FINGERPRINT IDENTIFICATION

NORRUL HIJA BINTI JAMALUDIN

This report is submitted in partial fulfillment of the requirements for the award of Bachelor of Electronic Engineering (Industrial Electronic) With Honours

Faculty of Electronic and Computer Engineering
Universiti Teknikal Malaysia Melaka

April 2008

UNIVERSTI TEKNIKAL MALAYSIA MELAKA
FAKULTI KEJURUTERAAN ELEKTRONIK DAN KEJURUTERAAN KOMPUTER

BORANG PENGESAHAN STATUS LAPORAN
PROJEK SARJANA MUDA II

Tajuk Projek	:	**FINGERPRINT IDENTIFICATION**
Sesi Pengajian	:	**2007 / 2008**

Saya **NORRUL HIJA BINTI JAMALUDIN**

mengaku membenarkan Laporan Projek Sarjana Muda ini disimpan di Perpustakaan dengan syarat-syarat kegunaan seperti berikut:

1. Laporan adalah hakmilik Universiti Teknikal Malaysia Melaka.
2. Perpustakaan dibenarkan membuat salinan untuk tujuan pengajian sahaja.
3. Perpustakaan dibenarkan membuat salinan laporan ini sebagai bahan pertukaran antara institusi pengajian tinggi.
4. Sila tandakan (√) :

☐	**SULIT***	(Mengandungi maklumat yang berdarjah keselamatan atau kepentingan Malaysia seperti yang termaktub di dalam AKTA RAHSIA RASMI 1972)
☐	**TERHAD***	(Mengandungi maklumat terhad yang telah ditentukan oleh organisasi/badan di mana penyelidikan dijalankan)
☑	**TIDAK TERHAD**	

Disahkan oleh:

(TANDATANGAN PENULIS)

Alamat Tetap: NO 31, TAMAN SRI DERGA
JALAN DATIK KUMBAR
05300 ALOR SETAR
KEDAH DARUL AMAN

Tarikh: 09/05/08

(COP DAN TANDATANGAN PENYELIA)

HANIM BINTI ABDUL RAZAK
Lecturer
Faculty Electronics and Computer Engineering (FKEKK)
Kolej Universiti Teknikal Kebangsaan Malaysia (KUTKM)
Locked Bag 1200
Ayer Keroh, 75450 Melaka

Tarikh: 9/5/08

"I hereby declared that this report entitled Fingerprint Identification is a result of my own work except for the works that have been cited clearly in the references."

Signature : .....

Student : NORRUL HIJA BINTI JAMALUDIN

Date :

"I hereby declare that I have read this report and in my opinion this report is sufficient in terms of the scope and quality for the award the Bachelor of Electronic Engineering (Industrial Electronic) With Honours"

Signature : .....

Name : HANIM BINTI ABDUL RAZAK

Date : 9/5/08

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

ACKNOWLEDGEMENT

Assalamualaikum Wbt

Praise to Allah S.W.T, the most Merciful an the Benevolent who has given me strength and His blessing to prepare and complete my thesis which is a partial fulfillment of requirements for the Degree of Bachelor in Electronic Engineering (Industrial Electronic).

On this opportunity, I would like to express my gratitude to the Faculty of Electronic & Computer Engineering (FKEKK), Universiti Teknikal Malaysia Melaka (UTeM) generally, and especially to supervisor Pn. Hanim Binti Abdul Razak for her helps, advices and guidance in the whole process of searching, collecting information, analyzing and completing this report.

To my parents, Jamaludin Bin Othman and Rohima Bt Mat, a million of thanks to them for their support, their pray, their helps and their love. Last but not least, I would like to thank all my friends in 4 BENE and also to everyone who involve in this project either direct or indirectly.

Thank you.

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 software. 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 software was utilized to 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* perisian MATLAB digunakan untuk mengesahkan ketulenan cap jari tersebut.

TABLE OF CONTENT

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

CHAPTER 1

INTRODUCTION

1.1 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 been 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.

