IRIS RECOGNITION USING ARTIFICIAL NEURAL NETWORK

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Special dedication to my loving parents, Mr. Mohammad Zuhary bin Mohammad Dahari and Mrs. Fauziah binti Dayan, my kindhearted supervisor, Puan Norazlina binti Abd.Razak and thanks to my dearest friends.

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ABSTRACT

Iris recognition is a biometrical based technology for personal identification and verification. Iris recognizes a person from his/her iris prints and analyses the features that have the coloured tissue surrounding the pupil. The iris is an internal organ because it is well protected by the eyelid and the cornea from environmental damage. Old identification system use password, token cards or pins. However, these security methods are not efficient enough due to forgotten, stolen and borrowed. Therefore, in this project iris recognition using artificial neural network are proposed because of iris uniqueness and stability. The development tool of iris recognition used is MATLAB and will focus on the software to perform recognition. The performance of iris recognition is expected to be more than 80% recognizable.

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ABSTRAK

Pengiktirafan Iris adalah teknologi berasaskan biometrik untuk pengenalan peribadi dan pengesahan. Iris mengiktiraf seseorang daripada corak iris dan menganalisis ciri-ciri yang mempunyai tisu yang berwarna sekitar pupil. Iris adalah organ dalaman kerana ia dilindungi oleh kelopak mata dan kornea dari kerosakan alam sekitar. Kaedah pengenalan yang lama mengunakan sistem pengenalan kata laluan, kad token atau pin nombor. Walau bagaimanapun, kaedah keselamatan ini tidak cukup cekap kerana boleh dilupakan, dicuri dan dipinjam. Oleh itu, dalam projek ini pengiktirafan iris menggunakan rangkaian neural tiruan dicadangkan kerana keunikan iris dan kestabilannya. Alat pembangunan pengiktirafan iris digunakan adalah MATLAB dan akan memberi tumpuan kepada perisian untuk melaksanakan pengiktirafan. Prestasi pengiktirafan iris dijangka lebih daripada 80% dikenali.

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TABLE OF CONTENTS

CHAPTER	TITLE		PAGE
	TITLE		**i**
	DECLARATION		**ii**
	SUPERVISOR CONFIRMATION		**iv**
	DEDICATION		**v**
	ACKNOWLEDGEMENT		**vi**
	ABSTRACT		**vii**
	ABSTRAK		**viii**
	TABLE OF CONTENTS		**ix**
	LIST OF TABLES		**xii**
	LIST OF FIGURES		**xiii**
	LIST OF ABBREVIATION		**xiv**
I	**INTRODUCTION**		
	1.1	PROJECT INTRODUCTION	1
	1.2	OBJECTIVE OF STUDY	3
	1.3	PROBLEM STATEMENT	3
	1.4	SCOPE OF STUDY	4
	1.5	METHODOLOGY	4
	1.6	ORGANIZATION	5
II	**LITERATURE REVIEW**		
	2.1	BIOMETRIC IDENTIFICATION	6
	2.2	HUMAN IRIS RECOGNITION	7

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2.3	STRUCTURE OF IRIS RECOGNITION SYSTEM	8
2.3.1	Image acquisition	9
2.3.2	Image processing	9
2.3.3	Matching	10
2.4	IRIS RECOGNITION STUDY AND RESEARCH	10
2.4.1	Automatic segmentation according to Libor Masek	10
2.4.2	Normalisation using Daugman's Rubber Sheet Model	14
2.4.3	Feature extraction using Fractal Dimension techniques	15
2.4.4	Artificial Nueral Network (ANN) for classification	18

