate suggestions to the user to capture better images. *See, e.g.*, EX1005, Fig. 3; EX1007, ¶ [284].

76. A POSITA considering Anon and Takeuchi would have been motivated and found it obvious to use a pre-stored table of suggestions. Such an approach is both streamlined and allows for context-dependent feedback. It is also well established in the art. *See* EX1017 (disclosing use of decision tables and GUI strings).

77. Anon by itself teaches or in combination with Takeuchi (as well as with Garcia-Molina) would result in a system that takes as inputs various image parameters, then compares them and generates feedback for the user to improve image quality. A POSITA would therefore have selected appropriate suggestion(s) from a pre-stored table to present to the user. To start, Takeuchi evaluates images with various methods, including assigning scores, and offers suggestions to the user. *See, e.g.*, EX1006, ¶¶ [0290]–[0295], Fig. 25. Anon, meanwhile describes offering suggestions to a user based on image quality that is calculated using various inputs of the kind described in Takeuchi. *See* EX1005, 5:25-51. I note that Anon describes the use of “rule sets” and “lookup data” for its suggestions. EX1005, 7:15-29.

78. While Anon does not expressly disclose organizing its rules with “tables,” pre-stored tables were well established in the art. *See* EX1017, 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” and that its rules may operate in combination with look-up data. EX1005, 7:15-21. A POSITA would have found it obvious that tables are a “data structure” that is efficient, common, and easily implemented for storage, retrieval (look up), and manipulation of data in this context. Because of their simplicity and efficiency, tables are among the most widely-used data structures for storage and retrieval of data in most applications. For instance, Garcia-Molina, in a database design textbook, calls tables “the most important model of data.” EX1016 (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.

79. In short, the combined system would calculate a composition measure, 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* EX1015, ¶ [0018].

iv. [1.c] “*suggesting to the user to move the device to*

*different location; and”*

80. As described above in the preamble [1.pre], which I incorporate herein, Anon discloses *suggesting to the user to move the device to different location*. See, e.g., EX1005, 3:32-34, 5:47-51, 7:25-27, 8:12-13, and 10:38-42; see also *id.*, 2:9-14, 2:16-28, 2:33-38, 3:14-26, 7:21-29, 7:44-50, 7:64-8:13, 7:44-50, 9:19-22, and 9:29-34.

v. [1.d] *“presenting the suggestion to the user.”*

81. As described above in the preamble [1.pre], which I incorporate herein, Anon discloses *presenting the suggestion to the user*. See, e.g., EX1005, 3:32-34, 5:47-51, 7:25-27, 8:12-13, and 10:38-42; see also *id.*, 2:9-14, 2:16-28, 2:29-44, 3:14-26, 6:7-8, 6:47-50, 7:21-29, 7:44-50, 7:64-8:13, 7:44-50, 9:19-22, and 9:29-34.

**b. Claim 2 (depending from Claim 1)**

82. In my opinion, the additional requirement of claim 2 of *wherein the background blurring test is based at least partially on data from at least one of, the sensor, lens, lens aperture or any combination thereof* is obvious in view of Anon. Anon teaches calculating quality indicators, including those relating to focus, based on image information from the lens and sensor. Anon also uses aperture information as an input. EX1005, 3:53-59 (“The inputs that the engine has to work with can include image inputs, such as the values of the pixels currently being sensed by a charge-coupled diode array of the camera, higher-level aspects of the image *being*

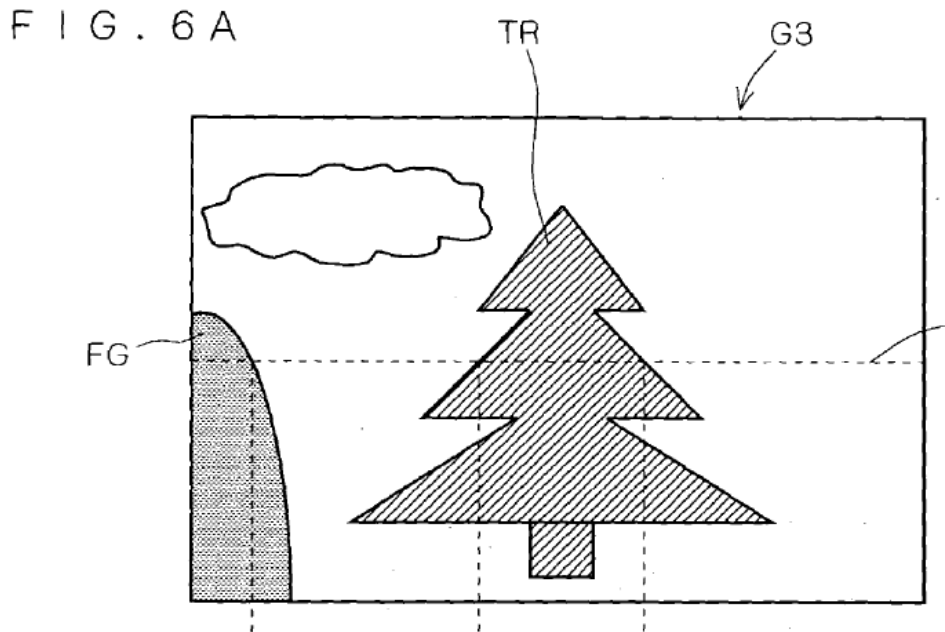
*sensed (e.g., the lack of sharp edges that might indicate a lack of appropriate focus), as well as camera settings (F-stop, aperture, shutter speed, film speed, detectors, color optimizers, etc.).”*; *see also id.*, 5:53-56.

