

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

MOBILEYE GLOBAL, INC.,

Petitioner,

v.

FACET TECHNOLOGY CORP.,

Patent Owner.

Case IPR2024-01110

Patent No. 9,335,255

**SUPPLEMENTAL REPLY DECLARATION OF
CHARLES E. THORPE, PH.D.**

TABLE OF CONTENTS

I.	INTRODUCTION AND SUMMARY OF OPINIONS.....	3
II.	BACKGROUND AND QUALIFICATIONS.....	4
III.	LEGAL STANDARDS	4
A.	Claim Construction.....	4
B.	Level of Ordinary Skill.....	5
C.	Obviousness.....	6
IV.	LEVEL OF ORDINARY SKILL IN THE ART.....	9
V.	CLAIM CONSTRUCTION	10
VI.	GALLAGHER AND LUMIA RENDER OBVIOUS CLAIM 15	14
VII.	UPDATED MATERIALS CONSIDERED	18
VIII.	CONCLUSION.....	19

I. INTRODUCTION AND SUMMARY OF OPINIONS

1. I, Charles E. Thorpe, have been retained as an independent expert by Mobileye Global, Inc. (“Petitioner” or “Mobileye”) in connection with an *inter partes* review of U.S. Patent No. 9,335,255 (the “’255 patent”) (Ex. 1001).

2. I submitted a first declaration in connection with Petitioner’s Petition for *Inter Partes* Review (Paper No. 1), and I understand that my first declaration is marked as Exhibit 1003 in this proceeding. Since submitting my first declaration, Facet Technology Corporation (“Patent Owner”) filed its Preliminary Response (Paper No. 7) and Request for Rehearing (Paper No. 19), and the Board instituted *inter partes* review for the ’255 patent (Paper No. 16). I understand that prior to institution, Patent Owner disclaimed claims 12-14 and 17-23 of the ’255 patent such that claim 15 is the only remaining claim at issue in the *inter partes* review.

3. Following institution, I was deposed on May 30, 2025, regarding the ’255 patent. A transcript of my deposition is marked as Exhibit 2025. After my deposition, I understand that Patent Owner submitted a Response to the Board’s institution decision (Paper No. 25), which included a declaration by Dr. Nikolaos Papanikolopoulos, Ph.D., marked as Exhibit 2023.

4. I have reviewed the Board’s Institution Decision, Patent Owner’s Response and Request for Rehearing, and Dr. Papanikolopoulos’s declaration. Based on my review of these materials, I offer the following supplemental remarks.

My remarks address new claim construction positions that Patent Owner and Dr. Papanikolopoulos raised with the Response and correct certain misstatements in Dr. Papanikolopoulos's declaration regarding my first declaration and the prior art.

5. The new documents that I have reviewed and Patent Owner's Response do not change my opinions I rendered in my first declaration. As I detailed in my first declaration, claim 15 of the '255 patent is invalid as obvious based on the combination of Gallagher in view of Lumia.

II. BACKGROUND AND QUALIFICATIONS

6. My background and qualifications are set forth in my first declaration, Exhibit 1003. I incorporate that section of my first declaration herein by reference. Ex. 1003, ¶¶ 3-18.

III. LEGAL STANDARDS

7. I am not a lawyer. My understanding of the legal standards to apply in reaching the conclusions in this declaration is based on discussions with counsel for Petitioner, my experience applying similar standards in other patent-related matters, and my reading of the documents submitted in this proceeding. In preparing this declaration, I sought to faithfully apply these legal standards to the Challenged Claims.

A. Claim Construction

8. I have been instructed that the terms appearing in the '255 patent should be interpreted in view of the claim language itself, the specification, the prosecution

history of the patent, and any relevant extrinsic evidence. The words of a claim are generally given their ordinary and customary meaning, which is the meaning that the term would have to a person of ordinary skill in the art at the time of the invention, which I am assuming here is August 12, 2000. While claim limitations cannot be read in from the specification, the specification is the single best guide to the meaning of a disputed term.

9. I have been instructed that certain elements in a patent claim may be expressed as a means for performing a specified function without the recital of structure, material, or acts in support and that such a claim is construed to cover the corresponding structure, material, or acts described in the specification and equivalents thereof. I have been instructed that a claim element that recites the word “means” is presumptively construed as a means-plus-function term.

