

FINGERPRINT IDENTIFICATION

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**This report is submitted in partial fulfillment of the requirements for the award
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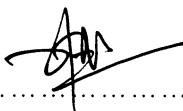
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Special dedicated to my beloved parents, family and fellow friends, who had strongly encouraged and supported me in my entire journey of learning...

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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 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

CHAPTER	TITLE	PAGE
	PROJECT TITLE	i
	DECLARATION FORM OF REPORT STATUS	ii
	DECLARATION	iii
	SUPERVISOR'S DECLARATION	iv
	DEDICATION	v
	ACKNOWLEDGEMENT	vi
	ABSTRACT	vii
	ABSTRAK	viii
	CONTENTS	ix
	LIST OF TABLE	xiii
	LIST OF FIGURE	xiv
	LIST OF APPENDIX	xvii
I	INTRODUCTION	
	1.1 PROJECT OVERVIEW	1
	1.2 PROJECT OBJECTIVES	3
	1.3 PROBLEM STATEMENT	4
	1.4 PROJECT SCOPE	5
	1.5 THESIS OUTLINES	5
II	LITERATURE REVIEW	
	2.1 INTRODUCTION	7
	2.2 FINGERPRINT CLASSIFICATION	10

2.2.1	Model Based	10
2.2.2	Structure Based	11
2.3	FINGERPRINT IDENTIFICATION	12
2.4	SOFTWARE DEVELOPMENT	18
2.4.1	MATLAB Software	18
2.4.2	Neural Network	18
2.4.3	Learning in Artificial Neural Network	19
	2.4.3.1 Supervised Learning	20
	2.4.3.2 Unsupervised Learning	20
2.4.4	Artificial Neural Networks Paradigms	21
2.5	BACKPROPAGATION METHOD	22
2.5.1	Backpropagation Network Definition	22
2.5.2	Self-Organizing Maps	23
2.5.3	Learning Vector Quantization Networks (LVQ)	24
2.6	SUMMARY OF THE PREVIOUS CASE STUDY	24

III METHODOLOGY

3.1	PROJECT METHODOLOGY	26
3.2	LOAD IMAGE	29
3.3	MINUTIA EXTRACTOR	29
3.3.1	Fingerprint Image Processing	29
	3.3.1.1 Fingerprint Image Enhancement	30
	3.3.1.2 Fingerprint Image Binarization	32
	3.3.1.3 Fingerprint Image Segmentation	32
3.3.2	Minutia Extraction	35
	3.3.2.1 Fingerprint Ridge Thinning	35
	3.3.2.2 Minutia Marking	36
3.3.3	Minutia Postprocessing	38
	3.4.3.1 False Minutia Removal	38
3.4	MINUTIA MATCHER	40
3.4.1	Alignment Stage	41
3.4.2	Minutia Match	41

3.5	Matlab Programming	41
3.6	Closing Remark	45

IV RESULTS AND ANALYSIS

4.1	Introduction	46
4.2	Selected Source Codes	46
4.2.1	Load Image	47
4.2.2	Enhancement	49
4.2.3	Binarization	54
4.3	Results And Discussions Of The Programming	56
4.3.1	Load Image	56
4.3.2	Histogram Equalization	58
4.3.3	Fast Fourier Transform	58
4.3.4	Binarization	59
4.3.5	Fingerprint Image Segmentation	60
4.3.6	Fingerprint Ridge Thinning	61
4.3.7	Minutia Marking	63
4.3.8	False Minutia Removal	63
4.3.9	Minutia Matching	65
4.4	Summary Of The Results	65
4.5	Analysis	67
4.5.1	Histogram Analysis	68
4.6	Closing Remark	70

V CONCLUSIONS AND RECOMMENDATIONS

5.1	Conclusions	71
5.2	Recommendations	72
5.2.1	Detection and Recognition from Various Position	72
5.2.2	Real Time Detection and Recognition	72

	xii
5.2.3 Image Format	72
REFERENCES	74
APPENDICES	77

LIST OF TABLES

NO	TITLE	PAGE
2.1	Artificial Neural Network Paradigms	22
3.1	Commands In MATLAB Programming	42
4.1	Comparison Of The Original Image With The Database	66
4.2	Comparison Of The Original Image With The Distorted Image	67

LIST OF FIGURES

NO	TITLE	PAGE
1.1	A Fingerprint Image Acquired By An Optical Sensor	2
1.2	Minutia (Valley Is Also Referred As Furrow, Termination Is Also Called Ending And Bifurcation Is Also Called Branch)	3
2.1(a)	Global And Local Features Of A Fingerprint	7
2.1 (b)	Examples Of Minutiae : A Minutiae Can Be Characterized By Its Position And Its Orientation	8
2.2	Each Fingerprint In The Figure Belongs To A Different Subclass Of The FBI's Classification Scheme, From Left To Right And From Top To Bottom: Whorl, Plain Arch, Right Loop, Left Loop, Central Pocket, Tented Arch, Twin Loop and Accidental Whorl.	9
2.3	Three Approaches Of Fingerprint Classification	10
2.4	The Five Models Corresponding To Each Type Of A Fingerprint	11
2.5	Directional Image Of Left Loop Of A Fingerprint	11
2.6	A Ridge Ending And Bifurcation Of Fingerprint Minutiae	13
2.7	Fingerprint Patterns : Arch, Loop And Whorl	14
2.8(a)	Feed-forward Configuration	18
2.8(b)	Feedback Configuration	19
2.9	Configuration Of A Supervised Learning	20
2.10	A Typical Diagram Of Unsupervised Learning	21
3.1	Flow of Methodology	26
3.2	System Design	28
3.3	Minutia Extractor Process	28
3.4	Minutia Matcher Process	28
3.5	The FFT Image	31