**2. Ground I.B: Claim 3 (depending from Claim 1) is Obvious in View of Anon, Takeuchi, Kosaka, and Garcia-Molina**

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

84. In my opinion, claim 3’s additional requirement of *wherein the total quality indicator also comprises of testing the obstruction of at least one lens* is obvious in further view of Kosaka.

85. Anon does not disclose detecting an obstruction in front of a lens, but Kosaka does. Kosaka teaches a digital camera system detects when a user’s finger is unintentionally blocking (obstructing) the lens before an image is captured. *See, e.g., EX1007, Fig. 6A below (FG representing a user’s finger)*. Given Anon’s goal of increasing photograph quality, it would have been obvious to a POSITA to include Kosaka’s finger-detection technique in Anon’s system.



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

87. According to Kosaka, the system analyzes the brightness (luminance) of pixels along a line or within an area of the image. A “low-brightness area” is defined as a region where the pixel value is lower than a predetermined threshold

(referred to as “TH1” by Kosaka). For example, in the description of FIG. 4B, the system identifies areas where the brightness is below threshold TH1 as potential obstructions (such as a finger or a tree). EX1007, ¶ [0069].

88. Kosaka further explains that the camera can notify the user of such an obstruction before the p is taken, allowing the user to correct the issue and avoid capturing an image with a finger or other object blocking the lens. In some embodiments, the system can even generate a corrected image by deleting the obstructed area or prevent the image from being recorded if an obstruction is detected. *See* EX1007, 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”).

89. In my opinion, a POSITA would have been motivated to use Kosaka’s obstruction-detection functionality with Anon’s camera. Anon and Kosaka are both concerned with improving the quality of captured images and automating the process of identifying and selecting “good” photographs. Kosaka teaches that finger obstruction is a significant and common cause of poor image quality, especially in small digital cameras. *See* EX1007, ¶¶ [0006] and [0007]. Anon’s system is designed to identify images with technical or compositional flaws. Integrating a

finger obstruction detection signal from Kosaka would allow Anon's system to recommend to users to correct this defect, improving the quality of images. These approaches are complementary: Kosaka detects a specific, common image flaw, while Anon offers a flexible, extensible framework for integrating such inputs into a comprehensive quality assessment. Anon's system is designed to accept a variety of image-based characteristics as inputs to its quality/composition measure, including "higher-level aspects of the image being sensed" and "image-based characteristics." *See* EX1005, 2:9-15, 3:53-57. Kosaka's output—a determination of whether a finger is obstructing the image—fits naturally as a binary or weighted input to Anon's quality scoring engine.

90. In view of the foregoing, it is my opinion that use of Kosaka's finger-detection functionality would have been nothing more than use of 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. A POSITA would have had a reasonable expectation of success in implementing this combination. Anon's system is designed to accept and combine multiple, diverse image-based inputs using weighted combinations, and Kosaka's output is simply another input to be weighted alongside other quality factors (focus, exposure, subject detection, etc.). The addition of Kosaka's finger obstruction detection would have been a

straightforward extension of this approach using routine software and processing techniques, and would have yielded predictable results, namely recommending that the camera user remove the finder obstruction.

**3. Ground I.C: Claim 4 (depending from Claim 1) is Obvious in View of Anon, Takeuchi, Li, and Garcia-Molina**

91. As discussed in detail below, it is my opinion that a POSITA would have been motivated to combine Anon with Takeuchi, Li, and Garcia-Molina, and that this combination renders them obvious.

92. In my opinion, the additional requirement of claim 4 of *wherein at least one of a focus distance or lens aperture is used to determining a depth of field of the image, wherein the depth of field is computed, based on a movement of the device in the z axis, wherein the z axis is the direction to the object in a scene, may be included in the total quality indicator* is obvious.