10. I have followed these principles in reviewing the claims of the '255 patent and forming the opinions set forth in this declaration.

B. Level of Ordinary Skill

11. I understand a person of ordinary skill in the art is determined by looking at (i) the type of problems encountered in the art; (ii) the prior art solutions to those problems; (iii) the rapidity with which innovations are made; (iv) the sophistication of the technology; and (v) the educational level of active workers in the field.

12. In my opinion, based on these factors, a person of ordinary skill in the art (“POSITA”) would have had at least a bachelor’s degree in mechanical engineering, electrical engineering, computer science, physics, or related discipline, and four years of experience in research, design, or development in computer vision systems. Higher levels of education may offset less experience and extensive experience can substitute for formal education.

13. I was at least a POSITA as of August 12, 2000, and supervised others who were at least a POSITA

C. Obviousness

14. I have been told that under 35 U.S.C. § 103, a patent claim may be obvious if the differences between the subject matter sought to be patented 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 said subject matter pertains.

15. I have been told that a proper obviousness analysis requires the following:

- a. Determining the scope and content of the prior art;
- b. Ascertaining the differences between the prior art and the claims at issue;
- c. Resolving the level of ordinary skill in the pertinent art; and

- d. Considering evidence of secondary indicia of non-obviousness
(if available).

16. I have been told that the relevant time for considering whether a claim would have been obvious to a person of ordinary skill in the art is the time of invention. For purposes of my analysis, I assumed that the date of invention for the Challenged Claims is August 12, 2000.

17. I have been told that a reference may be modified or combined with other references or with the person of ordinary skill's own knowledge, if the person would have found the modification or combination obvious. I have also been told that a person of ordinary skill in the art is presumed to know all the relevant prior art, and the obviousness analysis may take into account the inferences and creative steps that a person of ordinary skill in the art would employ.

18. I have been told that whether a prior art reference renders a patent claim obvious is determined from the perspective of a person of ordinary skill in the art. I have also been told that, while there is no requirement that the prior art contain an express suggestion to combine known elements to achieve the claimed invention, and while a suggestion to combine known elements to achieve the claimed invention may come from the prior art as a whole or individually and may consider the inferences and creative steps a person of ordinary skill in the art would employ, as filtered through the knowledge of one skilled in the art, obviousness grounds cannot

be sustained by mere conclusory statements and must include some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness.

19. I have been told that there is no rigid rule that a reference or combination of references must contain a “teaching, suggestion, or motivation” to combine references. But I also have been told that the “teaching, suggestion, or motivation” test can be used in establishing a rationale for combining elements of the prior art. I have also been told to be aware of distortions caused by hindsight bias, and that reading into the prior art the teachings of the invention at issue is improper.

20. I am aware that a claim may be obvious where the claim represents nothing more than a combination of prior art elements according to understood methods that yields predictable results. I am further aware that a claim may be obvious where it merely involves the simple substitution of one known element for another to achieve predictable results. I am additionally aware that it may be obvious to try a particular combination of claim features if selecting them requires merely choosing from a finite number of identified, predictable solutions, with a reasonable expectation of success.

21. I have been informed that, in an obviousness analysis, prior art must be analogous art to the patent being considered. I have been informed that a prior art

reference is considered to be analogous, or in the same field of art, if the reference is either (1) in the same field of endeavor as the challenged patent, regardless of the problems the challenged patent and the prior art address, or (2) reasonably pertinent to the particular problem being solved by the challenged patent.

IV. LEVEL OF ORDINARY SKILL IN THE ART

22. I provided my opinion about a person of ordinary skill in the art in my first declaration. Ex. 1003, ¶¶32-34.

23. Dr. Papanikolopoulos responded that my proposed level of ordinary skill for the '255 patent was “an excessive level of ordinary skill.” Ex. 2023, ¶57. But the only discernable difference Dr. Papanikolopoulos identifies is that my proposed definition uses “four years of experience” while Dr. Papanikolopoulos would instead propose only “two years of experience.” I disagree. Four years appropriately accounts for the state of the art and that a person of ordinary skill in the art would have derived much of his knowledge regarding computer vision systems through work experience or higher education because many undergraduate curricula for the time did not include extensive coursework regarding computer vision systems. For this same reason, my first declaration provides that “[h]igher levels of education may offset less experience.” Ex. 1003, ¶33. For example, around this time, I supervised several Ph.D. students working on dissertations related to computer vision. In the approximately two decades leading up to the earliest claimed

priority date of the '255 patent, computer vision systems were the topic of much research and development, and computer vision systems had become much more sophisticated by the late 1990s. In my opinion, four years of work experience appropriately accounts for the type of experience that a typical person having ordinary skill in the art would have possessed at that time.

