Literature Review

by Team Ravi

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Team Ravi Literature Review

Enhancing Fingerprint Authentication Latency Under Display by Normalizing Frame Luminance

What is under-display fingerprint sensor ?

An in-display fingerprint scanner, sometimes referred to as an under-display fingerprint sensor, is a tiny camera that sits beneath a device's display—like a laptop or smartphone—and takes a picture of the user's fingerprint.

Some keywords:

organic light-emitting diode (OLED) : is a light-emitting technology that uses organic materials to emit light.

A display panel can refer to an electronic screen on which information can be displayed.

A semiconductor device called a display driver integrated circuit (DDIC) is used to control display panels. In order to power the display panels, it takes high-speed digital data from the application processor and converts it to an analog voltage. DDICs are essential components for the switching and display control operations required by AMOLED and liquid crystal displays.

An example of a display technology that uses electroluminescent organic compounds on a base layer is the active-matrix organic light-emitting diode (AMOLED). The technology used to address pixels is known as the active matrix.

An electrical phenomenon known as electroluminescence occurs when a material reacts strongly to an electric current or strong electric field by releasing light.

Localized brightness compensation: By lowering the backlight, brightness compensation lowers power consumption.

One method to lessen backlight intensity in specific areas of the display is local dimming.

When you use the Local High Brightness Mode, your brightness is increased beyond what is achievable with manual brightness adjustments.

A luminance delay that can happen with OLED technology is called first frame dimming (FFD) or low first frame rate (FFR). A hysteresis effect in the display driver integrated circuit's parts may be the source (DDIC). There may be a delay in reaching the target luminance needed to properly capture a fingerprint on a device screen with FFD or low FFR.

A film of organic substances that emits light in response to an electric current is called an organic light-emitting diode (OLED) pixel. A mobile phone's OLED display may reach 400 to 500 pixels per inch (PPI), compared to the 100 to 200 PPI of a commercial large-scale OLED television. Samsung has produced the first 10,000 PPI OLED in history.

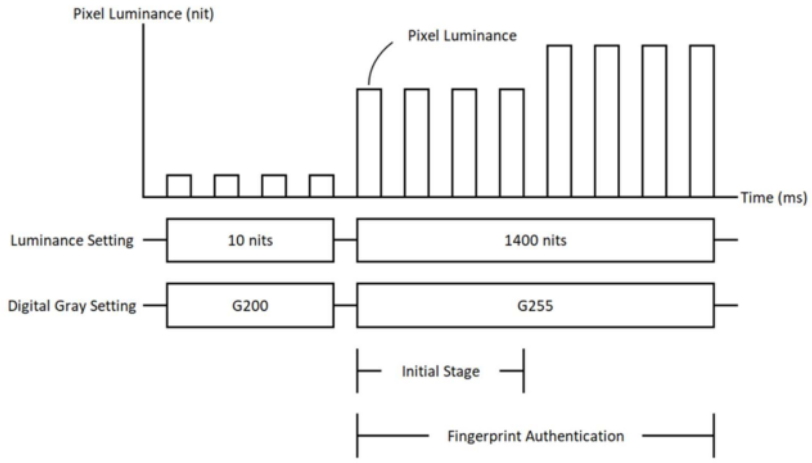
Description:

Computing device users can obtain convenient and personalized methods of user authentication through biometric authentication systems, such as face and fingerprint authentication. One technique that facilitates rapid and dependable user authentication is fingerprint scanning, which uses authorized fingerprints to determine whether to grant or deny access to computing devices to users. An optical under-display fingerprint sensor (UDFPS) is frequently found in computing devices that allow fingerprint scanning. A user may try to authenticate using a UDFPS by giving the computer device user input (like a fingerprint). One or more fingers could be placed on the computer screen right above the UDFPS, for instance. The user input may be illuminated by the display so that the UDFPS can generate frames (also known as "image capturing") at a predefined frequency (e.g., frame rate) by capturing reflected light. After that, the frames might be processed before being assessed by a "matcher," or fingerprint-matching algorithm. For instance, the matcher may verify

the authenticity of the user input by determining if details (such as a fingerprint's or a face's minutia) deduced from the frames correspond to an enrolled frame of a previously verified user input.

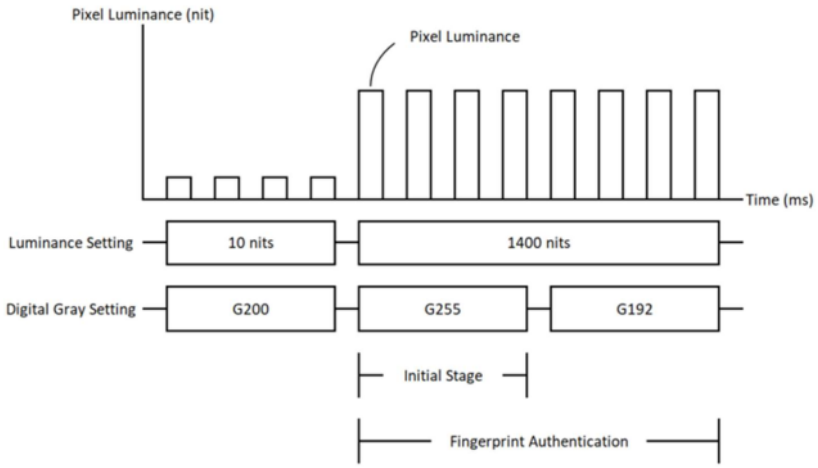
However, user authentication may be delayed if the user input is not illuminated optimally (e.g., dimly, inconsistently) during UDFPS sensing. For instance, an organic light-emitting diode (OLED) display's output may occasionally progressively rise to a target luminance, which would result in insufficient illumination of the user's input during the first step of UDFPS image capture. First frame dimming (FFD), an intrinsic feature of OLED technology, is a delay in luminance that may be brought on by a hysteresis effect in the display driver integrated circuit's (DDIC) transistors and capacitors, for example. Therefore, user authentication may be slowed down until later frames are received before the matcher evaluates the user input.

For instance, the entire AMOLED display may emit light with a luminance of 10 nits and a color of G200 prior to fingerprint authentication. The pixel circuits of the pixel circuit array may receive data-line signals (such as voltages) from the data-line driver that is operably coupled to the DDIC to implement a luminance of 1400 nits and a color of G255 upon the initiation of fingerprint authentication. In the first phase of fingerprint authentication, the high-luminance region's pixel circuits may emit light at a brightness of about 1000 nits even though they are receiving data-line signals that are intended to have a brightness of about 1400 nits. Following the first fingerprint authentication stage, which lasts for tens of milliseconds (ms) (for example, 25 ms), the high-luminance region's pixels may then begin to emit light at a luminance of about 1400 nits.



Graphical representation of FFD

In certain aspects, the LHBM manager during fingerprint authentication can make up for FFD by bringing the luminance from the initial stage of authentication back to normal after the fingerprint authentication process is complete. For instance, it might be known that the pixel luminance at the start of the fingerprint authentication process is 80% that of the pixel luminance at the end of the initial stage. It is also possible to know that G192's luminance is 80% that of G255. The LHBM manager may instruct the pixels to emit G192 after the initial stage of fingerprint authentication and G255 during the initial stage in order to normalize the luminance in the high-luminance region. By doing this, it may be possible to maintain the high-luminance region's luminance during fingerprint authentication, enhancing user experience and removing the need for the UDFPS to produce additional frames following the initial stage of fingerprint authentication.



Graphical representation of compensating for luminance latency

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