93. *First*, Anon itself discloses that depth of field may be an input into Anon's CFE. Specifically, Anon explains that low-level characteristics may be input into the CFE in determining composition measure: "In some cases, such as a purely abstract shot, many of the rules will have to be discarded or not considered and the engine can simply consider an overall measure of the energy (or visual intensity) of the proposed image based on *low-level characteristics of the proposed image.*" EX1005, 9:56-60 (emphasis added). Anon further identifies depth of field as an

example of a “low level characteristic”: “As a fall-back, of course, the camera can just default to optimizing *low-level characteristics* (e.g., light, focus, aperture, *depth of field*, etc.) each separately when there is not enough information to work with.” *Id.*, 9:64-67 (emphasis added).

94. ***Second***, while Anon does not teach how to calculate depth of field, Li teaches how to determine depth of field through the use of focus distance. For example, Li discloses determining depth of field by taking two images of an object at two different focus distances. The focus distances and the blur difference between photographs are then used to estimate the depth of field. EX1009, ¶ [0026].

95. Li also explains that changing the focus distance is achieved by moving the lens closer to or further from the subject of the photograph, *i.e.*, along the z axis: “When the subject is in focus, the captured image is the sharpest (has the highest contrast). It becomes blurrier (less contrast) ***as the lens moves away*** from the in-focus position. Generally, when two pictures are taken at two different focus distances, the one taken closer to the subject distance is sharper than the other. The focus distances at which the pictures are taken and the amount of the blur difference between these two pictures can be used to estimate the actual subject distance, or depth.” *Id.*, ¶ [0062]. Because the lens is part of the camera, moving the lens means

the camera (the claimed device) is also moved. This direction towards the photograph subject is defined by claim 4 to be the “z axis.”

96. Given Anon’s disclosure of depth of field as an input to the CFE, but with no specific disclosure on how to calculate the depth of field, it would have been obvious to use Li’s depth-of-field determination technique with Anon. A POSITA would have been motivated to use Li’s technique with Anon as a known technique to a known device ready for improvement to yield predictable results. There is nothing inventive about calculating depth of field.

**4. Ground I.D: Claims 5 and 10 (both depending from Claim 1) Are Obvious in View of Anon, Takeuchi, Bigioi, Wakabayashi, and Garcia-Molina**

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

**a. Claim 5**

98. With regard to claim 5, I find that claim unintelligible. Claim 5 (which depends from claim 1) includes the additional requirement wherein a separate  $QI_2$  is calculated for each lens and a sensor module the device has, *wherein  $QI_2$  of  $QI_{total}$  or both are based on at least two  $QI_1$  from 2 such lenses and sensor modules.* The phrase “ $QI_2$  of  $QI_{total}$  or both,” however, does not make any

grammatical sense in the context of the claim, and in my opinion, claim 5 therefore fails to provide reason certainty to a POSITA regarding the scope of claim 5. I have reviewed the specification and prosecution history, and they provide no help in understanding claim 5. In my opinion, therefore, claim 5 is invalid for indefiniteness.

99. I have been asked whether claim 5 would have been obvious if the Patent Owner were to seek to amend claim 5 by changing “QI2 of QI\_total or both” to “QI2 or QI\_total or both.” In my opinion, if claim 5 were amended in this manner, claim 5 would have been obvious.

100. While Anon does not disclose the use of more than one lens and sensor module, Anon discloses that its camera may be used for 3D photography: “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.” EX1005, 3:2-10 (emphasis added). Bigioi, however, teaches the creation of 3D photographic images through the use of stereoscopic images. EX1010, ¶¶ [0023], [0024], [0028]-[0029]. A POSITA would have understood that stereoscopic images are taken with two lenses/image sensors, for example one lens/sensor pair for the left and another for the right.

101. For example, the Wakabayashi reference discloses a stereoscopic image device that has two lenses and two sensors, one pair for left and one pair right: “as with the first imaging unit L, the second imaging unit R is provided with a shooting optical system including a second focus lens FLB, a second focus lens driving unit (hereinafter referred to as a second F lens driving unit) 104B for moving the second focus lens FLB in a direction of an optical axis, and a second imaging element 111B for receiving subject light obtained by forming an image of the subject in the second shooting optical system and creating an image signal representing that subject.” EX1015, ¶ [0094].

102. Given Anon’s disclosure of 3D photography, it would have been obvious to a POSITA to incorporate Bigioi’s stereoscopic technique into Anon’s camera in order to generate high quality 3D photographs. Use of Bigioi’s stereoscopic technique would have been nothing more than use of 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. While applying Bigioi’s teaching to Anon’s camera would require the addition of a lens and image sensor, nothing in Anon precludes the use of multiple lenses and image sensors.