24. While I continue to find my initial definition more appropriate given the scope and description of the '255 patent, my analysis and my opinions would not change depending on the difference between the proposed levels of experience. Even assuming two years of experience, a person of ordinary skill in the art would have found claim 15 obvious based on the combined teachings of Gallagher and Lumia.

V. CLAIM CONSTRUCTION

25. Patent Owner and Dr. Papanikolopoulos proposed constructions for the term “characterization profile” recited in claim 15. Paper 25 at 14-22; Ex. 2023, ¶¶76-86. Patent Owner and Dr. Papanikolopoulos suggest that the term should be interpreted as “a compilation, presented in a usable format, of the description of the properties and performance characteristics of a sensor across various conditions.” Paper 25 at 22; Ex. 2023, ¶86. I disagree with the proposed constructions and interpretations. Rather, I agree with the Board’s preliminary construction that “characterization profile” means “a conversion factor to convert measured light intensity into luminance.” Paper 16 at 21.

26. The construction for characterization profile that Patent Owner and Dr. Papanikolopoulos put forward is not consistent with how a person of ordinary skill in the art would have read that term in light of the claims and specification of the '255 patent. Patent Owner and Dr. Papanikolopoulos state that they are construing “characterization profile” to “reflect the well-understood concept of sensor characterization.” Paper 25 at 15-17; Ex. 2023, ¶¶77-78. But the concept of “sensor characterization” is very broad and does not require all of the elements in the construction proposed by Patent Owner and Dr. Papanikolopoulos. For example, sensor characterization may include the process of calibration. And a sensor characterization *profile*, in that situation, would include the result of that calibration. Lumia provides a typical example of a characterization profile, as discussed further below.

27. A person of ordinary skill in the art would not understand a “characterization profile” to require “a compilation, presented in a usable format, of the description of the properties and performance characteristics of a sensor across various conditions.” This vague definition does not consider the context in which the term “characterization profile” is used in the '255 patent, which is to be utilized in determining a luminance value. A compilation of the description of the properties and performance characteristics of a sensor does not explain how that compilation is used in determining luminance. A “characterization profile” also does not require

a description of the sensor characteristics across various conditions. Nothing in the language of claim 15 or the specification of the '255 patent supports limiting claim 15 to require determining a luminance value across various conditions.

28. The construction proposed by Patent Owner and Dr. Papanikolopoulos lacks context for relating the characterization profile to determining a luminance value. Claim 15 of the '255 patent specifically requires the use of a characterization profile “of the at least one light intensity sensor” to determine a luminance value. The light intensity values themselves are determined with “at least one light intensity sensor.” Ex. 1001, 19:48-51. So, a person of ordinary skill in the art would understand the term “characterization profile” is used in the context of converting from light intensity values to luminance values. In my opinion, the Board’s preliminary construction is consistent with the opinion in my initial declaration that Lumia teaches determining a luminance value utilizing a characterization profile of the light intensity sensor.

29. I disagree with Patent Owner and Dr. Papanikolopoulos that the Board conflated the '255 patent’s discussion of the look-up-table (“LUT”) 475 with the claimed “characterization profile.” Paper 25 at 20; Ex. 2023, ¶¶83-84. According to the '255 patent, the LUT 475 is a table stored digitally in memory that “uses the indexes of intensity ... and sheeting color to determine the luminance.” Ex. 1001, 11:53-56. The LUT 475 is not a conversion factor, but rather is created using “light

intensity sensor characterization 275.” Ex. 1001, 11:56-59. In other words, the LUT 475 digitally stores values resulting from converting light intensity values to corresponding luminance values for a given color based on, for example, conversion factors. The tabular storage of such information was a common technique at the time for reducing processing time because it is computationally less expensive to look up a value from a table than it is to perform a mathematical calculation. Once the LUT 475 is built out for the relevant intensity and color values, a system could determine a luminance value from a given light intensity value and color using the LUT 475 without even knowing the characterization profile of the light intensity sensor.

