

VERIFICATION OF FACE IMAGE SYSTEM

NUR AISYAH BT ABDUL AZIZ

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

Faculty of Electronic and Computer Engineering
Universiti Teknikal Malaysia Melaka

April 2009



UNIVERSITI TEKNIKAL MALAYSIA MELAKA
FAKULTI KEJURUTERAAN ELEKTRONIK DAN KEJURUTERAAN KOMPUTER

BORANG PENGESAHAN STATUS LAPORAN
PROJEK SARJANA MUDA II

Tajuk Projek : VERIFICATION OF FACE IMAGE SYSTEM

Sesi :
Pengajian : 2008/2009

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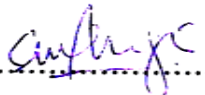
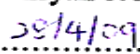
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Fakulti Kejuruteraan Elektronik Dan Kejuruteraan Komputer
Universiti Teknikal Malaysia Melaka (UTeM)

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Pejabat Pos Durian Tunggal
76109 Durian Tunggal, Melaka

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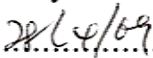
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Date: .....

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Signature:.....

Name: Cik Syafeeza Binti Ahmad Radzi.

Date:.....

Specially dedicated to
my beloved parents, brothers, sister and my lover who have encouraged, guided and
inspired me throughout my journey of education

ACKNOWLEDGEMENT

First of all, I would like to take this opportunity to express my deepest gratitude to my beloved project supervisor, Ms.Syafeeza Binti Ahmad Radzi for her guidance, encouragement and endurance during the whole course of this project. It is indeed my pleasure for her undivided support, invaluable advices and enthusiastic support to make my project a successful done. My special gratitude is to my beloved family, especially my parents for their fullest support throughout my 3 year's study in Universiti Teknikal Malaysia Melaka (UTeM). It is because of them, I am the person who I am today. For all their moral support all these while so that I will be able to complete my project successfully. My appreciation to my friends especially my course mates, for their technical advice and material aid. To all the people that assist me directly and indirectly in this project, once again I would like to say a big thank you. Thank you.

ABSTRACT

Nowadays, there are many type of biometrics was introduce such as face, voice, fingerprint and iris pattern. Among them, Face Recognition is one of type biometric that a fascinating topic in the field of computer vision. It has gained increasing interests over the years. Face recognition seems to be the most natural and effective method to identify a person since it is the same as the way humans do and there is no need to use special equipment. In face recognition, personal facial features extraction is the key to create more robust systems. Eigenface, neural network and fisherfaces have been proposed where each has its merits and weakness. Such techniques, however, are highly complicated and are computational-power hungry, making it difficult to implement them into low computational power and very costly. Therefore, in this project a very simple yet highly reliable face recognition was developed using Vector Quantization (VQ) Histogram method utilizing LabVIEW 8.5 and NI Vision Development.

ABSTRAK

Pada masa kini terdapat pelbagai jenis system yang menggunakan biometric telah diperkenalkan seperti menggunakan imej muka, suara, cap jari dan juga mata. Diantara kesemua sistem tersebut, sistem pengenalan imej muka adalah sistem yang paling menarik dan telah menjadi topik utama dalam impian perisian komputer. Sistem pengenalan imej muka ini boleh dikatakan cara yang paling berkesan dan lazim digunakan untuk mengenalpasti seseorang kerana ianya sama dengan cara manusia biasa mengenalpasti seseorang dan ianya juga tidak memerlukan peralatan khas. Eigenface, neural network and fisherfaces adalah diantara teknik yang telah diperkenalkan dan teknik-teknik ini sangat rumit dan juga memerlukan teknologi komputer yang tinggi dan juga sukar untuk digunakan dalam teknologi komputer yang rendah. Oleh itu, dalam projek ini satu sistem pengenalan imej muka yang mudah telah dicipta dengan hanya menggunakan LABVIEW 8.5 dan Vector Quantization (VQ) Histogram serta NI Vision Development.

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ABBREVIATION

ATM	-	Automated Teller Machine
AVI	-	Audio Video Interleave
BMP	-	Bitmap
ID	-	Identification
IMAQ	-	Image Acquisition
JPEG	-	Joint Photographic Expert Group
LabVIEW	-	Laboratory Virtual Instrumentation Engineering Workbench
LBG	-	Linde-Buzo-Gray
LDA	-	Linear Discriminate Analysis
LED	-	Light Emitting Diode
NI	-	National Instrument
PC	-	Personal Computer
PCA	-	Principle Component Analysis
PIN	-	Personal Identification Number
PNG	-	Portable Network Graphic
TIFF	-	Tagged Image File Format
VI	-	Virtual Instrument
VQ	-	Vector Quantization