103. To the extent the Patent Owner argues that Bigioi does not disclose two lenses and two image sensors, use of two lens/sensor pairs would have further

been obvious in view of Wakabayashi. Given that both Anon and Bigioi concern 3D images, use of Wakabayashi's left and right lens/sensor pairs designed for capturing images in 3D would have been use of 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.

104. Further, because QI2 may be based on where the camera lens is focused-upon as described above with regard to claim 1, it would have been obvious to calculate QI2 for both lens/image sensor pairs and use both QI2's to calculate the overall composition measure (QI\_total) as taught by Anon. It would have also been obvious to calculate a separate value of QI1 for each lens/image sensor pair for the same reason, and to use those values of QI1 in calculating the corresponding QI\_total. Indeed, Anon discloses that the inputs to the CFE are based on the digitally readable output of the image sensor. EX1005, 5:53-56; *see also* Figure 3 (showing individual image as an input into the CFE). Thus, when two separate image sensors are used, it would have been obvious to determine quality indicators on a per-image basis, and this is how Anon's system is designed to work.

**b. Claim 10**

105. In my opinion, the additional requirement of claim 10 of *further comprising building at least a partial reconstruction of a 3D scene according to the*

*images from the camera module; wherein the suggestion is further based on the 3D scene reconstruction* is also obvious in view of Bigioi and Wakabayashi.

106. As I indicate above, Anon expressly discloses that its digital camera may be used for 3D photography. Thus, Anon's CFE and the suggestions supplies apply to 3D photographs as well as 2D photographs.

107. Anon does not discuss the details of its 3D photography, but Bigioi provides such details, as described above with regard to claim 5, including recreating a scene with the 3D Bokeh effect, which is a high quality 3D image with background blur that gives the photograph a strong sense of depth and dimension. Bigioi explains, for example, that "the camera is caused to automatically capture and store a series of images while the user moves around a concave path centred on the face of one of the human subjects to be imaged," and further details that "the background blur may be refined by separating the facial images and foreground region of each image in the stereo pair from the respective background ... [t]he two background regions may then be initially aligned and disparity and depth map calculations may be used to more selectively determine near and far background regions. Both background regions may then be selectively un-aligned or selectively blurred or both, based on the determined pixel disparities and or depth maps to provide a more convincing 3D Bokeh effect." EX1010, ¶¶ [0015] and [0026].

Bigioi thus teaches the creation of a 3D scene from two different images. A POSITA would have been motivated to combine Bigioi's and Wakabayashi's 3D functionality with Anon for the same reasons described above with regard to claim 5.

**5. Ground I.E: Claims 6 is Obvious in View of Anon, Takeuchi, Ramesh, and Garcia-Molina**

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

109. In my opinion, the additional requirement of claim 6 of *wherein a confidence level of a subject detection is calculated based on the object detection, and used in calculation of  $QI_{total}$*  is invalid for indefiniteness because there is no antecedent basis for "the object detection. I discuss this in more detail in Ground II below.

110. I have been asked to consider, however, whether claim 6 would have been obvious if the Patent Owner amended claim 6 to change "the object detection" to "the subject detection." In my opinion, it would have been obvious. Anon discloses the detecting of a photographic subject. For example, Anon explains that inputs into the CFE may 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).” EX1005, 3:62-4:2.

111. Anon further discloses that inputs to the CFE can be weighted when determining an overall composition measure: “In various embodiments, these parameters may be input into a fuzzy logic set, or the like, and an evaluation, e.g. weighted, combination of parameters may be performed by the composition and feedback engine.” *Id.*, 8:32-35. Anon does not specifically disclose assigning a “confidence level” to an input to the CFE, but this would have been obvious to a POSITA in view of Ramesh.

112. Ramesh estimates the number of a people in a scene by using a “weighted sum of partial evidences.” EX1008, ¶ [0034]. An “object[']s location and attributes are updated using online uncertainty estimation 110,” which a POSITA would have understood is a confidence level because it provides a measure of how accurate the location and attribute measurements are. *Id.*, ¶ [0025]. Ramesh teaches that “less certain guesses” (*i.e.*, guesses with greater error) “are weighted less.” *Id.*, ¶ [0030]. Thus, Ramesh’s uncertainty estimates serve as confidence

levels, because they are used to determine how much weight should be given to a particular piece of evidence, where a higher weight indicates greater confidence.

