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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
19/249,847	06/25/2025	Zhenqiang Ying	OCULP0200C1	4090
150162	7590	08/26/2026	EXAMINER	
Freestone IP-Meta 8201 164th Ave NE SUITE 200, PMB 118 Redmond, WA 98052			SHEN, YUZHEN	
			ART UNIT	PAPER NUMBER
			2623	
			NOTIFICATION DATE	DELIVERY MODE
			08/26/2026	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

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cofficeaction@appcoll.com

Office Action Summary

Application No.

19/249,847

Applicant(s)

Ying et al.

Examiner

YUZHEN SHEN

Art Unit

2623

AIA (First Inventor to File) Status Yes

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1) ☒ Responsive to communication(s) filed on 06/24/2026.

☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on ____.

2a) ☒ This action is **FINAL**.

2b) ☐ This action is non-final.

3) ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on ____; the restriction requirement and election have been incorporated into this action.

4) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims*

5) ☒ Claim(s) 1-15 and 19-22 is/are pending in the application.

5a) Of the above claim(s) ____ is/are withdrawn from consideration.

6) ☒ Claim(s) 7-15, 19-20 and 22 is/are allowed.

7) ☒ Claim(s) 1-6 is/are rejected.

8) ☒ Claim(s) 21 is/are objected to.

9) ☐ Claim(s) ____ are subject to restriction and/or election requirement

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.

Application Papers

10) ☐ The specification is objected to by the Examiner.

11) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

a) ☐ All b) ☐ Some** c) ☐ None of the:

1. ☐ Certified copies of the priority documents have been received.

2. ☐ Certified copies of the priority documents have been received in Application No. ____.

3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

** See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)

3) ☐ Interview Summary (PTO-413)

Paper No(s)/Mail Date ____.

2) ☐ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b)

4) ☐ Other: ____.

Paper No(s)/Mail Date ____.

Detailed Action

1. The present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA.

Response to Amendment

2. The Amendment filed on 06/24/2026 has been entered. Claim 15 has been amended. Claims 16-18 have been canceled. Claims 21-22 have been added. Claims 1-15 and 19-22 remain pending in the application. Rejections of claims 7-14 under 35 U.S.C. 112(a) (pre-AIA 35 U.S.C. 112, first paragraph) are withdrawn.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103 which forms the basis for all obviousness rejections set forth in this Office action:

A patent for a claimed invention may not be obtained, notwithstanding that the claimed invention is not identically disclosed as set forth in section 102 of this title, if the differences between the claimed invention and the prior art are such that the claimed invention as a whole would have been obvious before the effective filing date of the claimed invention to a person having ordinary skill in the art to which the claimed invention pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 1-2 and 5-6 are rejected under 35 U.S.C. 103 as unpatentable over LERNER (US 20210174123 A1) in view of LEE (US 20180025478 A1).

Regarding claim 1, LERNER (**Figs. 1-7**) discloses a head-mounted device (**Fig. 7 shows a head-mounted device 401, which comprises an image capture device 122 as shown in Figs. 3-4; [0056]**) comprising:

an image sensor configured to generate raw image data (**Fig. 7 shows the head-mounted device 401 comprising a camera 430, corresponding to the camera 126 of the image capture device 122 as shown in Figs. 3-4, the camera capture images and generate an initial image data corresponding to a raw image data; [0063] and [0047];**

an image processing engine (**Figs. 3-4; image signal processor 134 or 153**) configured to receive the raw image data and perform partial image signal processing on the raw image data to generate processed image data (**Figs. 1-5 and [0032], [0038]-[0039], [0047]-[0048]; image signal processor 134 or 153 performs partial image signal processing and generates the processed image data; Fig. 6 and [0053]-[0054] show examples of images after partial image signal processing**); and

a controller configured to: transmitting the processed image data generated by the image processing engine to processing logic of a companion device (**transmitting the processed image data to external device 402A or 402B in Fig. 7, which comprises the second device 123 in Figs. 3-4; [0056]**) for further image processing (**Figs. 1-5 and [0032], [0038]-[0039], [0047]-[0048]; image signal processor 142 or 142A performs further image signal processing**).