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CHAPTER I

INTRODUCTION

1.1 Project Overview

This project is focusing on verification of face image system utilizing LabVIEW 8.5 and NI Vision Automated Inspection. This system uses facial image to implement a matching process between original images (still image) from the well-known in the database. The matching process is done by comparison the original image with the ORL Face Database using Vector Quantization (VQ) Histogram technique. In addition, to make this software user friendly, the Graphic User Interface (GUI) is created using LabVIEW 8.5. This system finds useful application in various surveillance activities and this system is intended to be done at home entrance. The VQ algorithm is well known in the field of image coding (compression) and schematically shown in Figure 1.1

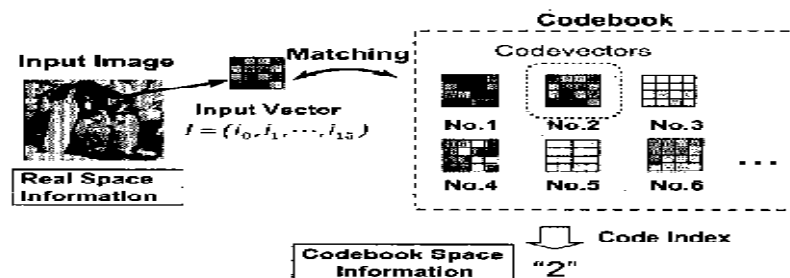


Figure 1.1 Vector Quantization Algorithms

1.2 Objective

The main objective of this project is to develop a verification system using facial image that is called “Verification of face image system” to solve the problem with current security alarm. The security alarm system today has limited features whereby this research is intended to overcome those limitations.

The next objective in this project is to use the Vector Quantization Histogram method in the system because this method is very simple yet highly reliable face recognition at a much lower cost. Besides that, this system is developed by LabView 8.5. With this software, the Vector Quantization Histogram method is easy to be implemented in the system face recognition system.

1.3 Problem Statement

Password/PIN known as Personal Identification Number systems is identification system that are not fully secure and efficient because they are not unique, and is possible to get stolen from somebody else. Therefore, this verification of face image system is introduced to solve the problem. This system uses facial image as the identification feature. Furthermore, it seems to be the most natural and effective method to identify a person through their face and there is no need to use special equipment.

The face recognition system today mostly is expensive because the techniques that are used to develop the system is complicated and are high power consumption. With the VQ histogram technique, the simple yet highly reliable system can be developed at a much lower cost.

1.4 Scope of Work

There are few scopes and guidelines are listed to ensure the project is conducted within its intended boundary. This is to ensure the project is heading to the right direction to achieve its objectives.

Firstly, the verification of face image system is designed and developed utilizing LabVIEW 8.5 and the Vision Development module.

Secondly, the face recognition system uses Vector Quantization Histogram method to process the facial images. Both of the software and method is used to design a system that can implement a matching process between two images from different source.

Ones of the most important process in the system is it can generate the codebook that has codevector in i. the codebook is used to generate a histogram that will become the feature vector of the human face.

1.5 Methodology

- i. Choose the project title
- ii. Analysis the project scope and background
- iii. Do the literature review, project objectives, problem statement, and methodology
- iv. Study LabVIEW 8.5
- v. Design and develop the system.
- vi. Troubleshooting and analysis the system
- vii. Final presentation.

1.6 Thesis layout

This thesis comprises five chapters. The following paragraph will elaborate briefly on the content of each chapter

The chapter I of the thesis explains the project overview, problem statement, objectives, scopes and methodology of project.

Chapter II gives the literature reviews on some important sources that is related to the project and explanation of each software and method used in the project.

Chapter III is the methodologies that describe the flow of the project implementation and explanation of processes to develop a face image system.

Chapter V is the project main focus which explained and showed the project progress and discussion.

Chapter VII pointed out the conclusion of the project including the problem encountered throughout the project implementation and future work consideration.

CHAPTER II

LITERATURE REVIEW

2.1 Biometric

Biometrics is the development of statistical and mathematical methods applicable to data analysis problems in the biological sciences [2].

The term "biometrics" is derived from the Greek words bio (life) and metric (to measure). For our use, biometrics refers to technologies for measuring and analyzing a person's physiological or behavioral characteristics, such as fingerprints, irises, voice patterns, facial patterns, and hand measurements, for identification and verification purposes [2]. Biometric technologies are becoming the foundation of an extensive array of highly secure identification and personal verification solutions [1].

Biometric technologies should be considered and evaluated giving full consideration to the following characteristics:

- i. Universality: Every person should have the characteristic. People who are mute or without a fingerprint will need to be accommodated in some way.
- ii. Uniqueness: Generally, no two people have identical characteristics. However, identical twins are hard to distinguish.
- iii. Permanence: The characteristics should not vary with time. A person's face, for example, may change with age.
- iv. Collectability: The characteristics must be easily collectible and measurable.

- v. Performance: The method must deliver accurate results under varied environmental circumstances.
- vi. Acceptability: The general public must accept the sample collection routines. Nonintrusive methods are more acceptable.
- vii. Circumvention: The technology should be difficult to deceive.

