IRIS RECOGNITION SYSTEM USING HISTOGRAM ANALYSIS

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I declare that this report entitled “Iris Recognition using Histogram Analysis” is the result of my own research expect as cited in the differences.

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Name : NORHUDA BINTI OTHMAN

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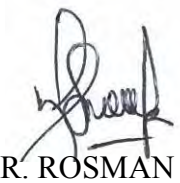
Signature : 

Supervisor's Name : MR. ROSMAN BIN ABD RAHIM

Date : 15 JUNE 2012

"Dedicated, in thankful appreciation for support, encouragement and understandings to my beloved parent, Mr. Othman Bin Dahali and Mrs. Bainah Binti Sanusi, my supervisor, Mr. Rosman Bin Abd Rahim, my siblings and all my friends."

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ABSTRACT

A biometric system provides automatic identification of an individual based on a unique feature or characteristic possessed by the individual. Iris recognition is regarded as the most reliable and accurate biometric identification system available. This report involves the development of iris recognition system using the histogram analysis method the Local Phase Quantization and Rotation Invariant Local Phase Quantization to verify the both the uniqueness of human iris as a biometric and performance. To determine the recognition performance of the iris image system digitized gray scale has been used and developed. Iris recognition system consists of the process of image segmentation, feature extraction which includes the RGB image to grayscale. Then, process transformation image to polar using Polar Transform and through the conversion process to form a histogram method LPQ and RILPQ. From this histogram, it will be analyzed to determine or recognize the iris image. To implement this recognition, the machine learning process has been implementing a database containing the iris image test database and iris image train database has been developed. K Nearest Neighbour classifier algorithm will use for recognition in the Iris Recognition System. An iris recognition system that requires the comprehension of a complex algorithm was succesfully developed and it is effective enough when being integrated with a system that requires identity checking. The overall system that deploy LPQ and RILPQ with histogram analysis was shown to achieve the initial objectives of this project. It was also proved to attain high recognition accuracy.

ABSTRAK

Satu sistem biometrik menyediakan pengenalan automatik individu berdasarkan ciri-ciri yang unik atau ciri-ciri yang dimiliki oleh individu. Iris pengiktirafan dianggap sebagai sistem pengenalan biometrik yang paling dipercayai dan tepat. Laporan ini melibatkan pembangunan sistem pengiktirafan iris menggunakan kaedah analisis histogram Pengkuantuman Fasa Tempatan dan Putaran yang berbeza Fasa Pengkuantuman Tempatan untuk mengesahkan kedua-dua keunikan iris manusia sebagai biometrik dan prestasi. Untuk menentukan prestasi pengiktirafan sistem imej iris didigitalkan skala kelabu telah digunakan dan dibangunkan. Iris sistem pengiktirafan terdiri daripada proses pengekstrakan segmentasi, ciri imej yang termasuk imej RGB kepada skala kelabu. Kemudian, proses transformasi imej kutub menggunakan Kutub Transform dan melalui proses penukaran untuk membentuk kaedah LPQ histogram dan RILPQ. Dari histogram ini, ia akan dianalisis untuk menentukan atau mengiktiraf imej iris. Untuk melaksanakan pengiktirafan ini, proses pembangunan pangkalan data telah dilaksanakan yang mengandungi imej iris ujian pangkalan data dan pangkalan data bagi melatih imej iris telah dibangunkan. KNN algoritma digunakan untuk pengiktirafan dalam Sistem Pengiktirafan Iris. Satu sistem pengiktirafan iris yang memerlukan kefahaman algoritma yang kompleks telah berjaya dibangunkan dan ia adalah cukup berkesan apabila disepadukan dengan sistem yang memerlukan semakan identiti. Keseluruhan sistem yang menghantar LPQ dan RILPQ dengan analisis histogram telah ditunjukkan untuk mencapai objektif awal projek ini. Ia juga membuktikan mencapai ketepatan pengiktirafan tinggi.