113. A POSITA would have understood that Anon's system, like any other real-time system analysis, is subject to uncertainty in the measurements it makes. This is particularly true when calculating image properties from a digitized image. Thus, a POSITA would have understood that when Anon's camera detects a face or object, there will be uncertainty in that determination. This uncertainty comes from things like noise, ambiguous scenes, or changing conditions. Anon also explains that "what characteristics are used to determine what is a 'good' image are very flexible and can be enhanced or changed completely over time." EX1005, 10:47-50. Under these circumstances, applying Ramesh's probabilistic approach to Anon provides a principled way to quantify and propagate uncertainty (error) in Anon's measurements and calculations. Associating a confidence interval with each weight would have allowed Anon's system to adaptively adjust the weight of each characteristic based on its reliability and combine output values from multiple sources in a statistically optimal way to arrive at more reliable composition measure (total quality indicator). In my opinion, therefore, the combination of Anon and Ramesh would merely be the application of a known technique (weighting parameters with confidence levels, as disclosed by Ramesh) to a known device

(Anon) ready for improvement to yield predictable results (an optimized composition engine).

**6. Ground I.F: Claim 7 (depending from Claim 6) is Obvious in View of Anon, Takeuchi, Ramesh, Bigioi, Wakabayashi, and Garcia-Molina**

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

115. In my opinion, the additional requirement of claim 7 of *wherein a confidence level of a subject focus is calculated based on a correlation between each QI2, and the confidence level is used in computation of QI\_total* is invalid for indefiniteness, because there is no antecedent basis for “each QI2.” I discuss this in Ground II below.

116. I have been asked, however, to consider when claim 7 would have been obvious if it were amended to depend from claim 5, and claim 5 were amended to correct its indefiniteness as discuss above with regard to claim 5. In my opinion, claim 7 would have been obvious in that situation. As I discuss above in Ground I.D, claim 5 would have been obvious. Further, as discussed above with regard claim 6, the use of confidence levels with Anon’s quality metrics would have been obvious in view of Ramesh. A POSITA would also have found it obvious to calculate the

confidence level based on the correlation between both values of QI2 given Anon's express teaching that the estimation of one characteristic (*e.g.*, object detection, location, and characteristics such as focus) influences the determination of the weights attached to other characteristics. EX1005, 3:53-4:3.

**7. Ground I.G: Claims 8 (depending from Claim 7) Is Obvious in View of Anon, Takeuchi, Bigioi, Kosaka, and Garcia-Molina**

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

118. In my opinion, the additional requirement of claim 8 of *wherein the total quality indicator also comprises of testing an obstruction of at least one lens* is obvious.

119. As I discuss below with regard to Ground II, claim 8 is invalid as indefinite, because it depends from claim 7, which is invalid as indefinite due to lack of antecedent basis as discussed in Ground I.E above and Ground II below. To the extent the Patent Owner seeks to amend claim 7 (and claim 5) as discussed above, in my opinion, the additional element of claim 8 would have been obvious in view of Kosaka for the same reasons discussed for claim 3 of Ground I.B above.

**8. Ground I.H: Claims 9 (depending from Claim 1) Is Obvious**

**in View of Anon, Takeuchi, Liu, and Garcia-Molina**

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

121. In my opinion, the additional requirement of claim 9 of *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 third value (QI2i) associated with each of multiple algorithms, and calculating or estimating the second value (QI2) based on the multiple third values (QI2i) from the multiple algorithms* is obvious.

122. **First**, Anon discloses an “aesthetic algorithm” as claimed. For example, Anon discloses determining “a measure of an aesthetic based on Japanese aesthetics, Chinese aesthetics, maritime aesthetics, mountaineering aesthetics, children aesthetics, urban aesthetics, etc.” Anon further explains that “there might be some cultures for which different colors have different meanings and some color combinations conflict, whereas in other cultures, the colors combinations are seen as harmonious. In such cases, the engine might send a signal or a message when the

processing performed by the engine suggests that the colors seen in the potential photograph are too ‘energetic’ when it takes into account that there are also many lines in the image and takes into account a set of cultural-specific external inputs.” EX1005, 7:7-14; *see also id.*, 4:42-51. Thus, Anon discloses the use of an “aesthetic algorithm” as claimed to evaluate an image.

123. **Second**, Anon also discloses a “blur detection algorithm” as claimed: “[t]he inputs that the engine has to work with can include image inputs, such as the values of the pixels currently being sensed by a charge-coupled diode array of the camera, *higher-level aspects of the image being sensed (e.g., the lack of sharp edges that might indicate a lack of appropriate focus).*” *Id.*, 3:35-57 (emphasis added). Further, as I explain above, it would have been obvious to incorporate Takeuchi’s background blur/focus algorithm into Anon’s system for determination of QI2.