III RESEARCH METHODOLOGY

3.1	PROJECT PLANNING	20
	3.1.1 Gantt Chart	20
3.2	PROJECT FLOW CHART	22
3.3	IMAGE PRE-PROCESSING	23
	3.3.1 Detecting upper and lower eyelid	23
	3.3.2 Isolation of eyelashes	25
3.4	SEGMENTATION	25
3.5	FEATURE EXTRACTION	29
3.6	NUERAL NETWORK CLASSIFICATION	30
	3.6.1 ANN Models	31
	3.6.2 ANN Training Part	32
	3.6.3 ANN Testing Part	32
3.7	ANALYZE PERFORMANCE	33
3.8	AUTOMATIC IRIS RECOGNITION	33

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IV	**RESULT & DISCUSSION**		
	4.1	AUTOMATIC IRIS SEGMENTATION	34
	4.2	FEATURE EXTRACTION	41
	4.3	NUERAL NETWORK	43
	4.4	ANALYZE PERFORMANCE	45
V	**CONCLUSION & RECOMMENDATION**		
	5.1	CONCLUSION	47
	5.2	RECOMMENDATION	49
	REFERENCES		51
	APPENDIX A		53
	APPENDIX B		64
	APPENDIX C		66

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LIST OF TABLES

NO	TITLE	PAGE
2.1	Comparison matching method	19
3.1	Gantt chart for 2013 and 2014	21

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LIST OF FIGURES

NO	TITLE	PAGE
2.1	Human eye anatomy	8
2.2	Architecture of iris recognition system	9
2.3	Sample iris database from CASIA	9
2.4	Sub-system of automatic segmentation	12
2.5	Edge detection step	1 3
2.6	Daugman's rubber sheet model	14
2.7	Some iris image with extracted spectrum	16
2.8	Fractal images	17
3.1	Project flow chart	22
3.2	Eyelash obstruction	23
3.3	Reflection	23
3.4	Lower eyelid	24
3.5	Upper eyelid	24
3.6	Iris image after eyelid removal	24
3.7	Iris and pupil segmentation	25
3.8	Pupil displacement relative to the iris center	27
3.9	Outline of the normalization process	27
3.10	Neural network start window	30
3.11	Neural network pattern recognition tool window	31
4.1	Original eye and segmentation eye	35
4.2	Iris region converted into rectangular pattern	35
4.3	Iris rectangular pattern	36
4.4	Failed and correct segmentation	36
4.5	Correct iris region	37
4.6	Failed iris region	38

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4.7	Correct iris segmentation	39
4.8	Failed iris segmentation	40
4.9	Feature number in MATLAB	41
4.10	Target data in excel	42
4.11	Input data in excel	42
4.12	Feature number, input data and target data	43
4.13	Import data set	43
4.14	Data used for validation, training and testing	44
4.15	Neural network diagram	44
4.16	Confusion and performance plot	45
4.17	Performance plot	46

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LIST OF ABBREVIATION

ANN	-	Artificial Neural Network
FFBPNN	-	Feed Forward Neural Network
CASIA	-	Chinese Academy of Sciences-Institute of Automation

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LIST OF APPENDIX

NO	TITLE	PAGE
A	Segmentation script	53
B	Feature extraction script	64
C	System overview	66

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CHAPTER I

INTRODUCTION

1.1 PROJECT INTRODUCTION

In today worlds, the security and identification is becoming very important part of our daily lives. For example in ATM application, authentication in airport and many other. The security method of using password or ID card is not secure enough due to certain problem. Biometric security is the alternative method for replacing old system. The biometric system provided automatic recognition of an individual. It is based on unique feature possess by the individual.

Biometrics system requires physical presence of the person to be identified. Biometric security can be divided into two parts. First part is behavioral biometric such as signature, speech or walking style and the other part is physical biometric such as fingerprint, facial or iris recognition. From capturing feature, the samples transformed using mathematical function and convert it into biometric template, which will be stored in database and allow comparisons to be made between the templates.

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Efficient biometric system is characterized from the feature that is unique and stable over time. Iris recognition is the leading technologies in the world of security. Iris recognition will recognize a person by analyzing the iris prints. Every individual have unique iris pattern and it is stable over person ages. Iris is considering as internal organ that is highly protected by the eyelid and cornea. Image processing technique can be applied to extract the unique iris pattern.