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LPQ	-	Local Phase Quantization
RILPQ	-	Rotation Invariance Local Phase Quantization
PCA	-	Principal Component Analysis
DWT	-	Discrete Wavelet Transform
RGB	-	Red, Green, Blue
KNN	-	K-Nearest Neighbour
GUI	-	Graphic User Interface

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CHAPTER I

INTRODUCTION

1.1 Background

`IRIS RECOGNITION` is a biometric technique to identify a person due to its unique pattern contained in each iris. Advantage of appearing on characteristics of iris with develops iris recognition system to identify an individual using the image of their iris. In this proposal, how to identify Iris is based on histogram of the image iris. The purpose of 'Iris Recognition', biometrical technology for personal identification and authentication, is to recognize a person from the iris. In fact, the iris pattern is characterized by a high level of stability and distinctiveness. Every individual has a unique iris.

Development 'Iris Recognition' uses MATLAB for ease of manipulation of images and applications. This has the potential to improve the efficiency of the introduction of the iris, and the system only need to store and process for the introduction of one-dimensional signal processing is required. The methodology in the form of this histogram analysis, how it is used in the registration and identification and performance in terms of positive and negative result will be presented through this project.

1.2 Problem Statement

Problem statement for this project are:

a) This system was developed to help and solve the problem of invasion of person identity information.
b) Iris recognition system is able to protect the security of any information more safe and secure.
c) Thus, by having this system it can help to improve the security level remarkably.

1.3 Project Objectives

The objectives of this project are:

a) To study and comprehend the iris recognition technology by using histogram analysis.
b) To design and develop an iris based recognition system with histogram analysis using MATLAB.
c) To analyze the performance of the histogram analysis method to recognize person.

1.4 Scope of the Project

Firstly, Project focuses on the software development only, not using hardware for capturing an iris image. The designed system will tested with develop own iris image database from downloading iris image. Recognition algorithm is implemented in MATLAB software. MATLAB software provides an excellent rapid application development with its image processing toolbox, and high level programming methodology. Other than that, the system using iris image because the iris has many advantages and benefits for biometric technology. Here are just a few of the benefits using iris recognition in this system. Iris has high accuracy; one of the main benefits

of using eye biometrics is the high accuracy that this technology provides. Everyone has an iris pattern that is distinct even twins. Both the left and right irises differ from one another as well. In theory, the accuracy of this technology should be at close to 100%. So, from this advantages will develop of iris recognition system.

1.5 Project Outline

This thesis comprises of five chapters. The first chapter briefly discusses the overviews about the project such as introduction, objectives, problem statements and scope of this project.

Chapter II describes about the research and information about the project. Every facts and information, which found through by any references had been selected. This literature review has been explained about the experienced project of the Iris Recognition and other project uses the same method for recognition using histogram.

Chapter III will discuss about the methodology that have been used in this project. The project must be understand first and make the research about previous project. The method that have been used are develop the software, troubleshooting the program and lastly the project have been presented. This chapter also consists about the project design software using more that one method.

Chapter IV, describe about the result and discussion. The result is presented more to Interface of Iris Recognition System, function of the system and performance of system and movement meanwhile discussion presented more to the problem that occur along this project session and that problem.

Finally, Chapter V tells about conclusion and recommendation. The conclusion describes about the task that have been done during this project. The recommendation is added to give an opinion and also an improvement on how the future works should have done.

CHAPTER II

LITERATURE REVIEW

This chapter will explain about the literature review which is related to this Iris Recognition or method will be uses in project. Information about the Iris Recognition and histogram analysis in LPQ and RILPQ method has been studied from different resources to perform this project

2.1 Iris Recognition Project

This section will discuss about the previous Iris Recognition project that have been developed by the previous researcher.

2.1.1 Iris Recognition using Harr Wavelet

According to C. H. Daouk, L. A. El-Esber, F. D. Kammoun and M. A. Al Alaoui, “Iris Recognition”, ‘Iris Recognition’ using Matlab for its ease in image manipulation and wavelet applications. The first step of project consists of images acquisition. Then, the pictures’ size and type are manipulated in order to be able subsequently to process them. Once the preprocessing step is achieved, it is necessary to localize the iris and unwrap it. This stage, can extract the texture of the

iris using Haar Wavelets. Finally, compare the coded image with the already coded iris in order to find a match or detect an imposter.

