Sweep Fingerprint Sensor

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Our modern society uses a lot of electronic services like e-banking, shopping with credit cards, e-mail communication, and many others. The problems of such services are mostly bound to insecurities and hacker attacks. There still has to be done a huge effort to ensure that the person who uses a service can securely be identified and thereupon be authorized to get access to the selected service. An identification element could be a biometric sensor. In the present project the goal was to use a fingerprint sensor for a biometric person identification. For this purpose a so called sweep fingerprint sensor was used.

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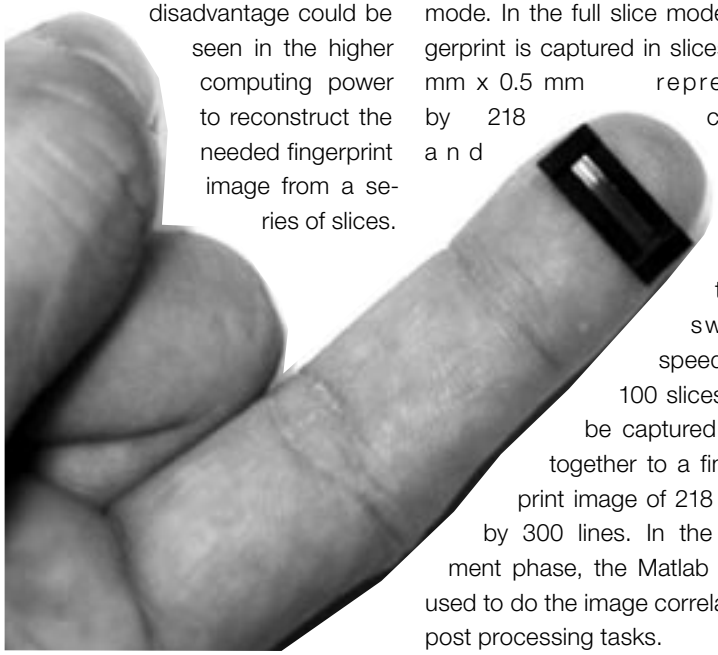
How to use a fingerprint sensor

To capture a fingerprint, a finger has to be swept over the sensor. The sensor converts the fingerprint on a row by row basis. A succeeding image processing is needed to reconstruct the fingerprint image. For a final biometric fingerprint identification, the captured finger has to be matched against a prestored fingerprint, using sophisticated feature extraction algorithms.

Why using sweeping sensors?

Compared to the full print finger sensors, the sweep sensors have several advantages. First of all, its size is much smaller and thus its cost much lower compared to full print finger sensors. Another advantage is the higher fraud attack resistance, since there are no tracks of the fingerprint left on the sensor surface. A disadvantage could be seen in the higher computing power to reconstruct the needed fingerprint image from a series of slices.



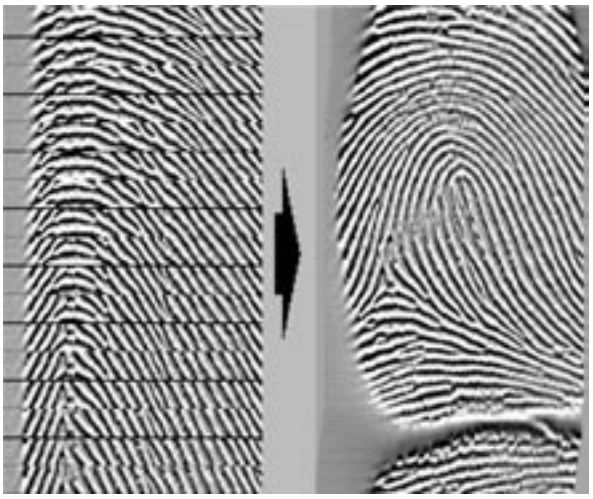
Sweep fingerprint sensor.

Ideas and goals

The performance of the sensor has been tested with the GECKO-evaluation-board. The board contains a FPGA (Field Programmable Gate Array), housing the sensor interface hardware and software. The sensor data is first stored in an on-board RAM of 128 kByte memory size. A complete fingerprint image size of 256x512 pixels can be stored in the RAM. An implemented VHDL-core of a PIC microcontroller and dedicated high speed hardware controls the fingerprint sensor. An additional USB-interface is used to upload the image to the host computer for further off-line image post processing tasks.

How our sweep sensor works

Fingerprints can be captured in three different modes, on a row-, sub-image- or a full slice- image caption mode. In the full slice mode, the fingerprint is captured in slices of 10.9 mm x 0.5 mm represented by 218 columns and 8 lines. Depending on the finger sweeping speed, several 100 slices have to be captured and put together to a final fingerprint image of 218 columns by 300 lines. In the development phase, the Matlab tool was used to do the image correlation and post processing tasks.



Fingerprint image slices produced from the sensor

Reconstructed fingerprint image