124. Anon, however, does not appear to discuss using the results of multiple algorithms to arrive at a single quality indicator as an input to the CFE. But, in my opinion, a POSITA would have found that obvious in view of Liu. Like Anon, Liu discloses a method for image quality assessment that involves the use of multiple algorithms, which Liu refers to as multi-method fusion, or MMF. Recognizing that any one quality assessment could be inaccurate, Liu proposes combining multiple

quality measures into a single assessment to provide better accuracy. As Liu explains, “[a] new methodology for objective image quality assessment (IQA) with multi-method fusion (MMF) is presented in this paper. The research is motivated by the observation that there is no single method that can give the best performance in all situations. To achieve MMF, we adopt a regression approach. The new MMF score is set to be the nonlinear combination of scores from multiple methods with suitable weights obtained by a training process.” EX1011, 1793. It would have been obvious to a POSITA to incorporate Liu’s MMF technique into Anon, in order to increase the accuracy of the inputs to Anon’s composition measure, such as QI2. A POSITA would also have been motivated to use some of Liu’s image quality algorithms with Anon, given Anon’s disclosure of using many different quality indicators to assess image quality.

125. Use of Liu’s MMF technique and also its various algorithms with Anon would have been nothing more than use of 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. Such a combination would have involved routine changes to Anon’s CFE that were well within the skill of a POSITA, with no required hardware changes. No other changes would need to be made to Anon.

**9. Ground I.I: Claims 11 and 12 (depending from Claims 1 and 2, respectively) are Obvious in View of Anon, Takeuchi, Yang, and Garcia-Molina**

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

127. Claims 11 depends from claim 1, and claim 12 depends from claim 2, and both claims contain the same additional requirement: “wherein the analyzing of at least one images for detecting or recognizing one or more objects uses algorithms of a deep learning.” Anon teaches the use of an object detection algorithm, but does not disclose a specific algorithm for doing so: “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).” EX1005, 3:62-4:3. The use of a deep learning algorithm as claimed would have been obvious to a POSITA in view of Yang.

128. Yang teaches the use of convolutional neural networks, or CNNs, for detecting and recognizing faces: “In one aspect, a computer implemented method

determines personal characteristics from images by generating a baseline gender model and an age estimation model using one or more convolutional neural networks (CNNs); capturing correspondences of faces by face tracking, and applying incremental learning to the CNNs and enforcing correspondence constraint such that CNN outputs are consistent and stable for one person.” Yang further explains that its system “includes performing face detection and tracking; aligning the detected faces; normalizing the faces to a plurality of patches; and sending the normalized faces to the CNNs to estimate gender and age.” EX1012, ¶¶ [0006] and [0007].

129. Yang further explains that a CNN is a form of a deep learning algorithm: “Convolutional neural networks are a class of deep learning approaches in which multiple stages of learned feature extractors are applied directly to the raw input images and the entire system can be trained end-to-end in a supervised manner.” EX1012, ¶ [0014]; *see also* EX1001, 10:13-15 (recognizes that neural networks use deep learning). Anon also discloses that neural networks, or deep learning, can be used in Anon’s system to train the CFE: “In various embodiments, the engine might execute a learning process based on a training set of pre-determined ‘good’ photographs. This training set might be determined by professional photographers and the process distilled to a set of rules or the coding of a neural network or fuzzy logic set.” EX1005, 8:44-48.

130. Given Anon’s express teaching of deep learning as well as the use of face detection algorithms, in my opinion, it would have been obvious to use a face-detection CNN as taught by Yang with Anon’s system in order to improve Anon’s face detection capabilities. Such a combination of Anon and Yang would have been the application of a known technique (use of deep learning algorithms for image detection) to a known device (Anon) ready for improvement to yield predictable results (an optimized composition engine).

**B. Ground II: Claims 5, 6, 7, and 8 are Invalid for Indefiniteness Under §112**

131. In my opinion, claims 5, 6, 7, and 8 are indefinite. Each of the claims lack reasonable certainty as to the scope of what is claimed. Further, this uncertainty cannot be resolved by consulting the specification or prosecution history.

132. Claim 5 depends from claims 1 and 2 and contains the phrase “wherein *QI2 of QI\_total or both* are based on at least two QI1 from 2 such lenses and sensor modules.” In my opinion, this claim element is unintelligible as to what “or both” is referring in the overall context of the claim language. If the claim had said *QI2 or QI\_total*, for example, then the claim would make grammatical sense. But that is not what the claim says. It is possible to propose other claim changes to allow the claim to make sense, but this only further demonstrates that the claim as drafted lacks a scope of reasonable certainty. I also reviewed the prosecution history, and

this is how the Applicant submitted the claim—this is not a typographical error from the Patent Office.

133. Claim 6 depends from claims 1 and 2 and recites “wherein a confidence level of a subject detection is calculated based on *the object detection*, and used in calculation of  $QI_{total}$ .” But “the objection detection” contains no antecedent basis—it is not contained in claim 1, claim 2, or claim 6—and makes no sense in view of the claim’s earlier reference to “subject detection.” A POSITA would also not have considered “object” to be referring to “subject,” because they are different words with different meanings. Moreover, “object detection” and “subject detection” typically require different techniques. Claim 6 therefore lacks reasonably certainty as to its scope. There is no way to fix this problem with reference to the specification or prosecution history. This is also how claim 6 was submitted to the Patent Office.

