Faculty of Electrical and Electronic Engineering Technology

DEVELOPMENT OF IOT DOOR LOCK SYSTEM WITH FACE RECOGNITION BY USING RASPBERRY PI

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Bachelor of Electronics Engineering Technology with Honours

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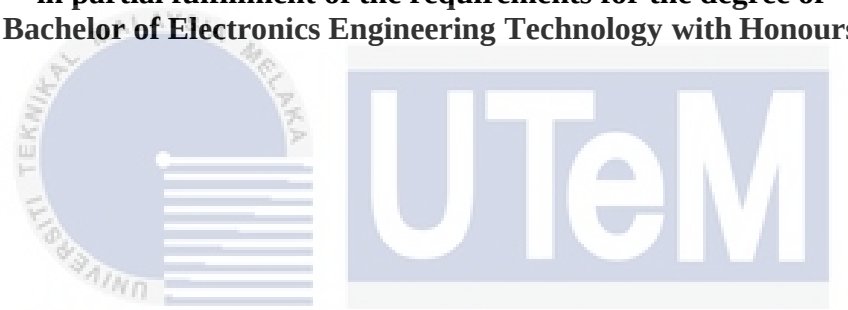
A project report submitted
in partial fulfillment of the requirements for the degree of
Bachelor of Electronics Engineering Technology with Honours



Faculty of Electrical and Electronic Engineering Technology

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

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UNIVERSITI TEKNIKAL MALAYSIA MELAKA
FAKULTI TEKNOLOGI KEJUTERAAN ELEKTRIK DAN ELEKTRONIK

BORANG PENGESAHAN STATUS LAPORAN
PROJEK SARJANA MUDA II

Tajuk Projek : DEVELOPMENT OF IOTDOORLOCK SYSTEM WITH FACE RECOGNITION BY USING RASPBERRY PI

Sesi Pengajian : 2021

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I declare that this project report entitled " **Development of Iot Door Lock System With Face Recognition By Using Raspberry Pi** " is the result of my own research except as cited in the references. The project report has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

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APPROVAL

I hereby declare that I have checked this project report and in my opinion, this project report is adequate in terms of scope and quality for the award of the degree of Bachelor of Electronics Engineering Technology with Honours.

Signature : 

Supervisor Name : Ts. Mohd Erdi Bin Ayob

Date : 28/02/2022

Signature :

Co-Supervisor :

Name (if any)

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DEDICATION

I dedicate this project to my beloved parents for providing all the support and assistance that have made possible the fruition of our efforts. They have never given up and will always be remembered in this heart.

Next, I dedicate this project to my supervisor lecturer for all support and give full cooperation during Final Year Project. Your patience, knowledge, and words of encouragement gave me immense strength throughout the project.

Then, to all my friend's thanks for their cooperation, advice, motivation, and support while conducting the Final Year Project.

To all lecturer, thank you for all their moral guidance and support during all this semester in Universiti Teknikal Malaysia Melaka

ABSTRACT

Everyday existence needs a high level of security. The problem with the traditional door lock is that it can be easily be unlock by using lock picks. The system's main goal is to create a safe door lock system utilizing the Internet of Things. The system also makes high security and comprises of parts to tackle the problem produced by intruders. The face recognition system, which is based on the Haar-like features detection technique and the Local Binary Pattern (LBP) identification algorithm, is the first section. A camera sensor is used to capture the face, and an image matching algorithm is used to recognize the authorized faces. The only person who can open the door is the one whose face matches the one on the other side. The manual mechanism is the second section. The alert system is the final part. The system is made up of a facial recognition security system, a manual key system, and a notification system. The usage of the Local Binary Pattern (LBP) algorithm in this system reduces the number of iterations utilized in the face recognition system. As a result of the time savings, the processing time of this system is faster than that of the standard system. The project will be complete if the system can recognize the registered faces through the camera and the door unlock. The prototype design has been developed, and the output of the facial recognition algorithm will lock or unlock the magnetic lock installed at the door using a relay circuit.