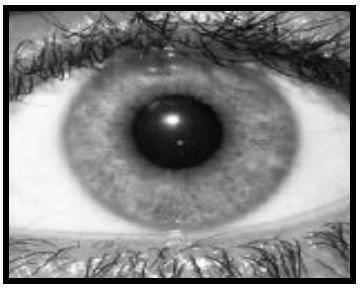

Figure 2.1: Original image

a) Image acquisition
b) Image manipulation
c) Iris localization

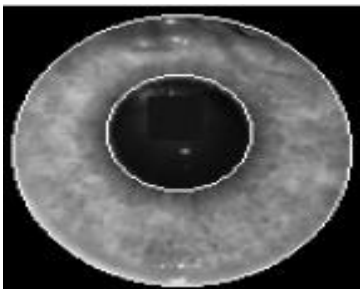

Figure 2.2: Localized Iris

Figure 2.3: Iris isolated image

d) Feature Extraction
e) Mapping
f) Haar Wavelets

Most previous implementations have made use of Gabor wavelets to extract the iris patterns. But, since we are very keen on keeping our total computation time as low as possible, we decided that building a neural network especially for this task would be too time consuming and selecting another wavelet would be more appropriate.

2.1.2 Iris Recognition of Human Iris Patterns

Accoding to Libor Masek, "Recognition of Human Iris Patterns for Biometric Identification", and the first stage of iris recognition is to isolate the actual iris region in a digital eye image. The iris region, shown in Figure 1.1, can be approximated by two circles, one for the iris or sclera boundary and another, interior to the first, for the iris/pupil boundary. The eyelids and eyelashes normally occlude the upper and lower parts of the iris region. Also, specular reflections can occur within the iris region corrupting the iris pattern. A technique is required to isolate and exclude these artefacts as well as locating the circular iris region.

The success of segmentation depends on the imaging quality of eye images. Images in the CASIA iris database do not contain specular reflections due to the use of near infra-red light for illumination. However, the images in the LEI database contain these specular reflections, which are caused by imaging under natural light. Also, persons with darkly pigmented irises will present very low contrast between the pupil and iris region if imaged under natural light, making segmentation more difficult. The segmentation stage is critical to the success of an iris recognition system, since data that is falsely represented as iris pattern data will corrupt the biometric templates generated, resulting in poor recognition rates.

2.1.3 Iris Recognition Works

At the outset of this project, some key tasks were identied that needed to be carried out to full the aim of creating a working prototype of an iris recognition system. The task was to read in an image of an eye and display this on screen. From

this stage the iris then needs to be isolated from the rest of the image; to do this accurately the pupil, iris, and eyelids all need to be identied. This isolation was originally specifed to be carried out manually by the user by clicking points on the image. The next task for the program was to calculate features of the iris pattern using the algorithms described by Professor John Daugman. The iris bitcodes that are obtained from this can then be used to compare against a database of other such bitcodes to and the identity of the individual.

2.1.4 Iris Recognition Based on Using Ridgelet and Curvelet Transform

There are different methods for personal identification with using biometric characteristics. In general, biometric is an individual identification ability based on physiological characteristics such as fingerprint, handwriting, retina, iris and face. There are many advantages of employing biometric system for identification but there are also some disadvantages. We can mention to high recognition accuracy, uniqueness, and no needs to memorize a code as advantages and low public acceptance, and complex or expensive equipments as disadvantages. Any way the advantages of using the biometric systems are more than its drawback, so using is increasing daily. Although using iris patterns for personal identification have been begun in the last 19th century, it takes more attention nowadays. In addition iris recognition system is a noninvasive method.

2.1.5 PCA based Iris Recognition using DWT

There are many iris recognition systems and the first automatic system was developed by Daugman using efficient integrodifferential operator, which is still popular in today's most of the iris recognition systems. In the zero crossings representation method the image is decomposed using wavelet transform and the required features are extracted from the image.