3.6	The Binarized Image	32
3.7	Direction Map	34
3.8	Original Image Area	34
3.9	After CLOSE Operation	34
3.10	After OPEN Operation	35
3.11	ROI + Bound	35
3.12	The Thinned Ridge Map	36
3.13	Bifurcation	37
3.14	Termination	37
3.15	Triple Counting Branch	37
3.16	False Minutia Structures	39
3.17	MATLAB 6.5 Icon	42
3.18	Current Directory, Workspace And Command Window	43
3.19	Open File window	43
3.20	Open 'Work' and 'finger' Folder	44
3.21	Start_gui_single_mode Part	44
4.1	Source Code Of Loading Image	48
4.2	Output Of The Loading Image	49
4.3	Classification Of '0' and '255'	49
4.4	Source Code Of The Histogram Equalization	50
4.5	Output Of The Histogram Equalization	50
4.6	Output After The Histogram Equalization	51
4.7	Histogram Equalization For Distorted Image	52
4.8	Source Code Of FFT	53
4.9	Output Of The FFT	54
4.10	Source Code Of Binarization	55
4.11	The Interface Part Of The Programming	56
4.12	The Pop Up Of Message Box	57
4.13	Selected Image	57
4.14	Histogram Enhancement	58
4.15	Fingerprint Enhancement By FFT	59
4.16	The Fingerprint Image After Adaptive Binarization	59
4.17	Direction Map	60
4.18	Region of Interest (ROI)	61

LIST OF APPENDICES

NO	TITLE	PAGE
APPENDIX A	FLOW CHART OF PSM I	77
APPENDIX B	FLOW CHART OF PSM II	78
APPENDIX C	SOURCE CODE OF FINGERPRINT IDENTIFICATION	79
APPENDIX D	SOURCE CODE OF LOAD IMAGE	85
APPENDIX E	SOURCE CODE OF FAST FOURIER TRANSFORMATION	86
APPENDIX F	SOURCE CODE OF BINARIZATION IMAGE	88
APPENDIX G	SOURCE CODE OF DIRECTION	89
APPENDIX H	SOURCE CODE OF REGION OF INTEREST	93
APPENDIX I	SOURCE CODE OF REMOVE SPURIOUS MINUTIA	95
APPENDIX J	SOURCE CODE OF FingerTemplateRead	99
APPENDIX K	SOURCE CODE OF SHOW MINUTIA	100
APPENDIX L	SOURCE CODE OF READ IMAGE	102
APPENDIX M	SOURCE CODE OF FingerTestRead	103
APPENDIX N	SOURCE CODE OF MinuOriginTransRidge	104
APPENDIX O	SOURCE CODE OF MinuOrigin_TransAll	106
APPENDIX P	SOURCE CODE OF MATCH_END	107
APPENDIX Q	SOURCE CODE OF MARK_MINUTIA	111
APPENDIX R	SOURCE CODE OF InterRidgeWidth	113
APPENDIX S	SOURCE CODE OF getLocalTheta	114
APPENDIX T	SOURCE CODE OF Batch_Template	118
APPENDIX U	SOURCE CODE OF Batch_Match_Intra	119
APPENDIX V	SOURCE CODE OF Batch_Match_Inter	120

APPENDIX W	SOURCE CODE OF FINGERPRINT IDENTIFICATION (PSM I)	121
APPENDIX X	GANTT CHART	127

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.

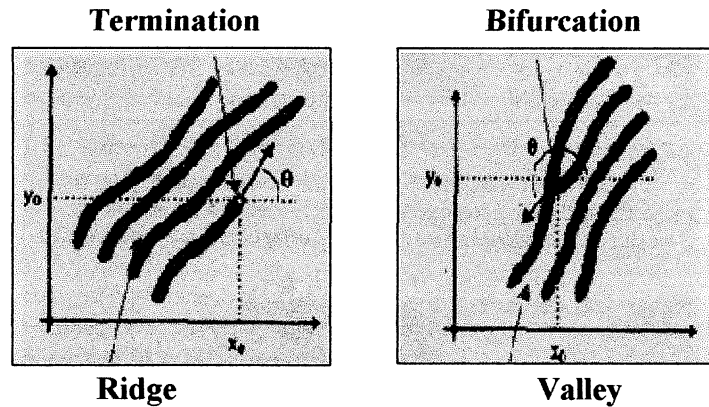


Figure 1.2: Minutia (Valley is also referred as Furrow, Termination is also called Ending, and Bifurcation is also called Branch)

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, strengths 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.

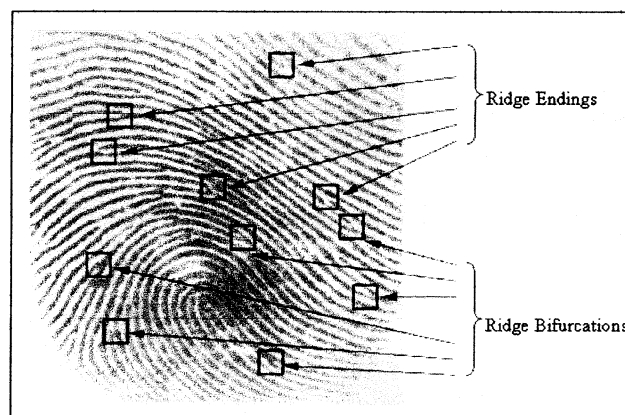


Figure 2.1(a): Global and Local Features Of A Fingerprint