30. Patent Owner and Dr. Papanikolopoulos also argue that the ’255 patent supports their construction that “a single profile includ[es] values for multiple conditions” because LUT 475 incorporates both foreground and background RA, where different sheeting colors are identified between the foreground and background RA. Ex. 2023, ¶84. I disagree. Claim 15 says nothing about multiple conditions. The only sensor claimed is a light intensity sensor. In the embodiment of the ’255 patent that Patent Owner and Dr. Papanikolopoulos point to, the light sensor is a black-and-white camera, which lacks the ability to determine colors. Ex. 1001, 11:24-27. While the ’255 patent discloses embodiments that factor in the color of a road sign, those embodiments rely on components not claimed in claim 15, such as the color image capture system.

31. Dr. Papanikolopoulos also argues that creating separate profiles to handle all colors in the 400nm to 700nm spectrum would be “impractical.” Ex. 2023, ¶85. But there is no need to identify a separate profile for every possible wavelength of color. Rather, a person of ordinary skill in the art would have understood that the universe of relevant colors is limited in this type of application because the colors of road signs or other road markings were typically standardized. *E.g.*, Ex. 1008. The ’255 patent itself lists only six relevant colors for sheeting materials. Ex. 1001, 6:12-26. Given the limited number of colors used in road markers, at the time of the invention, a person of ordinary skill in the art would have only needed a limited set of conversion factors for the characterization profile to convert intensity to luminance for most road markings (though claim 15 does not require doing so). This is what the ’255 patent contemplates as do other references from this period. Ex. 1001, 6:16-26; 10:66-11:3; Ex. 1008, Ex. 1012, 33 (Table A-4); Ex. 1019, 16-18.

VI. GALLAGHER AND LUMIA RENDER OBVIOUS CLAIM 15

32. Patent Owner’s and Dr. Papanikolopoulos’s new proposed construction for “characterization profile” does not alter my analysis or my conclusions that Gallagher in view of Lumia render obvious claim 15.

33. Patent Owner and Dr. Papanikolopoulos argue that Lumia cannot teach a characterization profile under their proposed construction because Lumia only describes computing its scale factor with single-color sheeting material. Paper 25 at

14; Ex. 2023, ¶76. I disagree. Lumia contemplates the use of its system and taking measurements for “typical two-color sign[s]” that, when the system is properly calibrated, give readouts for the average luminance values across each corresponding color. Ex. 1014 (“Lumia”), 16. These calculations can then be used through Lumia’s Equation 2 to determine retroreflectance. Lumia even discusses its approach through the use of a typical stop sign, depicted in Figure 3(a), with its related gray level intensities captured that represented the sign background, legend, and surround in Figure 3(b). Lumia, 16-17. Lumia also discusses measuring signs at various distances according to its described “modes.” Lumia, 20. These disclosures demonstrate that, even adopting Patent Owner’s and Dr. Papanikolopoulos’s proposed construction for “characterization profile” to require measurements across “various conditions,” Lumia discloses the “characterization profile” limitation.

34. Specifically, a person of ordinary skill in the art would have understood that a typical sign, such as the stop sign depicted in Figure 3(a), contains multiple colors (e.g., red and white), which Lumia may measure at various distances according to its described mode of operation. While the Experimental Results section of Lumia later discusses computing a scale factor in the context of only measuring white signs, Lumia’s disclosure is plainly broader. The Experimental Results section was intended to demonstrate the feasibility of Lumia’s teachings, and a person of ordinary skill in the art would not have read Lumia’s teachings as

limited to only the Experimental Results section. *See* Lumia, 26 (“The research and analysis presented in this report indicate that a reasonably accurate mobile system for measuring the average retroreflectance of traffic signs during daylight hours is feasible.”). A person of ordinary skill in the art would have recognized Lumia’s desire to create a system for measuring signs of various colors and its disclosure of measuring “typical two-color sign[s]” (e.g., a stop sign). Lumia did not need to describe calculating multiple scale factors, specifically in the Experimental Results section, in order for a person of ordinary skill in the art to understand that a potential design based off Lumia’s teachings would do so. Further, a person of ordinary skill in the art would have known and understood how to calibrate a system for differing between background and foreground colors.

