

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

REAL-TIME FACE RECOGNITION SYSTEM FOR AUTOMATIC DOOR ACCESS  
CONTROL

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**BORANG PENGESAHAN STATUS LAPORAN  
PROJEK SARJANA MUDA II**

**Tajuk Projek:** Real Time Face Recognition system for Automatic Door Access

**Sesi Pengajian:**

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Date: .....

Dedicated to my beloved late parents, Brother supervisor, seniors and friends.

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Its grateful to Allah S.W.T because with His blessing, I am able to solve my problems and get the opportunity to complete this Projek Sarjana Muda 2 (PSM 2) report which entitled Real Time Face Recognition System for Automatic Door. This Projek Sarjana Muda 2 (PSM 2) was prepared for Faculty of Electronics and Computer Engineering, Universiti Teknikal Malaysia Melaka (UTeM) basically for final year student to complete the Bachelor of Electronics Engineering.

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## ABSTRAK

Tujuan projek ini adalah untuk membina sistem pengecaman wajah dalam masa nyata untuk kawalan akses pintu. Ia adalah alat untuk menangkap imej muka seseorang untuk memberikan akses kepada pengguna yang dibenarkan apabila ia telah membuat perbandingan di dalam pangkalan data. Satu cam web telah digunakan untuk menangkap imej muka pengguna yang akan dihubungkan dengan modul Raspberry Pi yang akan memberi keluaran untuk membuka pintu menggunakan servo motor. Proses pengecaman wajah ini dilakukan dengan menggunakan kaedah eigenface. Imej kemudian akan melalui satu siri langkah-langkah pemprosesan imej untuk meningkatkan imej untuk menghasilkan imej positif yang mengandungi imej pengguna dan akhir sekali mengambil masa untuk membandingkan dengan templat dalam pangkalan data menggunakan AT & T yang mengandungi imej negatif. Jika pengguna diberi kuasa, pintu akan terbuka dan sebaliknya. Peranti ini dibuat dengan menggunakan raspberry pi 3 sebagai pengawal mikro untuk memproses imej, mengawal kamera dan untuk mengawal motor pintu.

## ABSTRACT

This project is to build a real-time face recognition system for door access control. It is a device to capture the face image of a person to give access to the authorized user when it been compare in the data base. A web cam been used to capture the image or the user face that will be connected to the Raspberry Pi module that will give the output to open the door using servo. The process of this face recognition was done by using eigenface method. The image will then go through a series of image processing steps to enhance the image to produce positive image that contain the user image and lastly taken its time to compare with the template in the database using AT&T that contain negative image. If the user is authorized, door will open and vice versa. The device is made by using a raspberry pi 3 as the microcontroller to process the image, controlling the camera and to control the motor of the door.



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## **CHAPTER 1**

### **INTRODUCTION**

#### **1.0 Project Background**

Human brain is a best in memories and recognizing faces and complex pattern. Even when there is an obstacle around, it does not affect the capability of the brain due to that it may help a computer to as intelligent as the human brain to detect and recognize human faces. A face recognition system is an application that will automatically identify and verify a person's image that has been captured by digital camera or a web cam. Face recognition and face detection is also known as Human Computer Interaction (HCI) system.

Face recognition system commonly used in security system, computational models of face recognition in particular are interesting as it can contribute to practical application as well instead of theoretical insight. Computer that recognizes faces in a high level visual problem which has numerous practical application such as criminal identification, biometric, security monitoring image and film processing, pattern recognition and human-computer interaction.

The project is about developing a real-time face recognition for automatic door access that consists of hardware and software. The purpose of this project is to improve the security by recognize the owner face. This system can be used in home, office and many more places that need high security.

This system functions by interfacing the software and hardware. When the camera recognizes the face, it will unlock the door. This project uses Raspberry PI, that acts like a computer because it has a SD card that will function as an operating system in it.

## **1.1 Problem Statement**

People often misplaces their keys and sometimes people also may have lost their key due to their carelessness. This face recognition for automatic door access system is the solution for this situation because this system is embedded into the door and it will function by recognizing a person. Besides that, it increases your home security and decrease the chances of key loses.

In security system, many types of password are used to access the private and confidential data such as characters (key in pin) or touch smart card using RFID. Password and pin are hard to remember and it also can be easily obtained or steal by other parties although they are other ways to keep the data such as card, token and keys but it can easily be misplaced, forgotten or duplicated. A magnetic card can be corrupted and unreadable. By developed a face recognition system it is mare secure because facial image been used as the ID in this system. It may prevent and avoid all the disadvantages above.

Using face recognition system also allows a person to enter a place or building without manually open the door knob. It is also an advantage when a person walks in with many things in their hand this system will automatically open when the face been recognition.

Face recognition have many benefits such as it can prevent a person to cheat their attendance in class or for work, it can detect criminal faces in the security camera around us and it can be integrated easily to become a system.

## **1.2 Objective**

- To develop a portable control access device.
- To identify the user ID.
- To install the face recognition system and can identify a person's face.