ABSTRAK

Keselamatan adalah bahagian penting dalam kehidupan seharian. Masalah utama kunci pintu tradisional adalah ianya mudah untuk dibuka menggunakanpembuka pintu. Matlamat utama sistem ini adalah untuk mengembangkan sistem kunci pintu yang selamat menggunakan Internet of Things. Untuk menyelesaikan masalah yang disebabkan oleh penceroboh, sistem ini juga membuat keselamatan yang tinggi dan terdiri daripada beberapa bahagian. Bahagian pertama adalah sistem pengecaman wajah yang berdasarkan kaedah pengesanan ciri seperti Haar dan algoritma pengenalan Pola Binary Tempatan (LBP). Wajah ditangkap menggunakan sensor kamera, dan wajah yang disahkan dikesan menggunakan algoritma pemadanan gambar. Hanya orang yang wajahnya sepadan dengan wajah di seberang pintu yang dapat membukanya. Kemudian, bahagian kedua adalah sistem keselamatan kata laluan. Dan bahagian terakhir adalah sistem amaran, Sistem ini disusun oleh gabungan sistem keselamatan pengenalan wajah, sistem kunci manual dan sistem pemberitahuan. Dalam sistem ini, iterasi yang digunakan dalam sistem pengecaman wajah dikurangkan dengan menggunakan algoritma Local Binary Pattern (LBP). Oleh itu, dalam menjimatkan masa, masa pemprosesan sistem ini lebih baik daripada sistem biasa. Projek ini akan selesai jika sistem dapat mengecam muka yang didaftarkan melalui kamera dan kunci pintu terbuka. Reka bentuk prototaip telah dibangunkan, dan output algoritma pengecaman muka akan mengunci atau membuka kunci kunci magnet yang dipasang di pintu menggunakan litar geganti.

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CHAPTER 1

INTRODUCTION

1.0 Introduction

This chapter includes a summary of the project, including the background of this project door look system with face recognition, problem statement of the project, objectives to achieve and scope of the project.

1.1 Background of Project

Security and safety are getting more popular in today's world, and they're being enhanced and employed to make our lives simpler. Building security should not be ignored, especially now that technology has become such a vital part of people's lives. Home security is a very useful application of IoT and we are using it to create an inexpensive security system for homes as well as industrial use[1]. This project mentions a prototype of a safe door unlocking system. Facial recognition has become a prominent subject in computer vision and biometrics as a result of the difficulty in recognizing a face image. Along with fingerprint and retinal matching, they have become a prevalent approach in biometrics technology.

The technology is a self-locking door that recognizes people by their faces. Because identical faces constitute a biometric trait, they might be used instead of passwords or pins. They're nearly difficult to imitate and nearly foolproof. The suggested facial recognition door lock protection system was designed to discourage burglary in high-security places like the house while using less energy and providing a more efficient standalone security solution for both intruder detection and door security. A Raspberry Pi is made up of a circuit, a camera, and a door lock solenoid. When someone walks through the door, the system recognizes their face and opens the door if the face is recognized. If the face is not recognized, the door unlocks a photo is taken to be sent to the registered phone number telegram account.

Numerous face recognition algorithms have been created, including appearance-based, active appearance-based, support vector machines (SVM), Bayesian models, deep learning neural networks, and texture-based algorithms. This project will investigate various methods for recognizing faces based on their appearance, including direct correlation, eigenface, and fisherface. Unlike direct correlation algorithms, which use the original image size of the face picture, eigenface and fisherface algorithms compress the image to its most discriminating factor and look for similarities between images in a reduced dimension image size. The fisherface algorithm classifies faces using inner class information and may use many faces of a single individual to increase in-class variance and thereby class separation. By contrast, the eigenface approach uses a single image for each individual and includes the variation of the image into the overall recognition process. Light and facial expressions affect the eigenface approach. However, the computing requirements are significantly lower than those for the fisherface algorithm. As a result, the eigenface approach will be implemented on a low-power device known as the Raspberry Pi.

1.2 Problem Statement

Home owner often face difficulties in using the traditional door locks, this project is to solve the problems and improve home security with the IoT helps. This system will help the users to safeguard their homes by placing the system on the doors or windows and monitoring the activity through their smart phones[1].

- Lost the key to enter the residence.
- Low level of security if using regular locks.
- Time consuming to use key for open the door lock.

1.3 Project Objective

This project aim to develop a door lock by using raspberry pi with a face recognition feature. Therefore, several objectives are stated to attain the purpose of the project. The main objective for this project:

i. To design an automatic door lock system by using haarcascade.
ii. To develop a face recognition feature by using OpenCv in raspberry pi.
iii. To generate images as output for the monitor and telegram

1.4 Scope of project

The goal for this project is to create an IoT Door Lock System with Face Recognition that may be used in a home, work place, or any other place where there is a risk of intrusion. The design is made with a Raspberry Pi and a few other components such as a camera, relay module and a solenoid door lock. This is a project that may be used by anyone. The purpose of this initiative is to make it easier to identify intruders in the case of a robbery and to save people from being constantly on the lookout. The project's features include notification, which is connected to your smartphone.