Table 2.1 A comparison of biometrics from: Yun, Yau Wei. The '123' of Biometric Technology, 2003.

Biometrics	Univer- sality	Unique- ness	Perma- nence	Collect- ability	Perfor- mance	Accept- ability	Circum- vention
Face	H	L	M	H	L	H	L
Fingerprint	M	H	H	M	H	M	H
Hand Geometry	M	M	M	H	M	M	M
Keystroke Dynamics	L	L	L	M	L	M	M
Hand vein	M	M	M	M	M	M	H
Iris	H	H	H	M	H	L	H
Retina	H	H	M	L	H	L	H
Signature	L	L	L	H	L	H	L
Voice	M	L	L	M	L	H	L
Facial Thermogram	H	H	L	H	M	H	H
DNA	H	H	H	L	H	L	L
H=High, M=Medium, L=Low							

Biometrics is used in two major ways: Identification and Verification. Identification is determining who a person is. It involves taking the measured characteristic and trying to find a match in a database containing records of people and that characteristic. This method can require a large amount of processing power and some time if the database is very large. It is often used in determining the identity of a suspect from crime scene information. Verification is determining if a person is who they say they are. It involves taking the measured characteristic and comparing it to the previously recorded data for that person. This method requires less processing power and time, and is often used for accessing places or information. [2]

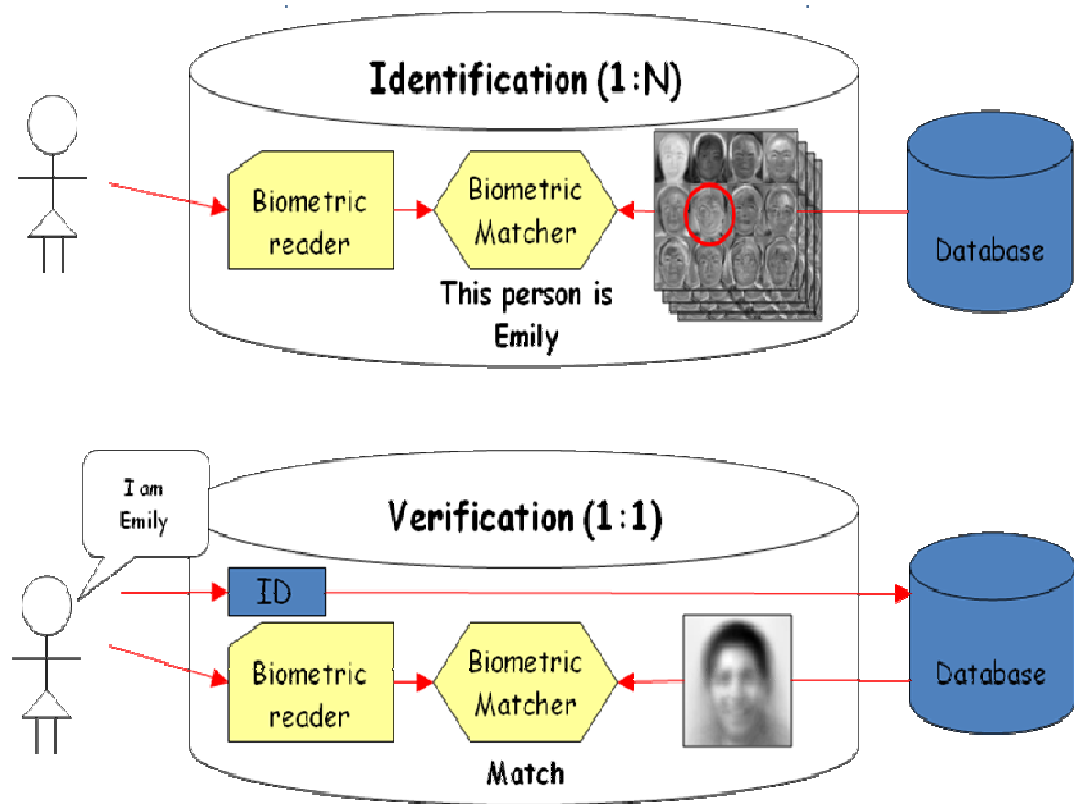


Figure 2.1 Comparison between identification and verification.

2.1 .1 Types of Biometrics:

- i. Bertillonage - measuring body lengths (no longer used)
- ii. Fingerprint - analyzing fingertip patterns
- iii. Facial Recognition - measuring facial characteristics
- iv. Hand Geometry - measuring the shape of the hand
- v. Iris Scan - analyzing features of colored ring of the eye
- vi. Retinal Scan - analyzing blood vessels in the eye
- vii. Vascular Patterns - analyzing vein patterns
- viii. DNA - analyzing genetic makeup
- ix. Speaker Recognition - analyzing vocal behavior
- x. Signature - analyzing signature dynamics
- xi. Keystroke - measuring the time spacing of typed words