## **1.3 Scope of project**

Item	Scope
<b>Data Base</b>	<ul style="list-style-type: none"> <li>• For offline method, AT&amp;T database will be used to test the detection and recognition method.</li> </ul>
<b>Software</b>	<ul style="list-style-type: none"> <li>• Python Language</li> <li>• Putty</li> <li>• XLaunch</li> </ul>
<b>Hardware</b>	<ul style="list-style-type: none"> <li>• Raspberry PI 3</li> <li>• Serve Motor</li> <li>• SD Card</li> </ul>
<b>Performance Masure</b>	<ul style="list-style-type: none"> <li>• Fake Acceptance Rate (FAR)</li> <li>• False Rejection Rate (FRR)</li> <li>• True Acceptance (TA)</li> <li>• Accuracy</li> </ul>

### 1.5 Expected Outcome

- A small house that will be installed with the face recognition system and the door.
- The door will be unlocked when the registered user stand in front of the door.
- This system can be applied for home or laboratory.

## **1.6 Report Organization**

This report is presented in four chapters. Chapter 1 focused on brief introduction of the project carried. The important overview or description including the problem statement, project objective and project scopes are well emphasized in this part.

Chapter 2 will be based on literature review of the project. It is mainly focused on the previous research and the conceptual information applied on this system.

Chapter 3 will explain on the concepts, theories and principles used to complete the project. This part consists of the methodology and the information on research and experiment during the project development.

Chapter 5 will explain the discussion of the project and the conclusion for this project.

## **CHAPTER 2**

### **LITERATURE REVIEW**

#### **2.0 Introduction**

This chapter provides a detail description about what have been published on some topics by scholars and researchers. The main purpose of writing this literature review is to acquire knowledge and ideas that have been established about face recognition system in real-time that will be focused on Real-time Face Recognition for Automatic Door Access Control System. The review also highlights the strengths and weakness of the existing works.

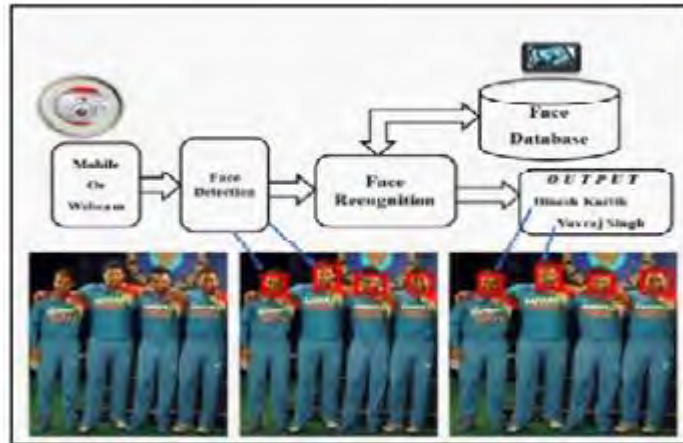
Besides that, there are a number of resources on the topic of Face Recognition system that have been widely published. This information has been collected from different resources such as published documentation, white paper and journals in the web site.

This chapter will be separated into two sections that are face detection and face recognition. It provides an overview of literature review as well as basic concept on how face recognition is carried out by using various methods.

## **2.1 Previous Research**

### **2.1.1 Real Time Face Detection and Recognition System**

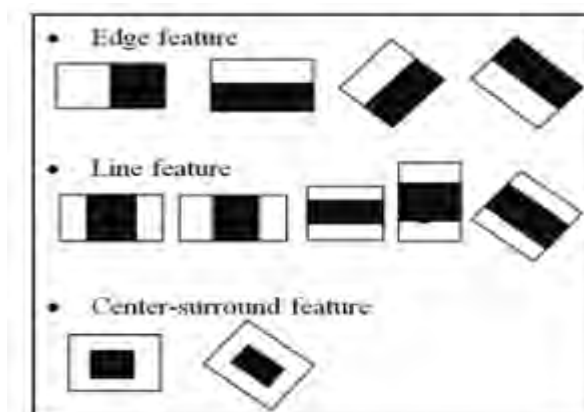
Face detection and recognition system is more cheap, simple, accurate and non-intrusive process as compare to other type of biometrics. The system falls into two categories namely face detection (1:1) and face recognition (1: N). In the face detection phase, we need to classify between face versus non-face region while in recognition process we have to compare that single face image with multiple images from the input image. While capturing an image from a web cam we have to come across some problems like pose (position of camera), presence of structural components (spectacles and beard), facial expression, occlusion (obstructed by someone), image orientation (variation in rotation), imaging condition (lightning and camera characteristics). Face detection is a common feature of digital cameras since 2006. Automatic face detection and recognition system is placed at New Zealand airport only for their citizens since 2010 while airport in Europe started to equipped with similar systems from 2008 for security purpose [1].



**Figure 2.1: Block diagram of the system**

Haar Like Feature for Face Detection Haar like features are digital image feature used for object detection but here we used it for face detection. The biggest advantage of it over most other features is its calculation speed. Figure 2.2 shows the types of Haar like feature. Generally, eye region is darker than other region from the face. Figure 2.3 shows how Haar like feature is used for face detection purpose. Figure 2.4 gives the complete preprocessing steps, which includes binary to gray scale image conversion, Histogram Equalization method (HE), Laplacian of Gaussian filter (LG) and final step is contrast adjustment. Preprocessing is done because we have to remove influence cause by illumination variation for accurate face recognition [1].

- Edge feature
- Line feature
- Center-surround feature



**Figure 2.2: Types of HAAR Like Features**