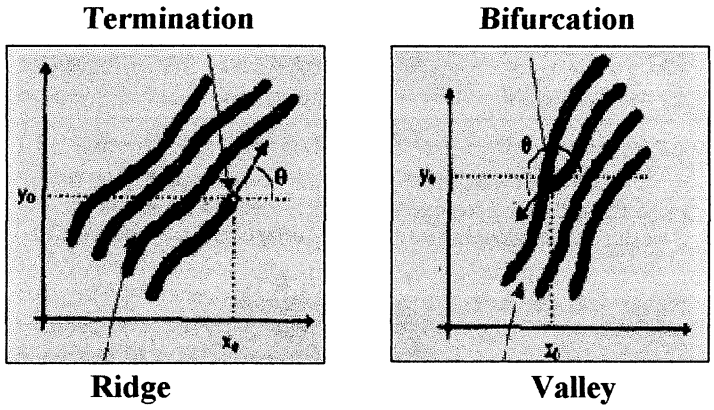

Figure 1.2: Minutia (Valley is also referred as Furrow, Termination is also called Ending, and Bifurcation is also called Branch)

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 is focus of this project. The second approach, which is the 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 Objectives of project

The main objectives of conducting this project included:

i. To develop a system that can match between two fingerprint images.
ii. To develop fingerprint detection and recognition using MATLAB software.
iii. To compare the data of fingerprint with true owner fingerprint.

iv. To apply several methods to build a minutia extractor and a minutia matcher 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 so on. The fingerprint is then playing the important role for the security purpose. The fingerprint is identified to recognize the unknown person.

In order to aid forensics in criminal identification and authentication in civilian applications, 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.

1.4 Scopes of project

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

i. Develop system that can compare between two fingerprint images.
ii. Do not use any sensor, the process is replaced by loading an image from the FVC2000 database.
iii. This Fingerprint Identification System is not a real time system.
iv. Matlab 6.5 software was utilized the system because of its significant features for capturing image and accuracy.

1.5 Structure of Report

Generally, this report contains 5 main chapters. Those are Introduction, Literature Review, Methodology, Results & Discussion and Conclusion & Suggestion. In Chapter I – Introduction, briefly explained overview of the whole projects that has been introduced and why it must be implemented into real world, the objectives of project, problem statement, scope of work that have been done when developing the project and methods that have been used. Every facts and information, which found through journals or other references, will be compared and the better methods have been chosen for the project. It will be described in detail in Chapter II. Methods that have been used in order to achieve the objectives of the project are explained in detail in Chapter III. The chapter also includes the explanation about the software that has been built and its programming source code. Chapter IV is Results & Discussion that explained the output and the operation of the project with end user view. Conclusion & Suggestion are included in Chapter V

which contain suggestions, strengthens and weakness of the project. Chapters are separated in sequences in order to give view for readers.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

Fingerprints are the ridge and furrow patterns on the tip of the finger and are used for personal identification [8]. The characteristic of a fingerprint image can be divided into two main categories, which are local (low) features and global (high) features as shown in Figure 2.1. Local features are commonly named as minutiae consists of ridge ending and bifurcation, whereas, global features consist of core and delta.

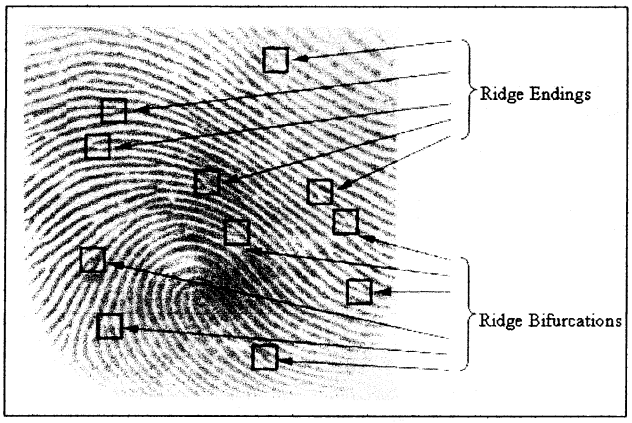

Figure 2.1(a): Global and Local Features Of A Fingerprint