CHAPTER 2

LITERATURE REVIEW

2.0 Introduction

Provides an overview of numerous topics from prior work and a literature review that are relevant to this project in this chapter. This chapter includes covers the project's specifics, as well as the equipment used and the application.

2.1 Theory of Recognize Face

Computer vision is a field of study that is now gaining popularity in the development of many applications in everyday life. Recognizing or locating one or more faces or unique items has already become commonplace. The recent interest in face recognition can be attributed to the increase of commercial interest and the development of feasible technologies to support the development of face recognition[2].

The recognition procedure is divided into three steps. Identification is the initial stage, then extraction, and lastly categorization. Object detection is a technique for locating items in photographs. When there are a few other elements in the background, facial recognition in real time is difficult. Due to a face rotation of more than 30 degrees, a shift in illumination, or other variables that may impede facial appearance, such as beards or spectacles, it is sometimes difficult to capture the face of an item. The extraction technique for recognizing an item is regulated by certain criteria and needs the usage of distinct characteristics. The data is then classified based on these qualities. When a human face is the target of detection, classification is the final step in the recognition process. It is mostly used to categorize emotional responses.

2.1.1 Camera and Image processing

Many cameras must be set in a certain region for automated monitoring of a scene in HSH, according to Kolias et al[3]. They must therefore be immune to current limits like as noise, illumination, picture quality, and computational cost. To address these limitations and enhance recognition accuracy, Kolias et al. employ Radio Frequency Identification technology, which is great for the unique recognition of persons. They investigated if RFID might be used in combination with hemispheric image video cameras. Despite the benefits and drawbacks of each methodology, their integration shows that combining them might lead to reliable item detection and interactions in a given context. The current research concludes with a discussion of some of the possible applications for such integration.

They consider that the usage of cameras and image processing on the Internet of Things is a novel research area, pointing to an HSH issue[4]. This article discusses face recognition and the categorization of perceived emotion on patients' faces. Mano et al. also review the existing literature, indicating that the majority of research in this sector does not place a high enough premium on patient monitoring. Additionally, just a few studies take the patient's emotional condition into account, which may be critical to the patient's ultimate recovery. The result is a prototype that is portable across multiple platforms. Mano et al concepts, are influenced the current investigation.

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In 2016, Mano proposed a proposal for using cameras in conjunction with the Internet of Things for home healthcare. A typical wireless Personal Area Network (WPAN) architecture is used to develop a Smart Design for In-Home Healthcare (SAHHc), which comprises of sensors (IP cameras) and a router with a server (Decision Maker).

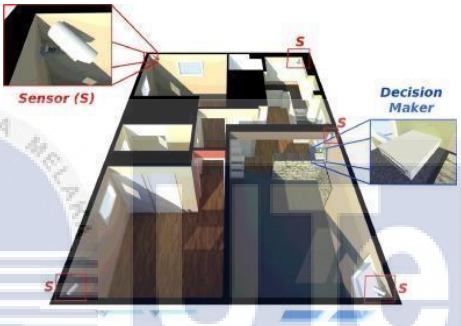

Figure 2.1.2.1

Example of simple SAHHc [8]

This method is commonplace, but it comes with a number of security issues. As a result, a traditional HD webcam is employed, which is coupled to a Raspberry Pi 3 microcontroller.

The major decision piece, the Decision Maker was the microcontroller Raspberry Pi 3. The communication path is depicted in the block diagram below:

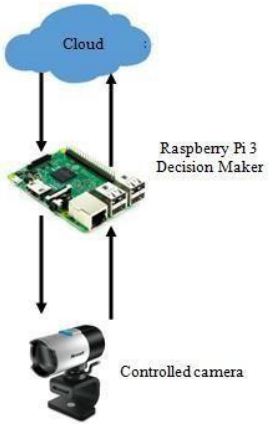

Figure 2.1.2.2

Block scheme of communication

The structure of this system consisted of:

- Basic gadgets that operate as sensors and can obtain information more about patient's health and the environment if necessary (e.g., HD cameras in this scenario).
- Sensors can detect abnormal movement or falls, as well as their faces. The sensors detect activities when someone enters the room. The person may be recognized based on how the camera is moved and the individual's face is captured (conditions depend on the degree of face rotation, light conditions, camera distance, etc.). The activities of the specified person will be tracked if they are a patient.

Face detection, tracking, and motion detection are important and popular research subjects in image processing. Computer vision is a technological and scientific research concerned with electronic equipment's capacity to extract intelligence from a digital image in order to "understand a scenario" and so make a decision on whether or not to accomplish the task. This characteristic may be seen in virtually every form of technology used in research and business. This article discusses the Raspberry Pi 3 microcontroller and the OpenCV module. OpenCV had