LERNER discloses the head-mounted device (head-mounted 401) comprising a battery (**battery 427; [0062]**). LERNER further discloses transmitting the processed image data generated by the image processing engine to processing logic of a companion device to reduce the battery usage (**[0016]-[0017]**). LERNER does not disclose determining a power level of a battery of the head-mounted device and transmitting the

processed image data to the companion device for further image processing in responsive to the power level of the battery being below a battery threshold. However, LEE (e.g., **Figs. 2-6 and 12**) discloses a distributed image signal processing system, wherein an image processing engine of a first electronic device (**Figs. 2 and 4; image signal processor 170 of first electronic device 100**) configured to receive the raw image data (**Figs. 2 and 4; image data captured with a camera 110**) and perform partial image signal processing on the raw image data to generate processed image data (**Figs. 2-4 and 6; [0065] and [0111]-[0113]; partial image signal processing**). LEE (e.g., **Figs. 2-6 and 12**) further discloses a controller configured to: determine a power level of a battery of the first electronic device (**[0063]; processor 170 determines battery level of the first electronic device 100**); and responsive to the power level of the battery being below a battery threshold (**[0065]; battery threshold**), transmitting the processed image data generated by the image processing engine to processing logic of a companion device (**Figs. 2-4 and 6; [0064]-[0065] and [0111]-[0113]; transmitting the processed image data to the second electronic device 200, which performs further image signal processing**). Therefore, it would have been obvious to one skilled in the art at the effective filing date of the claimed invention to incorporate the teaching from LEE to the head-mounted device of LERNER, which would reduce image processing load and increase battery usage.

Regarding claim 2, LERNER in view of LEE discloses the head-mounted device of claim 1, the combination of LERNER with LEE discloses wherein the image processing engine of the head-mounted device is configured to generate YUV image data from the

processed image data (**LERNER, [0025]; first device performs YUV image data generation and noise reduction**) when the power level is above the battery threshold (**LEE, [0065]; battery threshold**). Therefore, it would have been obvious to one skilled in the art at the effective filing date of the claimed invention to incorporate the teaching from LEE to the head-mounted device of LERNER for the same reason above.

Regarding claim 5, LERNER in view of LEE discloses the head-mounted device of claim 1, LERNER (**Figs. 1-7**) discloses wherein the processed image data is transmitted to the companion device by a wireless communication channel (**Fig. 7 an [0061]; wireless communication**).

Regarding claim 6, LERNER in view of LEE discloses the head-mounted device of claim 1, LERNER (**Figs. 1-7**) discloses wherein the processed image data is transmitted to the companion device by a wired communication channel (**Fig. 10 an [0088]; wired communication**). In addition, LEE (**e.g., Figs. 2-6 and 12**) also discloses wherein the processed image data is transmitted to the companion device by a wired communication channel (**[0041] and [0158]; wired communication**).

5. Claims 3-4 are rejected under 35 U.S.C. 103 as unpatentable over LERNER (US 20210174123 A1) in view of LEE (US 20180025478 A1) and further in view of NAMBIAR (US 9305227 B1).

Regarding claim 3, LERNER in view of LEE discloses the head-mounted device of claim 1, but does not disclose wherein the processed image data is transmitted to the

companion device when the communication channel is established and the power level of the battery is below the battery threshold. However, NAMBIAR (**Figs. 1-5**) discloses a distributed image signal processing system, wherein image processing is performed utilizing a local process on a first electronic device in conjunction with a remote process on a remote second electronic device, wherein the controller is further configured to check whether a communication channel is established with the companion device (**e.g., Fig. 3A, step 304, and Fig. 3B, step 354**), and wherein the processed image data is transmitted to the companion device when the communication channel is established (**e.g., Fig. 3A, step 304, and Fig. 3B, step 354; col. 8, line 32-col. 9, line 14, col. 11, lines 36-50**) and the power level of the battery is below the battery threshold (**e.g., Fig. 3A, step 306, and Fig. 3B, step 356; col. 8, line 32-col. 9, line 14, col. 11, lines 36-50**). Therefore, it would have been obvious to one skilled in the art at the effective filing date of the claimed invention to incorporate the teaching from NAMBIAR to the head-mounted device of LERNER in view of LEE, which would reduce image processing load and increase battery usage.

Regarding claim 4, LERNER in view of LEE discloses the head-mounted device of claim 3, NAMBIAR (**Figs. 1-5**) discloses wherein the image processing engine of the first electronic device is configured to generate image data from the processed image data when the communication channel with the companion device is not established (**e.g., Fig. 3A, step 304, and Fig. 3B, step 354; col. 8, lines 41-48 and col. 11, lines 36-43**). Therefore, the combination of LERNER, LEE, and MAMBIAR discloses wherein the image processing engine of the head-mounted device is configured to generate YUV

image data from the processed image data when the communication channel with the companion device is not established. It would have been obvious to one skilled in the art at the effective filing date of the claimed invention to incorporate the teaching from NAMBIAR to the head-mounted device of LERNER in view of LEE for the same reason above.

