

IRIS CLASSIFICATION BY USING AN IMPROVED DIFFERENTIAL BOX-COUNTING METHOD


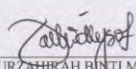

NURZAHIRAH BINTI MD YUSOF

This Report Is Submitted In Partial Fulfillment of the Requirements for the Award Of
Bachelor of Electronic Engineering (Computer Engineering) With Honors

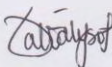
Faculty of Electronic and Computer Engineering

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
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A special dedication to my parents, Mr. Md Yusof Bin Sani and Mrs. Rohana Binti Yaakob for giving me a moral support, for my supervisor Puan Norazlina Binti Abdul Razak for supervise teaching me during my final year project studies, and thanks to my dearest friends.

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ABSTRACT

Biometric system is technologies that use information about a person or their physical identity to recognize the person. Biometric system depends on some specific data of uniquely trait to work more effective. In general biometrics is any use of biological data in technology. A biometric system will involve running data through algorithm for a particular result, usually related to a positive identification of a user or other individual. Type of biometrics technology are DNA matching, ear, iris recognition, retina recognition, face recognition, fingerprint recognition, finger geometry recognition, gait, hand geometry recognition, signature recognition and typing recognition. Iris recognition is the feature that found in iris that use for recognition or identify the person. Iris is suitable for biometric system because stable, unique, flexible, reliable and non-invasive and these features make iris recognition more secure and trusted verification system. Therefore, in this project the Improved Differential Box-Counting Method was introduced in feature extraction process in order to evaluate the performance of this method in iris recognition system. A neural network tool in MATLAB is used to evaluate the performance of the system. The performance of this method is expected to achieve 80% of recognizable.

ABSTRAK

Sistem biometrik adalah teknologi yang menggunakan identiti fizikal mereka untuk sistem pengecaman atau sistem sekuriti. Sistem biometrik bergantung kepada beberapa data tertentu yang unik untuk menjadi lebih berkesan. Biometrik umum adalah setiap penggunaan data biologi. Sistem biometrik melibatkan data melalui algoritma untuk hasil tertentu, biasanya berkaitan dengan pengenalan yang positif daripada pengguna atau individu lain. Jenis teknologi biometrik adalah padanan DNA, telinga, pengiktirafan iris, pengiktirafan retina, pengecaman muka, pengecaman cap jari, pengecaman geometri jari, gaya berjalan, pengiktirafan geometri tangan, pengiktirafan tandatangan dan pengiktirafan menaip. Pengiktirafan iris adalah corak yang dijumpai di dalam iris yang menggunakan pengiktirafan atau mengenal pasti orang itu. Iris adalah sesuai untuk sistem biometrik kerana stabil, unik, fleksibel, boleh dipercayai dan tidak invasif dan ciri-ciri ini membuatkan pengiktirafan iris lebih selamat dan sistem pengesahan lebih dipercayai. Oleh itu, dalam projek ini Berbeza Box-Counting Kaedah yang lebih baik telah diperkenalkan dalam proses pengecaman corak iris untuk menilai prestasi kaedah ini dalam sistem pengiktirafan iris. Alat rangkaian neural dalam MATLAB digunakan untuk menilai prestasi sistem. Prestasi kaedah ini dijangka mencapai 80% daripada dikenali.

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LIST OF ABBREVIATION

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

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CHAPTER I

INTRODUCTION

1.1 Project Introduction

The biometric technologies are the demand for simple, convenient, and high security authentication systems for protecting private information. The personal information can be protected in the form of biometrics which uses human physiological or behavioral features for personal identification. Most existing biometric systems have high complexity in time or space or both [1]. Humans have physical behavioral which makes it unique advantages for biometric systems. Authentication based on password, smart cards and pins number can be forgotten or stolen compare to authentication system that using physical behavioral. Iris recognition is one of the most reliable among all the biometric because of the stability and distinctiveness of the iris pattern [2].

By using biometric system, during the authentication process there are two phases involve which is enrollment and authentication. During the enrollment phase, the feature are extracted from iris textures and saved in database and during the authentication phase, feature are extracted from query iris template and classified against database [3]. Iris recognition system

consists of five major steps. First step is image acquisition; the image of iris must be in high quality in order to get best result. Next is segmentation process, process of removing noise, then proceed to normalization, process of changing to square block pattern. Fourth step is process of feature coding and last step is matching process [4].

The concept of fractal dimension can be used in a large number of applications, such as shape analysis and image segmentation. The fractal dimension offers the ability to describe and to characterize the complexity of the images or more precisely of their texture composition [5]. Box counting-method is most widely used dimension because it is easy realization for computer. Moreover, it is more simplicity and automatic computability [6]. Differential box-counting methods have several major problems and by using the improved differential box-counting method it can solve the major problem that encounter when using the differential box-counting method [7].

1.2 Objectives of the projects

There are several objectives when doing this project. The objectives are:

- To use an improved differential box-counting method in iris classification.
- To evaluate the performance and the accuracy of the improved differential box-counting method by using 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 are can be forgotten or stolen by others. Iris recognition is one of the most secure authentications as they are not have to memorize password, pin numbers or bring cards anymore. The method of improved differential box-counting method is used to determine the performance and the accuracy. The differential box-counting method is one of the frequently used techniques to estimate the fractal dimension. However the differential box-counting method cannot deal with the two major problems. Improved differential box-counting method is used to deal with the problem simultaneously and improved the accuracy.

1.4 Scope of Project

Scopes of these projects are to perform the neural network classification and measure the performance of the classification. The result for the accuracy must more than 80%. All the iris images are obtained from database CASIA. Matlab is used as development tool to program the algorithm in order to compute the fractal dimension for iris image. To compute the fractal dimension, the improved differential box-counting method will be used. Total image that be compute are 150, 10 person and 15 image from each person. The iris image are standardize to the right eyes only.