Biometrics is the science of measuring physical properties of living beings. It is a collection of automated methods to recognize an individual. First, a person is enrolled into a database using the specified method. Information about a certain characteristic of the human is captured. This information is usually placed through algorithms that tum the information into a code. The probe information is again placed through the algorithms, and the new code is compared with the ones in the database to discover a match and hence, identification.

Biometrics works by unobtrusively matching patterns of live individuals in real time against enrolled records. Leading examples are biometric technologies that recognize and authenticate faces, hands, fingers, signatures, irises, voices, and fingerprints. Biometric templates cannot be reverseengineered to recreate personal information and they cannot be stolen and used to access personal information. Requirements of a biometric feature are uniqueness, universality, permanence, measurability, user friendliness, collectability, acceptability. The four categories of characteristics are used for comparison between different types of biometrics; they are comfort, accuracy, availability, costs.

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As the level of security breaches and transaction fraud increases, the need for highly secure identification and personal verification technologies is becoming apparent.Biometrics involves using the different parts of the body,such as the fingerprint or the eye, as a password or form of identification. Currently, in crime investigations fingerprints from a crime scene are being used to find a criminal. However, biometrics is becoming more public. Iris scans are used in United Kingdom at ATM's instead of the normal password / codes.

1.2 OBJECTIVES

The objectives of this project are:

i. To perform automatic iris segmentation from eye image.

ii. To extract features by using fractal technique.

iii. To perform iris recognition automatically by using artificial neural network.

1.3 PROBLEM STATEMENT

Nowadays, people used password, cards or pin number for authentication of individual and security. The problem regarding to these security method is can be forgotten by the individual. Also it can be borrowed and stolen by other individual. Therefore, iris recognition method offer the most secure authentication based on the characteristics possess by the individual without requiring them to memorize password, pin number or bring the card with them. In comparison to the other biometric system, iris recognition is an alternative to improve security level remarkably and as benefit with the common biometric system such as fingerprint.

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1.4 SCOPE OF STUDY

The projects only focus on software for performing the recognition. The algorithm for recognition is development in MATLAB software that may provide excellent application with their powerful image processing toolbox. The iris image acquisition that performed capturing of eye image will not be covered in this project. The database for eye image is downloaded from the CASIA iris image database version 2.0.

1.5 METHODOLOGY

To complete this project, they are several stages to be followed and perform. The first stage is to implement image pre-processing that will enhance the quality of the eye image captured. Second stage is process of segmentation. It is required to distinguish iris texture from the rest of eye image. Feature extraction is the third stage; in this process we only take the most important information from the segmented iris. The feature vector is then are classify using Artificial Neural Network (ANN) after that the performance will be analyse and perform the automatic iris recognition.

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1.6 ORGANIZATION OF REPORT

The report consists of 5 chapters organized as follow:

i. Chapter 1 discuss about introduction of this project. It consists of background, objective, problem statement, scope and methodology.

i. Chapter 2 contain literature review on past studies about iris recognition and relevant information related to iris recognition form the researches around the world.

ii. Chapter 3 will describe on the implementation of the project. What are the methods that will be used in every stage and how it work.

iii. Chapter 4 is about the progress result in this semester and its discussion of findings.

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CHAPTER II

LITERATURE REVIEW

This chapter will explain and discuss about the literature reading which is related to iris recognition and the implementation method that has been studied from different resources to perform this project.

2.1 BIOMETRIC IDENTIFICATION

According to Patil, (2009) Identification of human through biometric technologies is becoming common. Different biometric technologies like finger, face, voice, iris recognition, etc. use different behavioral or psychological characteristics of human for recognition. Application of biometric system are used in computer systems security, secure electronic banking, mobile phones, credit cards, secure access to buildings, health and social services. (Saminathan, Devi and Chakravarthy, 2012).

