CLAIMS

What is claimed is:

1. An optical object recognition method comprising:

driving first light sources among a plurality of light sources included in a display panel, the first light sources being disposed to correspond to an object recognition window which is a partial region of the display panel;

obtaining a plurality of images based on reflected light received by an object recognition sensor through the object recognition window while driving the first light sources;

obtaining at least one of the plurality of images as a first reference image for optical object recognition associated with a first object; and

storing the first reference image,

wherein obtaining the at least one of the plurality of images as the first reference image includes:

obtaining a plurality of first values by performing a spatial signal processing on the plurality of images, respectively;

obtaining a plurality of second values by performing a frequency signal processing on the plurality of images, respectively; and

selecting at least one image among the plurality of images as the first reference image, based on the plurality of first values and a predetermined first threshold value, and/or based on the plurality of second values and a predetermined second threshold value.

2. The method of claim 1, wherein:

the first reference image is an image that does not include the first object,

the plurality of images includes a first image that includes the first object, and

the first reference image is an image obtained immediately before or immediately after the first image among the plurality of images that are obtained.

3. The method of claim 1 or claim 2, further comprising:

sensing, by a touch sensor panel, a touch input of a user, and

wherein, when the touch input is sensed, the first light sources are driven, the plurality of images are sequentially obtained, and the first reference image is obtained and stored.

4. The method of any one of claims 1 to 3, further comprising:

checking whether the display panel or an electronic device including the display panel has an unused state, and

wherein, when the display panel or the electronic device has the unused state, the first light sources are driven, the plurality of images are sequentially obtained, and the first reference image is obtained and stored.

5. The method of any one of claims 1 to 4, wherein, among the plurality of images, at least one image having a respective first value smaller than or equal to the predetermined first threshold value is selected as the first reference image.

6. The method of any one of claims 1 to 4, wherein, among the

plurality of images, at least one image having a respective second value smaller than or equal to the predetermined second threshold value is selected as the first reference image.

7. The method of any one of claims 1 to 4, wherein, among the plurality of images, at least one image having a respective first value smaller than or equal to the first threshold value and having a respective second value smaller than or equal to the second threshold value is selected as the first reference image.

8. The method of claim 1, wherein the first reference image is an image that does not include the first object, the method further comprising:

obtaining at least another one image among the plurality of images as a first image, the first image being an image that includes the first object; and

obtaining a first effective image for the first object based on the first image and the first reference image.

9. The method of claim 8, wherein obtaining the first effective image includes:

obtaining the first effective image by subtracting the first reference image from the first image.

10. An electronic device comprising:

a display panel including a plurality of light sources, the display panel configured to drive first light sources among the plurality of light sources to display an object recognition window on a partial region of the display panel;

an object recognition sensor configured to continuously obtain a plurality of images based on reflected light received through the object recognition window while driving the first light sources;

a processor configured to obtain at least one of the plurality of images as a first reference image for optical object recognition associated with a first object, the first reference image being an image that does not include the first object; and

a memory configured to store the first reference image,

wherein the processor is further configured to:

obtain a plurality of first values by performing a spatial signal processing on the plurality of images, respectively;

obtain a plurality of second values by performing a frequency signal processing on the plurality of images, respectively; and

select at least one image among the plurality of images as the first reference image, based on the plurality of first values and a predetermined first threshold value, and/or based on the plurality of second values and a predetermined second threshold value.

11. The electronic device of claim 10, further comprising:

a touch sensor panel configured to sense a touch input of a user,

wherein the processor is configured to check whether the display panel or the electronic device has an unused state, and

wherein, when the touch input is sensed or when the display panel or the electronic device has the unused state, the display panel is configured to drive the first light sources, the object recognition sensor is configured to continuously obtain the plurality of images, the processor is configured to obtain the first reference

image, and the memory is configured to store the first reference image.

12. A biometric device comprising:

a plurality of light-emitting pixels disposed behind a pattern recognition window of a larger display panel;

a plurality of light-sensing pixels disposed behind the light-emitting pixels in a reflective light path from the pattern recognition window;

a plurality of memory cells in signal communication with the plurality of light-sensing pixels, respectively, wherein the plurality of memory cells is configured to receive from the plurality of light-sensing pixels a plurality of images; and

a processor is configured to:

obtain a plurality of first values by performing a spatial signal processing on the plurality of images, respectively;

obtain a plurality of second values by performing a frequency signal processing on the plurality of images, respectively; and

select at least one image among the plurality of images as a reference image, based on the plurality of first values and a predetermined first threshold value, and/or based on the plurality of second values and a predetermined second threshold value,

wherein the reference image is indicative of a shadow cast by at least the plurality of light-emitting pixels when light emitted by the plurality of light-emitting pixels is reflected back through the pattern recognition window.

13. The biometric device of claim 12, wherein the plurality of memory

cells is further configured to subtract the reference image from a raw image acquired by the light-sensing pixels to form a pure biometric pattern image.

14. The biometric device of claim 13, wherein the pure biometric pattern image is indicative of at least one of a fingerprint, an iris, or a face.

15. The biometric device of claim 13 or claim 14, wherein the reference image and the raw image are obtained contemporaneously.

16. The biometric device of any one of claims 12 to 15, further comprising a touch sensor configured to activate at least one of the plurality of light-emitting pixels or the plurality of light-sensing pixels.

17. The biometric device of any one of claims 12 to 16, further comprising a plurality of optical devices disposed in front of the plurality of light-sensing pixels to concentrate or focus reflected light upon the plurality of light-sensing pixels.