FINGERPRINT IDENTIFICATION

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Special dedicated to my beloved parents, family, fiancé and fellow friends, who had strongly encouraged and supported me in my entire journey of learning…

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ABSTRACT

The use of fingerprint for identification has been employed in law enforcement for about a century. A much broader application of fingerprint is for personal authentication, for instance to access a computer, a network, a bank-machine, a car, or a home. Fingerprint verification system based on neural network analysis is a process of verifying the fingerprint. This project highlights the development of fingerprint identification system using MATLAB. Verification is done by comparing the data of fingerprint with true owner fingerprint. The fingerprint images then will go through the processing data and comparison process to differentiate the data fingerprint. In this project, a backpropagation neural network algorithm in toolbox MATLAB was trained to learn and identify whether the fingerprint is genuine or forgery.

ABSTRAK

Penggunaan cap jari sebagai pengenalan identiti telah digunakan dalam penguatkuasaan undang-undang untuk bertahun-tahun lamanya. Aplikasi penggunaan cap jari sebagai pengenalan peribadi digunakan untuk mengakses komputer, rangkaian, mesin ATM, kereta atau rumah, dan sistem kehadiran untuk sesebuah organisasi. Sistem pengesahan cap jari berasaskan pada analisis rangkaian neural adalah proses untuk mengesahkan identiti sesuatu cap jari. Projek pengesahan cap jari ini dibangunkan menggunakan perisian MATLAB. Pengesahan dilakukan dengan membuat perbandingan imej cap jari yang diambil untuk membuktikan pemilik sebenar cap jari. Imej cap jari tersebut akan melalui proses pemprosesan data, proses penapisan kebisingan dan proses perbandingan untuk mengenal pasti perbezaan setiap data cap jari. Dalam projek ini, algoritma 'Backpropagation Neural Network' di dalam 'toolbox' MATLAB digunakan untuk mengesahkan ketulenan cap jari tersebut.

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CHAPTER I

INTRODUCTION

1.1 Project Overview

Biometrics is the science and technology of authentication (i.e. establishing the identity of an individual) by measuring the person's physiological or behavioral features. The term is derived from the Greek words "bios" for life and "metron" for degree. In information technology (IT), *biometrics* usually refers to technologies for measuring and analyzing human physiological characteristics such as fingerprints, eye retinas and irises, voice patterns, facial patterns, and hand measurements, especially for authentication purposes. Examples of behavioral characteristics which can be measured include signature recognition, iris recognition, face recognition and voice recognition.

Fingerprint detection and recognition is applied in fingerprint scanning especially for security purpose because of the current security and authorization features. Fingerprint scanning is more efficient than the current security, passwords and authorization features. Furthermore there is no need to memorize as did for passwords.

A fingerprint is the feature pattern of one finger. It is believed with strong evidences that each fingerprint is unique. Each person has his own fingerprints with the permanent uniqueness. So fingerprints have being used for identification and

forensic investigation for a long time. Figure 1.1 shows a fingerprint image acquired by an optical sensor.

Figure 1.1: A Fingerprint Image Acquired by An Optical Sensor

A fingerprint is composed of many ridges and furrows. These ridges and furrows present good similarities in each small local window, like parallelism and average width.

However, fingerprints are not distinguished by their ridges and furrows, but by Minutia, which are some abnormal points on the ridges. Among the variety of minutia types that has been used in the project to detect and recognize a person is termination, which is the immediate ending of a ridge, the other is called bifurcation, which is the point on the ridge from which two branches derive. Figure 1.2 shows the two types of minutia.