134. Claim 7 depends from claim 6 and, in my opinion, is indefinite because claim 6 is indefinite. Claim 7 also includes the clause “wherein a confidence level of a subject focus is calculated based on a *correlation between each  $QI_2$* , and the confidence level is used in computation of  $QI_{total}$ .” But there is no antecedent basis for “each  $QI_2$ .” Claims 1, 2, and 6, from which claim 7 depends only have a

single QI2. This is also how claim 6 was submitted to the Patent Office. Claim 7 therefore lacks reasonably certainty as to its scope.

135. Claim 8 depends from claim 7, and in my opinion, is indefinite for the same reasons claim 7 is indefinite.

**C. Ground III: Claim 4 Lacks Written Description**

136. In my opinion, claim 4 is invalid for failure to satisfy the written description requirement. Claim 4 depends from claim 1 and requires “wherein at least one of a focus distance or lens aperture is used to determining a depth of field of the image, wherein the depth of field is computed, based on a movement of the device in the z axis, wherein the z axis is the direction to the object in a scene, may be included in the total quality indicator.” I have reviewed the ’452 specification, and there is no discussion that I can find of computing depth of field based on movement of the device in the z-axis. There is no description or other indication in the ’452 specification that the inventors actually had full possession of the purported invention claimed in claim 4.

**D. Ground IV: The Challenged Claims Are Invalid for Failure to Claim Patentable Subject Matter under § 101**

137. In my opinion, the Challenged Claims are invalid for failure to claim patentable subject matter under the two-step framework in *Alice Corp. Pty. v. CLS*

*Bank Int'l*, 573 U.S. 208 (2014) for determining patent eligibility under 35 U.S.C. § 101.

138. **First**, in my opinion, the Challenged Claims are directed to a patent-ineligible concept—namely, the abstract idea of assessing picture quality and suggesting that the photographer take another picture from a different location. Here, the Challenged Claims are directed to a process that photographers conduct in their minds—assessing a picture’s quality and then taking a new picture to try to capture a better picture. For example, a photographer can look at a proposed photograph in a digital camera view finder or LCD screen and note that the picture is out of focus, the subject is sub-optimally located, the colors are too bright, etc.

139. According to the ’452 patent’s specification, the purported invention seeks to solve the problem of cameras that “still rely on the camera user to assess a picture’s quality, either at the time of taking the picture, or at a later stage.” EX1001, 1:37-40. It explains that at the time of the purported invention, to capture a better picture, “[m]any users simply take more than one picture, say 5-6 pictures, so they will be able to choose a good one.” *Id.*, 1:41-43. The specification describes an alleged solution that “utilize[s] camera hardware . . . to evaluate pictures taken in real time, and actively assist in obtaining the best picture given the circumstances at hand.” *Id.*, 2:24-28. For example, by “provid[ing] detailed suggestions on how to

take a better picture, if possible.” *Id.*, 3:27-32. One such suggestion may be for the photographer “to move from his current location to another location.” *Id.*, 16:8-9. In other words, the Applicant sought to address the purported problem identified in the ’452 patent of taking a low-quality picture by assessing that picture and suggesting that the photographer move to a different location to take an improved picture. This is an abstract idea.

140. The ’452 patent also relies on purely conventional and stock camera components to implement its abstract idea—an “optical lens,” an “image sensor,” and a “processor.” EX1001, Claim 1. The ’452 specification even confirms that these are conventional components. *Id.*, 6:31-33 (“Any suitable input device, such as but not limited to a sensor, may be used ...”); *id.*, 6:36-37 (“Any suitable processor may be employed to compute or generate information as described herein ...”).

141. Anon’s conventional components are also used to perform their basic and intended functions, *i.e.*, capturing and digitizing images. And Anon’s CFE just implements steps that can be performed by the human brain using a generic computer processor running software, such as “calculating from an image received by at least one sensor and lens . . . a quality indicator,” an “aesthetic quality indicator,” and a “total quality indicator,” “selecting . . . at least one appropriate suggestion from a

pre-stored table,” “suggesting to the user to move the device to different location,” and “presenting the suggestion to the user.”

142. The dependent claims recite additional elements regarding the “quality indicator[s],” the “suggestions,” or add “algorithms” that are generic. In all instances, the dependent claims are directed to the same abstract idea of assessing the quality of a picture and suggesting where to take a new picture based on that assessment without specifically describing how that result is achieved. Thus, they are all abstract.

