CLAIMS

1. A computer-implemented method comprising:

receiving, using a processor, a hyperspectral image of a retina of a patient;

detecting, by the processor, a shadow in the hyperspectral image, wherein detecting the shadow in the hyperspectral image comprises calculating a shift vector of the shadow in the hyperspectral image;

determining, by the processor that the shadow of the hyperspectral image exceeds a threshold by comparing the shift vector with the threshold; and

in response to determining that the shadow of the hyperspectral image exceeds the threshold, initiating, by the processor, a capture of an additional hyperspectral image of the retina of the patient.

2. The computer-implemented method of claim 1 further comprising generating an alert to a user comprising a message indicating that new hyperspectral image of the retina are needed because of the shadow.

3. The computer-implemented method of claim 1, wherein ~~detecting the shadow in the hyperspectral image comprises calculating a shift vector of the shadow in the hyperspectral image.~~

~~4. The computer-implemented method of claim 3, wherein~~ the shift vector indicates an amount and angle of shadowing.

~~5.~~ 4. The computer-implemented method of claim ~~3, wherein determining the shadow of the hyperspectral image exceeds the threshold comprises comparing the shift vector with the threshold.~~

~~6. The computer-implemented method of claim 3~~ 1 further comprising:

detecting, by the processor, a field of view (FOV) and optic disk (OD) of the retina in the hyperspectral image;

computing, by the processor, a soft mask using the FOV and the OD of the retina in the hyperspectral image;

computing, by the processor, a first center of gravity using the soft mask and the hyperspectral image;

normalizing, by the processor, the hyperspectral image;

applying, by the processor, a tensor to the normalized hyperspectral image;

computing, by the processor, a second center of gravity using the normalized hyperspectral image with the tensor; and

generating, by the processor, the shift vector using the first center of gravity and the second center of gravity.

7. 5. The computer-implemented method of claim 3 1 further comprising:

detecting, by the processor, a second shadow in the additional hyperspectral image;

determining, by the processor, that the second shadow of the additional hyperspectral image does not exceed the threshold; and

in response to determining that the second shadow of the additional hyperspectral image does not exceed the threshold, transmitting, by the processor, the hyperspectral image and the additional hyperspectral image, wherein the hyperspectral image comprises an overlay of the shadow and values of the shift vector.

8. The computer-implemented method of claim 1 comprising:

registering, by the processor, the hyperspectral images to correct a detected eye motion between the hyperspectral images and wherein the step of detecting comprises detecting, by the processor, a shadow in the registered hyperspectral images.

9. The computer-implemented method of claim 5, wherein the shift vector comprises a length of the shadow and an angle of the shadow

10. 6. A system comprising:

an image sensor;

a memory; and

a processor coupled with the image sensor and the memory, the processor configured to perform a method comprising:

receiving a hyperspectral image of a retina of a patient;

detecting a shadow in the hyperspectral image, wherein detecting the shadow in the hyperspectral image comprises calculating a shift vector of the shadow in the hyperspectral image;

determining that the shadow of the hyperspectral image exceeds a threshold by comparing the shift vector with the threshold; and

in response to determining that the shadow of the hyperspectral image exceeds the threshold, facilitating an image sensor to capture an additional hyperspectral image of the retina of the patient.

11. in response to determining that the shadow of the hyperspectral image exceeds the threshold, initiating a capture of an additional hyperspectral image of the retina of the patient by the image sensor.

7. The system of claim 106, wherein the method performed by the processor further comprises generating an alert to a user comprising a message indicating that a new hyperspectral image of the retina are needed because of the shadow.

12. 8. The system of claim 10, wherein detecting the shadow in the hyperspectral image comprises calculating a shift vector of the shadow in the hyperspectral image.

13. The system of claim 126, wherein the shift vector indicates an amount and angle of shadowing.

14. The system of claim 13, wherein determining the shadow of the hyperspectral image exceeds the threshold comprises comparing the shift vector with the threshold.

15. The system of claim 139. The system of claim 6, wherein the method performed by the processor further comprises:

detecting a field of view (FOV) and optic disk (OD) of the retina in the hyperspectral image;

computing a soft mask using the FOV and the OD of the retina in the hyperspectral image;

computing a first center of gravity using the soft mask and the hyperspectral image;

normalizing the hyperspectral image;

applying a tensor to the normalized hyperspectral image;

computing a second center of gravity using the normalized hyperspectral image with the tensor; and

generating the shift vector using the first center of gravity and the second center of gravity.

