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2.6: Fingerprint Scanners and their Features

(extract)

- *Mosaicking*: The enhanced translation vectors produced by the relaxation stage are used to register and superimpose the slices. Finally, each pixel of the reconstructed output image is generated by performing a weighted sum of the intensities of the corresponding pixels in the slices.

2.6 Fingerprint Scanners and their Features

Several fingerprint scanners, based on the sensing technologies surveyed in Section 2.4, are commercially available. Certainly, the main characteristics of a fingerprint scanner depend on the specific sensor mounted which in turn determines the image features (dpi, area, and dynamic range), size, cost, and durability. Other features should be taken into account when a fingerprint scanner has to be chosen for a specific application.

- *Interface*: FBI-compliant scanners often have analogue output (e.g., RS-170) and a frame grabber is necessary to digitize the images. This introduces an extra cost and usually requires an internal board to be mounted in the host. On the other hand, in non-AFIS devices, the analogue-to-digital conversion is performed by the scanner itself and the interface to the host is usually through a simple Parallel Port or USB connection.
- *Frames per second*: This indicates the number of images the scanner is able to acquire and send to the host in a second. A high frame rate (e.g., larger than 5 frames/sec) better tolerates movements of the finger on the sensors and allows a more friendly interaction with the scanner. It can also provide a natural visual feedback during the acquisition.
- *Automatic finger detection*: Some scanners automatically detect the presence of a finger on the acquisition surface, without requiring the host to continually grab and process frames; this allows the acquisition process to be automatically initiated as soon as the user's finger touches the sensor.
- *Encryption*: As discussed in Chapter 9, securing the communication channel between the scanner and the host is an effective way of securing a system against attacks. For this purpose, some commercial scanners implement state-of-the-art symmetric and public-key encryption capability.
- *Supported operating systems*: Depending on the application and the infrastructure where the fingerprint scanners have to be employed, compatibility with more operating systems, and in particular the support of open-source operating systems such as Linux, could be an important feature.

Table 2.1 lists some commercial scanners designed for the non-AFIS markets, whose cost is less than $200 US. Except for ultrasound scanners, which are not ready for mass-market applications yet, Table 2.1 includes at least one scanner for each technology.

	Technology	Company	Model	Dpi	Area (h×w)	Pixels
Optical	FTIR	Biometrika www.biometrika.it/eng/	FX2000	569	0.98"×0.52"	560×296 (165,760)
	FTIR	Digital Persona www.digitalpersona.com	UareU2000	440	0.67"×0.47"	316×228 (72,048)
	FTIR (sweep)	Kinetic Sciences www.kinetic.bc.ca	K-1000	up to 1000	0.002"×0.6"	2×900 (H×900)
	FTIR	Secugen www.secugen.com	Hamster	500	0.64"×0.54"	320×268 (85,760)
	Sheet prism	Identix www.identix.com	DFR 200	380	0.67"×0.67"	256×256 (65,535)
	Fiber optic	Delsy www.delsy.com	CMOS module	508	0.71"×0.47"	360×240 (86,400)
	Electro-optical	Ethentica www.ethentica.com	TactilSense T-FPM	403	0.76"×0.56"	306×226 (69,156)
Solid-state	Capacitive (sweep)	Fujitsu www.fme.fujitsu.com	MBF300	500	0.06"×0.51"	32×256 (H×256)
	Capacitive	Infineon www.infineon.com	FingerTip	513	0.56"×0.44"	288×224 (64,512)
	Capacitive	ST-Microelectronics us.st.com	TouchChip TCS1AD	508	0.71"×0.50"	360×256 (92,160)
	Capacitive	Veridicom www.veridicom.com	FPS110	500	0.60"×0.60"	300×300 (90,000)
	Thermal (sweep)	Atmel www.atmel.com	FingerChip AT77C101B	500	0.02"×0.55"	8×280 (H×280)
	Electric field	Authentec www.authentec.com	AES4000	250	0.38"×0.38"	96×96 (9,216)
	Piezoelectric	BMF www.bm-f.com	BLP-100	406	0.92"×"0.63	384×256 (98,304)

Table 2.1. Some commercial scanners, grouped by technology. Technologies are presented in the order of Section 2.4, and within each technology, companies are listed in alphabetical order. The table reports for each scanner, the resolution, the sensing area, and the number of pixels. For sweep sensors, the vertical number of pixels varies depending on the length of the sweep, and therefore, cannot be determined a priori.

Figures 2.14 through 2.17 compare the same finger (a good-quality finger, a dry finger, a wet finger, and a poor quality finger, respectively) as acquired by using some of the scanners listed in Table 2.1.

Figure 2.14. Fingerprint images of the same finger with ideal skin condition as acquired by different commercial scanners. Images are reported with right proportions: a) Biometrika FX2000, b) Digital Persona UareU2000, c) Identix DFR200, d) Ethentica TactilSense T-FPM, e) ST-Microelectronics TouchChip TCS1AD, f) Veridicom FPS110, g) Atmel FingerChip AT77C101B, h) Authentec AES4000.