143. For example, claim 2 recites that the “background blurring test” used to determine the “aesthetic quality indicator” is based on generic “data” from the “sensor, lens, or lens aperture.” Claims 3 and 8 recite that the “total quality indicator” simply factors in whether the lens has an “obstruction,” which the specification explains “may occur as a result of putting the finger partly or fully on the lens.” EX1001, 14:56–58. Claim 4 requires a “depth of field” calculation as an input into the “total quality indicator.” But the specification admits that depth of field is one known “photographic parameter[.]” among a non-limiting list of ten known photographic parameters that characterize or are generated by a known “[l]ens/sensor module 200 such as OmniVision OM886.” *Id.*, 7:46–64. Claim 5 adds additional quality indicators based on the use of two different lenses, but does

not change the fact that the claim is still directed to the abstract idea of evaluating an image. Claims 6 and 7 factor in a “confidence level of a subject detection” or “confidence level of a subject focus,” respectively, both generic determinations, without any explanation of how those confidence levels are calculated. Claim 9 recites using generic “algorithms” to calculate the quality indicator and claims 10 and 11 utilize generic “algorithms” for “analyzing” the image. Claim 10 recites the generic step of “building at least a partial reconstruction of a 3D scene” to provide the claimed “suggestion,” but provides no information on how to perform that reconstruction. In all instances, every claim is directed to the same abstract idea of assessing the quality of a picture and suggesting where to take a new picture based on that assessment without specifically describing how that result is achieved. The claims also do not recite any technological improvement. Rather, the claims are results-oriented and performed on generic components. They recite calculating one or more generic quality indicators and selecting an undefined suggestion based on a quality indicator. The claims do not recite how the quality indicators are calculated or how the suggestions are determined. In my opinion, therefore, the claims are directed to abstract ideas.

144. ***Second***, in my opinion, the Challenged Claims all lack an inventive concept under *Alice* step 2. The Challenged Claims recite only conventional camera

components, such as an “optical lens,” an “image sensor,” and a “processor,” which are “merely a conduit for the abstract idea.” They perform the steps of “calculating,” “selecting,” “suggesting,” and “presenting.” These are the generic steps of assessing the picture quality and presenting a suggestion to the photographer, which are nothing more than the abstract idea itself, and they are all taught by references such as Anon.

145. Further, the '452 specification confirms that these are the generic functions of a generic processor. *See* EX1001, 5:64-6:13 (describing that terms such as “processing,” “selecting,” “calculating,” and “producing” “or the like, refer to the action and/or processes of a computer or computer system, or processor or similar electronic device”). Thus, the claims fail at step two because they are written at a high level of generality and merely use well-understood, routine, conventional components to apply the abstract idea.

146. Further, in my opinion, the claims’ recitation of generic “quality indicators” do not supply an inventive concept. This is because the '452 specification expressly describes that “quality indicators,” including a “total quality indicator,” are known in the “[p]rior art,” making them an existing technology that cannot supply an inventive concept. They are also taught by Anon, as discussed above.

147. As I demonstrate in the above discussion of the various grounds of obviousness, where I discuss references such as Kosaka, Li, Bigioi, Wakabayashi, Ramesh, Liu, Yang, and Garcia-Molina, the dependent claims do not recite any inventive concept either, in my opinion. As discussed above, they simply recite additional elements regarding the “quality indicator[s],” the “suggestions,” or additional generic “algorithms” that were known in the art. The “quality indicators” are admittedly known in the prior art, and the “algorithms” are generically claimed as an “aesthetic algorithm,” “a corner detection algorithm,” “a blur detecting algorithm,” and “algorithms of deep learning.” *See* EX1001, Claims 9, 11-12. Claim 10’s recitation of “a partial reconstruction of a 3D scene” does not say how to do accomplish that reconstruction, and therefore also cannot supply an inventive concept, and was also known in the art. Moreover, methods for performing all of these generically-claimed algorithms were well-understood, routine, conventional in the field. Considering each of the Challenged Claims as a whole, there is nothing in the combination of elements that is anything other than routine and conventional. Whether the elements are considered individually or together in an ordered combination, the claims are simply directed to assessing the picture quality and presenting a suggestion to the photographer.

**IX. SECONDARY CONSIDERATIONS**

148. I am not aware of any evidence of secondary considerations that have a nexus to the claimed inventions that would overcome the demonstration of obviousness of the claims of the '452 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 the Patent Owner.

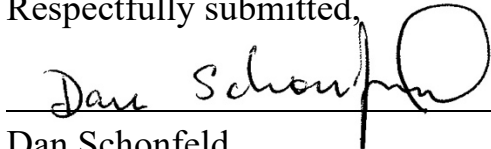
**X. CONCLUSION**

149. For the reasons set forth above, it is my opinion that all of the Challenged Claims of the '452 patent are invalid.

150. 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 8, 2025

Respectfully submitted,

  
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Dan Schonfeld