35. Dr. Papanikolopoulos further argues that because retroreflectivity and luminance are distinct, there is no reason for combining Lumia with Gallagher to determine a luminance value. Ex. 2023, ¶89. But luminance and retroreflectivity are related based on the illumination of a given light source. A person of ordinary skill in the art would have understood that only simple calculations would have been required once either luminance or retroreflectivity were known in order to convert and solve for the other variable. Lumia teaches everything needed to determine luminance from intensity and to determine retroreflectivity from luminance.

36. I also disagree with Dr. Papanikolopoulos's explanation that Lumia's camera cannot measure the sign's luminance since Lumia's "CCD sensor...has no sense of the direction of how photons reach each of its pixels." Ex. 2023, ¶¶75, 93. Cameras such as what Lumia discloses use lenses to restrict the light coming in from specific angles; this necessarily determines the direction of incoming light, and the size of pixels necessarily determines the unit area sensed at a fixed distance. Taking the as-measured intensity values would then require calibration (e.g., conversion) to transform the intensity value from the sensor element into a luminance value (e.g., to mimic the human eye, as important for understanding quality of road marker signs for drivers along a roadway). By undertaking this conversion, a system like Lumia would then be able to take its intensity values in a given field of view and convert them to luminance values. Lumia describes this process when it discusses using the sensing elements of its video camera as individual luminance meters, whose intensity values correspond to luminance values after being properly calibrated. Lumia, 16.

37. Lumia's Equation 2 describes how each variable of the equation (specifically, luminance and retroreflectivity) can be measured in the context of a mobile system. Lumia, 16. Lumia's teachings directly benefit Gallagher for determining luminance. For example, Gallagher discloses that its system determines road markers by measuring reflectance levels (e.g., intensity values) of the road

markers. Ex. 1005 (“Gallagher”), [0066]-[0067]. While certain embodiments of Gallagher’s light sensor may have fewer individual photo sensing elements than Lumia (Gallagher is not limited to a particular type of light sensor and says that a variety of types may be suitable), a person of ordinary skill in the art would have understood how to use the intensity values measured through Gallagher’s system to derive luminance and then retroreflectivity values through Lumia’s Equation 2. The number of photo sensing elements would not materially change the ability of Gallagher’s system to derive luminance values through Lumia’s Equation 2. And a person of ordinary skill in the art would have understood that the number of photo sensing elements (e.g., photodiodes) may affect the resolution of the array but not the underlying mathematical principles used for measuring intensity values and converting to luminance. Other higher resolution arrays were known at the time, and a person of ordinary skill in the art would have understood from Gallagher that these higher resolution arrays were within the scope of Gallagher’s invention. Gallagher, [0039] (“A variety of light sensors are envisaged as being suitable in the apparatus 1,” including “light sensors with different spectral responses or similar light sensors with different filters.”); Ex. 1006, 8:38-45, 10:18-29.

VII. UPDATED MATERIALS CONSIDERED

38. In forming my opinions, I have analyzed the exhibits I listed in my first declaration, including the ’255 patent, its prosecution history, and the prior art cited

in my analysis of the Petition Grounds, as well as the other materials cited in this supplemental declaration.

39. My opinions are based on my experience, knowledge of the relevant art, the documents identified above, and the documents discussed in this declaration.

VIII. CONCLUSION

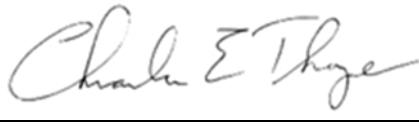
40. For the reasons set forth above as well as my first declaration, in my opinion, a person of ordinary skill in the art would have found claim 15 of the '255 patent obvious by Gallagher in view of Lumia.

41. In signing this declaration, I understand that the declaration will be filed as evidence in a contested case before the Patent Trial and Appeal Board of the United States Patent and Trademark Office. I acknowledge that I may be subject to cross-examination in the case and that cross-examination will take place within the United States. If cross-examination is required of me, I will appear for cross-examination within the United States during the time allotted for cross-examination.

42. I declare that all statements made herein of my knowledge are true and that all statements made on information and belief are believed to be true; and further, that these statements were made with knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. § 1001.

43. I declare under penalty of perjury under the laws of the United States of America that the foregoing is true and correct.

Executed on this 15th day of September 2025.

By: 

Charles E. Thorpe