16. 10. The system of claim 136, wherein the method performed by the processor further comprises:

detecting a second shadow in the additional hyperspectral image;

determining that the second shadow of the additional hyperspectral image does not exceed the threshold; and

in response to determining that the second shadow of the additional hyperspectral image does not exceed the threshold, transmitting the hyperspectral image and the additional hyperspectral image, wherein the hyperspectral image comprises an overlay of the shadow and values of the shift vector.

17. 11. A computer program product comprising a computer-readable storage media having computer-executable instructions stored thereupon, which when executed by a processor cause the processor to perform a method comprising:

receiving a hyperspectral image of a retina of a patient;

detecting a shadow in the hyperspectral image;, wherein detecting the shadow in the hyperspectral image comprises calculating a shift vector of the shadow in the hyperspectral image;

determining that the shadow of the hyperspectral image exceeds a threshold; and

in response to determining that by comparing the shadow of the hyperspectral image exceedsshift vector with the threshold, facilitating an image sensor to capture an additional hyperspectral image of the retina of the patient.; and

in response to determining that the shadow of the hyperspectral image exceeds the threshold, facilitating an image sensor to capture an additional hyperspectral image of the retina of the patient.

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12. The computer program product of claim 1711, wherein the method performed by the processor further comprises generating an alert to a user comprising a message indicating that a new hyperspectral image of the retina are needed because of the shadow.

19. 13. The computer program product of claim 17, wherein detecting the shadow in the hyperspectral image comprises calculating a shift vector of the shadow in the hyperspectral image.

~~20. The computer program product of claim 19~~11, wherein the shift vector indicates an amount and angle of shadowing.

~~21.~~ 14. The computer program product of ~~claim 19, wherein determining the shadow of the hyperspectral image exceeds the threshold comprises comparing the shift vector with the threshold.~~ claim

~~22. The computer program product of claim 19~~11, wherein the method performed by the processor further comprises:

~~detecting~~ a field of view (FOV) and optic disk (OD) of the retina in the hyperspectral image;

~~computing~~ a soft mask using the FOV and the OD of the retina in the hyperspectral image;

~~computing~~ a first center of gravity using the soft mask and the hyperspectral image;

~~normalizing~~ the hyperspectral image;

~~applying~~ a tensor to the normalized hyperspectral image;

~~computing~~ a second center of gravity using the normalized hyperspectral image with the tensor; and

~~generating~~ the shift vector using the first center of gravity and the second center of gravity.

~~23.~~ 15. The computer program product of ~~claim 19~~11, wherein the method performed by the processor further comprises:

~~detecting~~ a second shadow in the additional hyperspectral image;

~~determining~~ that the second shadow of the additional hyperspectral image does not exceed the threshold; and

~~in~~ response to determining that the second shadow of the additional hyperspectral image does not exceed the threshold, transmitting the hyperspectral image and the additional hyperspectral image, wherein the hyperspectral image comprises an overlay of the shadow and values of the shift vector.

~~24.~~ 16. A computer-implemented method comprising:

receiving, using a processor, a hyperspectral image of a retina of a patient;

~~detecting~~, by the processor, a shadow in the hyperspectral image by calculating a shift vector of the hyperspectral image;

determining, by the processor, the shift vector of the hyperspectral image exceeds a threshold by comparing the shift vector with the threshold; and

in response to determining that the shift vector of the hyperspectral image exceeds the threshold, initiating, using the processor, a capture of an additional hyperspectral image of the retina of the patient.

~~25.~~ 17. The computer-implemented method of ~~claim 24~~ claim 16, wherein the shift vector comprises a length of the shadow and an angle of the shadow.

~~26.~~ 18. A computer-implemented method comprising:

receiving, using a processor, hyperspectral images of a retina of a patient;

registering, by the processor, the hyperspectral images to correct a detected eye motion between the hyperspectral images;

detecting, by the processor, a shadow in the registered hyperspectral images, wherein detecting the shadow in the hyperspectral image comprises calculating a shift vector of the shadow in the hyperspectral image;

determining, by the processor, that the shadow of the hyperspectral images exceeds a threshold by comparing the shift vector with the threshold; and

in response to determining that the shadow of the hyperspectral images exceeds the threshold, initiating, using the processor, a capture of an additional hyperspectral image of the retina of the patient.

~~27.~~ 19. The computer-implemented method of ~~claim 26~~ claim 18, wherein detecting the shadow in the hyperspectral images comprises calculating a shift vector of the shadow in the hyperspectral images.

~~28. A computer program comprising program code means adapted to perform the method of any of claims 1 to 9 or any of claims 24 to 27, when said program is run on a computer.~~