Firstly, an individual is enrolled into a database using specified method, and then the information of certain characteristics is captured. The information taken is

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then transform into algorithm then turn it into code. The information is again placed through the algorithm, the new code is compared with the ones in the database to discover a match and hence, identification (Chaskar and Sutaone, 2010).

In study of Jain, Ross, and Prabhakar (2004), they state that there are certain requirements that must be met for physical characteristics in biometric system. Such as:

1) Universality, this means that every individual must have unique characteristics.
2) Distinctiveness is only owned by one person which each characteristic is different within human.
3) Permanence, this means that the characteristic is stable and unchangeable.
4) Collectability, the data can be measured quantitatively.

2.2 HUMAN IRIS RECOGNITION

Iris recognition is an automated method of biometric identification that uses mathematical pattern recognition techniques. According to Masek (2003), the iris is a thin circular diaphragm, which lies between the cornea and the lens of the human eye. Iris is a combination of specific characteristics such as crypts, freckles, pits, radial furrows and striation. Iris recognition is the most reliable biometric system available because of iris uniqueness (Bhalchandra, 2008).

Each person have their own unique iris pattern, the different even exist between identical twins. Biometric system of iris recognition can be used to identify a person by analyzing the patterns found in the iris. (Ahmad and Tamimi, 2012). Iris is a protected internal organ and is it stable throughout life, it can serve as a kind of living password that one need not remember but one always carries along. (Chaskar

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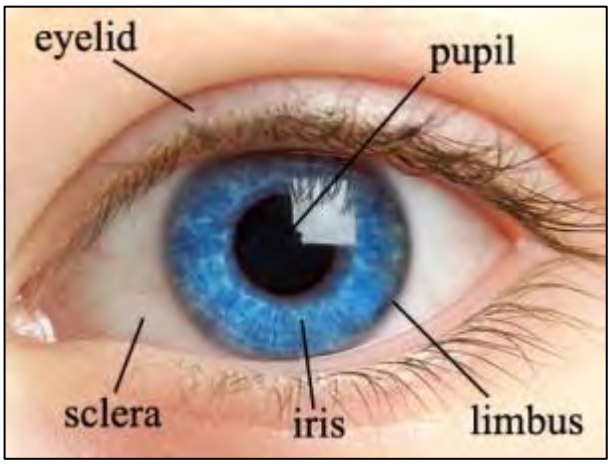
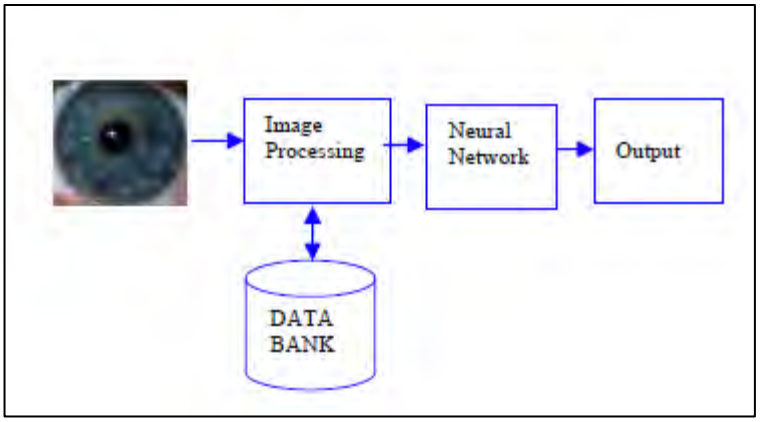
and Sutaone, 2010). Iris has great advantages, such as variability, stability and security, thus it is the most promising for high security environments (Karthikeyan, 2010). The human eye anatomy is illustrated in figure 2.1



[17] Figure 2.1: Human eye anatomy

2.3 STRUCTURE OF IRIS RECOGNITION SYSTEM

The architecture of iris recognition system is illustrated in figure 2.2 the summarized human iris identification consists of image acquisition, image processing and matching process.



[12] Figure 2.2: Architecture of iris recognition system

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