Chapter 7
Application of Fingerprint-Matching Algorithm in Smart Gun Using Touch-Less Fingerprint Recognition System

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ABSTRACT

Fingerprint recognition systems are widely used in the field of biometrics. Many existing fingerprint sensors acquire fingerprint images as the user's fingerprint is contacted on a solid flat sensor. Because of this contact, input images from the same finger can be quite different and there are latent fingerprint issues that can lead to forgery and hygienic problems. For these reasons, a touchless fingerprint recognition system has been investigated, in which a fingerprint image can be captured without contact. While this system can solve the problems which arise through contact of the user's finger, other challenges emerge.

INTRODUCTION

Many biometric characteristics were used to verify a specified human's identity. Some of these recognition characteristics included iris, face, fingerprint, voice, hand geometry, and eye pattern retinal. Among all these characteristics, for automatic private identification, fingerprint recognition was the most common and reliable biometric function. To obtain excellent fingerprint pictures with suitable features, various kinds of sensors (including optical, thermal, and capacitive sensors) have been created. Also, to improve authentication efficiency, a big range of algorithms have begun.

Despite all these efforts to acquire good fingerprint images and improve performance, because of its trigger design, touch-based sensors can not be used in the Gun. The trigger has much less space to identify, and since the finger has to be set on it, the same position and types of finger minutiae would be different. In such a situation, it would be tough to recognize fingerprints.

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The method was suggested to decrease this issue using a fingerprint sensing technology. It is called a fingerprint recognition system without touch. The Touchless fingerprint technology does not require contact between the finger's skin and the sensing region. Fingerprint accession without touch is remote sensing technology to capture the ridge valley pattern that is vital. A touchless fingerprint scheme has been explored in this section that substantially overcomes the issues engaged in standard touch-based sensors.

The following chapter is structured. The background of the research job was described in section 2. Section 3 presents the main focus of the chapter. Section 4 describes the recognition and matching algorithm for touchless fingerprints. Section 5 provided the implementation of this algorithm in Smart Gun. Sections 6 give a suggestion about future scopes. Finally, in chapter 7, conclusions are discussed.

BACKGROUND

Acquisition of touchless fingerprinting is a remote sensing technology for capturing the ridge-valley pattern that offers vital identification data. Several methods have been indicated for the touchless fingerprint recognition scheme.

(Y. Song. C. Lee, 2004) proposed a preprocessing technique that comprised of low pass filtering, segmentation, and Gabor enhancement for their own-designed touch-less sensor.

(C. Lee, 2006) resolved the 3D to 2D image mapping problem that was introduced by (Y. Song. C. Lee, 2004) by a robust view difference image rejection method. Preprocessing of the fingerprint images captured with a mobile camera has been proposed by (C. Lee. S. Lee, 2006)]. Application of the fingerprint verification technology to mobile handsets is discussed by (Thornton, 2005) and a novel method for the fingerprint enhancement has been developed for that particular design by (T. Nakanuira, 2004). Most recently, (Diaz-Santana, 2006) introduced a new touch-less device - The Surround Imager, which can acquire 3D rolled- equivalent fingerprints. To make 3D touch-less fingerprints interoperable with the current AFIS system. (Y. Chen. G. Parziale. E. Diaz—Sanlana, 2006) proposed an unwrapping algorithm that unfolds the 3D touch-less fingerprint images into a 2D representation that is comparable with the legacy rolled fingerprints. (Elnighammer, 2002) developed a touchless fingerprint sensor using a camera. They used a polarizer filter and a band-pass filter (N.Vyas, 2011) in order to acquire the right quality image.

MAIN FOCUS OF THE CHAPTER

Fingerprint

A fingerprint is the mirror image of one finger. It is an impression of the furrows and friction ridges on all parts of the finger.the ridges and furross present functional similarities in each, like parallelism and average width. The fingerprint is not differentiated by its ridge and furrows, but by characteristics called minutiae, the ridges.there are two kinds of minutiae shown below.

1. A ridge's jarring end (ridge ending)
2. A single ridge (ridge bifurcation) that splits into two ridges.