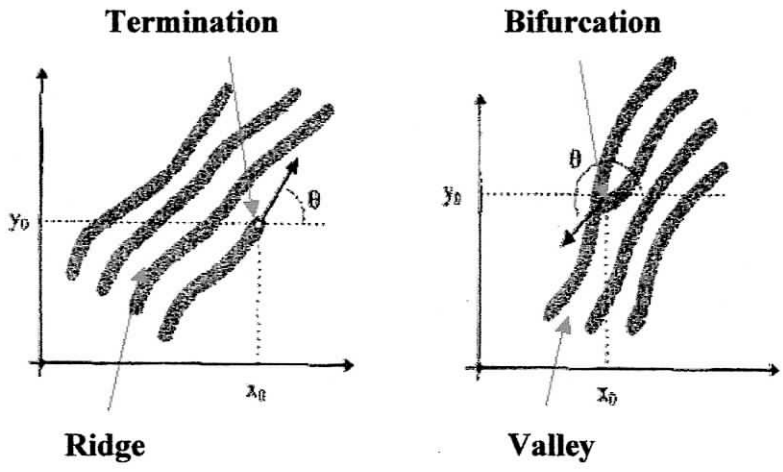

Figure 1.2: Minutia (Valley is also referred as Furrow, Termination is also called Ending, and Bifurcation is also called Branch)

Two representation forms for fingerprints separate the two approaches for fingerprint recognition. The first approach, which is minutia - based, represents the fingerprint by its local features, like terminations and bifurcations. This approach has been intensively studied, also is the backbone of the current available fingerprint recognition products. This approach has been concentrate in the project. The second approach, which uses image - based methods, tries to do matching based on the global features of a whole fingerprint image. It is an advanced and newly emerging method for fingerprint recognition. And it is useful to solve some intractable problems of the first approach. But the project does not aim at this method, so further study in this direction is not expanded in the thesis.

1.2 Project Objectives

The main objectives of conducting this project included:

i) To develop fingerprint detection and recognition using MATLAB.
ii) Able to apply the fingerprint detection and recognition for security purpose.
iii) To verify by comparing the data of fingerprint with true owner fingerprint.

iv) To apply several methods to build a minutia extractor and a minutia method.

v) To determine the most suitable method to verify the genuinity of a fingerprint.

1.3 Problem Statement

Passwords, credit cards, smart cards, were widely used in the society. However, passwords could be forgotten and cards could be lost or illegally copied which implies that the traditional methods for identifying or verifying a person may not be valid again.

Nowadays, in order to identify a person conveniently with efficiency, some special features should be extracted to discriminate from one person to another. For instance, the way that people speak, the iris texture, the hand shape, the human face, and etc. The fingerprint is then playing the important role for the security purpose. The fingerprint can be identify to recognize a person among a group of known individuals.

In order to aid forensics in criminal identification, authentication in civilian applications and for preventing unauthorized there is a need to develop a fingerprint detection and recognition. Even though the sequential approach is efficient from design and processing point of view, it may introduce errors in the feature extraction and recognition stages. It is believed that by reexamining the original image data, some of the errors in the end – to - end sequential processing can be eliminated, resulting in an improvement in system accuracy.

Additionally, by attaching additional discriminative attributes to the features (feature refinement) and designing an appropriate similarity metric that exploits these attributes, the matching accuracy can be further improved. By using this method the system users could minimize their cost by cutting down the purchase of padlock or setting up a new and sophisticated security system. This method is easier to extract

the image compared to the other method. Thus, fingerprint detection and recognition for security purpose reduces these hustles.

1.4 Project Scope

In order to understand about this title, the scopes of the project are listed:

i) Research and literature study on the most appropriate programming that has been used in the project and in order to achieve high detection accuracy and satisfactory. For an example MATLAB has been chosen because it is easier to extract data from the capture image. It also achieves high detection accuracy.

ii) Analyze and study contemporary fingerprint detection and recognition implemented around the globe, thus explore and upgrade it.

iii) Determine the most suitable concept that can be used and applied it.

iv) Design a prototype that able to improve the existing system. This has been achieved by using MATLAB that is known as artificial intelligent which is a high performance language for technical computing.

1.5 Thesis Outlines

This thesis is represented by five chapters. The following is the outline of this Fingerprint Identification project in chapter by chapter. Chapter I discuss about the brief overview about the project such as introduction, objectives, problem statement and scope of the project.

Chapter II describes about the research and information about the project. Every facts and information, which found through journals or other references, will be compared and the better methods have been chosen for the project. This literature