Allowable Subject Matter

6. Claims 7-15, 19-20, and 22 are allowed. Claim 21 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. The following is an examiner's statement of reasons for allowance: The present invention is directed to a head-mounted display device including a distributed image signal processing engine. The closest prior arts, LERNER (US 20210174123 A1), LEE (US 20180025478 A1), and WANG (US 20240171701 A1), individually or in combination, disclose a head-mounted device comprising: an image sensor configured to generate raw image data; an image processing engine configured to receive the raw image data and perform partial image signal processing on the raw image data to generate processed image data; and a controller configured to: determine a status of an operating application of the head-mounted device; and responsive to the status of the operating application, transmitting the processed image data generated by the image processing engine to processing logic of a companion device for further image processing, but fails to teach wherein the processed image data is transmitted to the companion device when the status of the operating application includes capturing videos. In addition, the closest prior arts disclose

a method of distributed image signal processing comprising: generating raw image data with an image sensor of a head-mounted device; performing ultralight image signal processing on the raw image data with an image processing engine of the head-mounted device, wherein performing the ultralight image signal processing generates statistics of the raw image data; determining a power level of a battery of the head-mounted device; and responsive to the power level of the battery being below a battery threshold, transmitting the processed image data of the raw image data generated by the image processing engine to processing logic of a companion device for further image processing, but fail to teach transmitting both the raw image data and the statistics of the raw image data generated by the image processing engine to the companion device for further image processing.

Response to Arguments

7. Regarding claim 1, applicant's arguments filed 06/24/2026 have been fully considered but they are not persuasive. Applicant argues that the cited references do not disclose the limitation "responsive to the power level of the battery being below a battery threshold, transmitting the processed image data generated by the image processing engine to processing logic of a companion device for further image processing" of the claim 1.

The examiner respectfully disagrees with applicant's arguments. LERNER (Figs. 1-7) discloses a head-mounted device 401, a camera 430 captures images and generate a raw image data ([0063] and [0047]), an image signal processor 134 or 153 performs partial image signal processing and generates a processed image data (Figs. 1-6 and

[0032], [0038]-[0039], [0047]-[0048], and [0053]-[0054]), a controller transmits the partial processed image data to an external device 402A or 402B, and an image signal processor 142 or 142A of the external device performs further image signal processing (Figs. 1-5 and [0032], [0038]-[0039], [0047]-[0048], and [0056]).

LERNER discloses the head-mounted device 401 comprising a battery 427 ([0062]). LERNER further discloses transmitting the partially processed image data generated by the image processor of the head-mounted device to an external device to reduce the battery usage ([0016]-[0017]). LERNER does not disclose determining a power level of the battery and transmitting the partially processed image data to the external device for further image processing in responsive to the power level of the battery being below a battery threshold.

However, LEE (e.g., Figs. 2-6 and 12) discloses a distributed image signal processing system, comprising a first electronic device 100 and an external second electronic device 200. A camera 110 of the first electronic device 100 capture image data and generate raw image data and the image signal processor 170 of the first electronic device 100 performs partial image signal processing on the raw image data to generate processed image data (Figs. 2-4 and 6; [0064]-[0065] and [0111]-[0113]). LEE (e.g., Figs. 2-6 and 12) further discloses a processor 170 determines battery level of the first electronic device 100 ([0063]), and transmits the partially processed image data to the second electronic device 200 for further image signal processing (Figs. 2-4 and 6; [0065] and [0111]-[0113]).

Applicant argues that LEE discloses the first electronic device transmitting unprocessed rather than processed image data to the second electronic device. However,

LEE ([0064]) clearly teaches that the image signal processor 170 of the first electronic device 100 performs partial image signal processing including “pre-processing, alignment, warping, blending, encoding, composing, ...”. LEE ([0111]-[0113]) also teaches that based on battery level, the image signal processor 170 of the first electronic device 100 performs partial image signal processing and the remaining process is performed by the second electronic device 200.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Inquiry

Any inquiry concerning this communication or earlier communications from the examiner should be directed to YUZHEN SHEN whose telephone number is (571)272-1407. The examiner can normally be reached on 9:00-18:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Chanh Nguyen can be reached on 571-272-7772. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/YUZHEN SHEN/

Primary Examiner, Art Unit 2623