1.5 Project Limitation

The project has a limitation of study. Only 150 images from 10 persons will be used to perform the neural network classification and fractal dimension. Only Matlab is used to program the algorithm in order to compute the fractal dimension

for the iris image. The method when doing fractal dimension estimation is only used the improved differential box-counting method.

1.6 Report Structure

This thesis is combination of five chapters that contain introduction, literature review, methodology, expected result, conclusion and recommendation about the project. Every chapter is provided with brief explanation about the project.

First chapter is about the introduction of the project. In this chapter, we will explain about the background and the objectives of the project. The concept and overall overview about the project also include in this chapter. Next is chapter 2 which is about the literature review for the improved differential box-counting method based on previous research.

Next is chapter 3, methodology. We will be explaining about the methodologies of the project. This chapter will show the step on how to do this project and problem solving in a specific method to estimate the fractal dimension and feature extraction by using improved differential box-counting method. Then last step is to do the neural network classification, the performance of the method must more than 80% of accuracy.

Chapter 4 describes the expected result that will get by the end of the project based on the objectives that we want. Last chapter, chapter 5 will be describing about conclusion and recommendation for the project. Propose for the future also include in this chapter.

CHAPTER II

LITERATURE REVIEW

In this chapter, we will explain and discuss about the literature which is related to iris recognition and implemented method that have studied from different resources to perform this project.

2.1 Introduction

Biometrics system contains variety of techniques using for identification and authentication purpose. Biometric system is for to ensure the security of authentication is only access by the right person. Types of biometrics are divided by two, by physical and behavioral. Examples of biometric techniques are fingerprint, iris, speech, odor, gesture, retinal scan, hand vein and thermo gram [8].

Biometric are make use of certain physiological and behavioral characteristic of a person for identification and verification. Automated person authentication

systems based on iris recognition are reputed to be the most reliable among all biometric method because of the high level of stability and distinctiveness of iris pattern. These biometric systems are suitable for replaced the old authentications method that are using password, pin numbers and cards that can be easily hacked or forgotten by the person [2].

The imaging the pattern it can be done at distances of less than a meter. The iris image has the greater mathematic advantage as the pattern variability of the iris is enormous. The iris is an internal organ so the iris is well protected from environment and stable over time[9]. Iris region contain of the iris circle and pupil circle. The iris circle display variety of textures which can broadly classified. When capture an iris, the iris may be partially concealed by the upper eyelid, lower eyelid or the eyelashes. To avoid these problems segmentation is done [2].



Figure 2.1: Example of iris pattern

There are many methods that had been proposed by the researcher to increase the accuracy and the performance of iris recognition. Those methods are believed to be most reliable and have highest accuracy.

In study of Jain, Ross, and Prabhakar , 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 Iris Recognition Systems

Iris recognition is an automated method of biometric identification that uses mathematical pattern recognition techniques. According toMasek, 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[4].

Iris recognition has very high accuracy compare to other techniques of biometrics system. The human iris is an annular region between the pupil and the sclera. The iris controls the amount of light entering through the pupil. There is no patterns were identical even they have same biological like twins. There are five major steps when doing the iris recognition. The steps are image acquisition, the segmentation process, the normalization, feature coding and matching process.

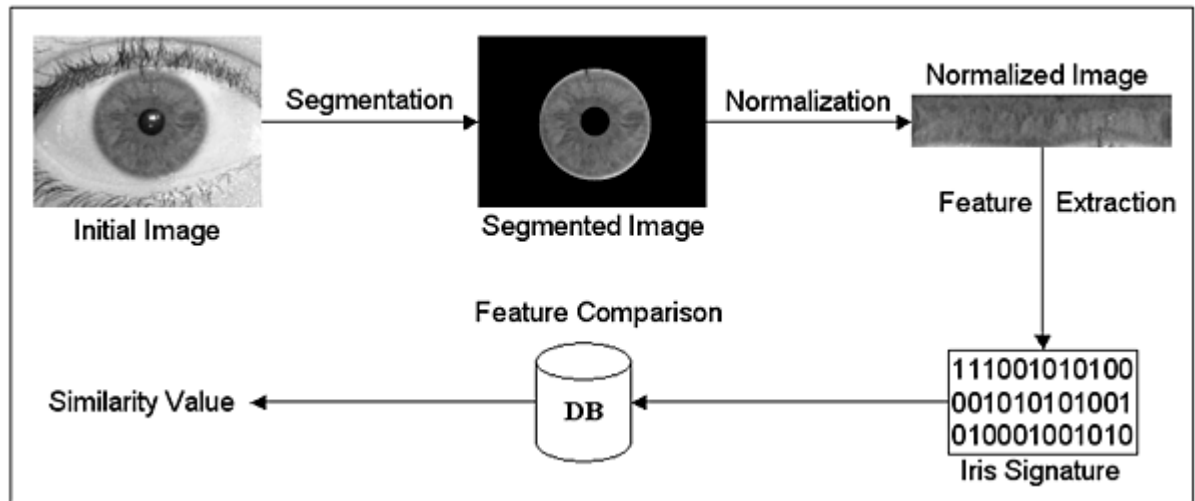


Figure 2.2: The process that involve in the project.

2.2.1 Image acquisition

First step of iris recognition is image acquisition. Image acquisition is defined as the action of retrieving an image from some source. The images that we have obtained are non-process image that are very important to continue the rest of step for image processing. Without the image acquisition, the whole process of image processing cannot be done. High qualities of image that obtain during the image acquisition are very important to lead the high accuracy and high performance of the iris recognition.