

“An Application of Biometric Technology: Fingerprint Recognition”

Overview of Previous Article

Our last article reviewed iris recognition biometrics, and how it was used to positively identify the famous National Geographic picture of the “Afghan Girl”—Sharbat Gula. An in depth description of the science behind iris recognition technology was provided, as well as a history of the famous picture. Also, the challenges of locating and positively identifying the “Afghan Girl” were examined.

This article focuses upon another popular biometric technology—fingerprint recognition. Although iris recognition has been deemed among the most stable of the biometric technologies available today, fingerprint recognition has been around the longest, and there are more commercial applications of it than iris recognition. For example, different types of fingerprint recognition devices can be found for network access and physical access entry configurations; it is the primary tool utilized for AFIS (Automated Fingerprint Identification System) databases; and it is also the biometric tool of choice for financial institutions.

The Science Behind Fingerprint Recognition

The first step in fingerprint recognition is known as “image acquisition”. In this part of the process, a user places his or her finger on a platen (also referred to as a scanner), which is located on the top of most fingerprint recognition devices. Numerous images of the fingerprint are then captured. It should be noted that during this stage, the goal is to capture images of the center of the fingerprint, which contains many of the unique features. All of the captured images are then converted into black and white images.

The second step in fingerprint recognition is the location and determination of unique characteristics of the processed fingerprint image. The fingerprint is composed of various “ridges” and “valleys” which form the basis for the loops, arches, and swirls that you can easily see on your fingertip. The ridges and valleys contain different kinds of breaks and discontinuities. These are called “minutiae”, and it is from these “minutiae” that the unique features are located and determined. There are two types of “minutiae”: (1) Ridge endings (the location where the ridge actually ends); and (2) Bifurcations (the location where a single ridge becomes two ridges).

The third step in fingerprint recognition is that of template creation, based upon the unique features found in the “minutiae”. The location, position, as well as the type and quality of the “minutiae” are factors taken into consideration in the template creation stage. Unlike iris recognition technology in which there is only one primary vendor (and thus only one set of algorithms), fingerprint recognition technology consists of many vendors (and thus, many more algorithms). As a result, each type of fingerprint recognition technology has its own set of algorithms for template creation and matching.

The fourth and final step of fingerprint recognition is template matching. This is where the system will either attempt to verify or identify you, by comparing the enrollment

template against the verification template. For a detailed description on verification and identification, as well as template matching, please visit our website at www.htgadvancesystems.com.

There are three main technologies available today for the capture of fingerprint images: (1) Optical technology-this is the oldest and most popular form used for image capture. Essentially, a camera (located in the fingerprint recognition device) takes raw images of the fingerprint. (2) Silicon technology-a silicon chip is used, and the capacitive characteristics of the fingerprint are captured into images. (3) Ultrasound technology- Basically, an ultrasound image of the fingerprint is captured. This technology has proved to work better than the other two, because it can penetrate through different types of fingerprint dirt and residue.

Our next article will focus upon real world applications of another biometric technology- hand geometry recognition.