1. Basic Concepts

(1) With increasing identity fraud and emphasis on security, there is a growing and urgent need to efficiently and effectively identify humans.

(2) Proof of identity in association with travel documents is mostly based on the comparison of biometric characteristics.

(3) Biometrics is a discipline to study how to automatically recognize individuals based on their biological and behavioral characteristics.

(4) Identity: whatever makes something the same or different.

(5) Verification is used to solve "is this the person he claims to be?"; identification is used to solve "who is this person?".

(6) FAR is a measure of the likelihood that a biometric system will incorrectly accept an access attempt by an unauthorized user; FRR is a measure of the likelihood that the system will incorrectly reject an access attempt by an authorized user; they are both functions of the system security threshold. There exists a specific value $t$ for the threshold, making the FAR equal to FRR; at that $t$, the value of FAR (FRR) is called as the system's equal error rate (EER).

(7) Fingerprints are weakly determined by genetics.

(8) Fingerprint sensors can be classified into three categories, optical based ones, silicon based ones, and ultrasound based ones.

(9) Fingerprint features can be classified into three levels. Level 1 features include delta points and core points; level 2 features include termination points and bifurcation points; level 3 features include sweat pores, incipient ridges, and creases.

(10) Minutiae-based matching is a widely used method for fingerprint matching.

(11) Gabor filter is widely used for feature extraction from images; its definition is,
\[ G(x, y) = \exp\left(-\frac{1}{2}\left(\frac{x^2}{\sigma_x^2} + \frac{y^2}{\sigma_y^2}\right)\right) \exp\left(i2\pi f x'\right), \] where \( x' = x\cos\theta + y\sin\theta, y' = -x\sin\theta + y\cos\theta. \]

(12) Gabor filter based CompCode is a quite successful 2D palmprint recognition method.
(13) 3D palmprint is a potential solution to solve some inherent problems existing in 2D palmprints.
(14) Iris is weak determined by genetics.
(15) IrisCode, based on binarizing image's responses to Gabor filters, is a classical method for iris matching.

2. Programming

(1) Gabor filter is a widely used for feature extraction. Run the demo "Gabor filter" to see how to generate it.
(2) Study the demo "3D Palmprint" to see how to perform 3D palmprint recognition.