Faculty of Electrical and Electronic Engineering Technology

DEVELOPMENT OF AN AUTOMATED FACE MASK DETECTOR AND BODY TEMPERATURE CHECK

AHMAD MUHAJER BIN ABDUL AZIZ

Bachelor of Computer Engineering Technology (Computer Systems) with Honours

2021

DEVELOPMENT OF AN AUTOMATED FACE MASK DETECTOR AND BODY TEMPERATURE CHECK

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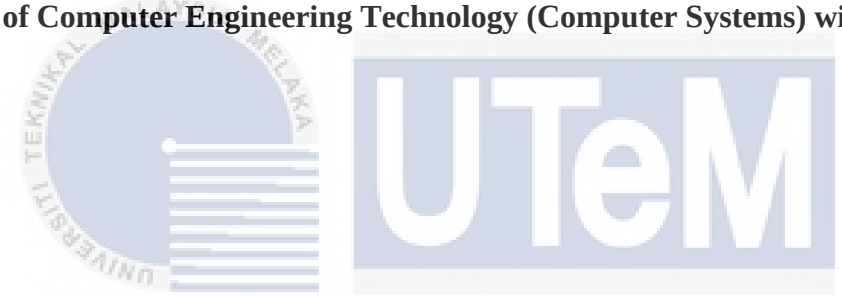
A project report submitted
in partial fulfillment of the requirements for the degree of
Bachelor of Computer Engineering Technology (Computer Systems) with Honours



Faculty of Electrical and Electronic Engineering Technology

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

2021

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Tajuk: Development Of An Automated Face Mask Detector And Body Temperature Check

Sesi Pengajian: 2021

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TS. NUR ALISA BINTI ALI

Alamat Tetap:

BLOK 41-07-08

PPR DBKL

GOMBAK SETIA,

SETAPAK,

53100, W.P KUALA LUMPUR

Tarikh:

Cop Rasmi Penyelia

NUR ALISA BINTI ALI
Pensyarah
Jabatan Teknologi Kejuruteraan Elektronik dan Komputer
Fakulti Teknologi Kejuruteraan Elektrik dan Elektronik
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I declare that this project report entitled “Development Of An Automated Face Mask Detector And Body Temperature Check” 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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Date : 11/1/2022

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 Computer Engineering Technology (Computer Systems) with Honours.

Signature : 

Supervisor Name : TS. NUR ALISA BINTI ALI

Date : 11/1/2022

Signature : 

Co-Supervisor Name (if any) : TS. SHAMSUL FAKHAR BIN ABD GANI

Date : 11/1/2022

DEDICATION

To my beloved mother, ROHANA BINTI ABDUL WAHAB

My family,
(NUR HIDAYAH BINTI ABDUL AZIZ, NUR HIDAYATUL AIN BINTI ABDUL AZIZ, NUR AZRUL HAQIM BIN ABDUL AZIZ, MOHD NAQIUDDIN BIN ABDUL AZIZ, AZNAAIM BIN ABDUL AZIZ)

My soft and kindhearted supervisor
TS. NUR ALISA BINTI ALI

And my Ex-Supervisor
TS. SHAMSUL FAKHAR BIN ABD GANI

Co-supervisor
TS. NADZRIE BIN MOHAMOOD

Finally, my teammate
(MUHAMMAD SYAFIQ BIN MOHD NADZRI, SARAH AMIRA BINTI KAMARUZAMAN, NURIN QASHRINA BINTI HAZRAN, NOOR SHAMYZA BINTI MOHD ZAKI)

ABSTRACT

A technique for monitoring the most recently found coronavirus is proposed in this project (Development of An Automated Face Mask Detector and Body Temperature Check). A large number of people died in many country including Malaysia due to this fatal disease. This condition has a wide variety of symptoms, making it difficult to determine whether or not a person is suffering from it. The symptoms are verified by WHO and we can identify this disease based on them. Using Raspberry Pi, this proposed system can track people who not either wearing face mask or wearing it properly. A system is being developed that used MLX 90614 sensor and Camera Pi Module to perform thermal scanning of the human body and detected a face mask. If a person has symptoms and their body temperature is 100F or higher when scanning using a thermal scanner, it will show to the screen. If nothing happen to the person, they can pass to a premises. If the user got high temperature or not wearing a face mask, the picture of users and their body temperature details will be send to high management to take a serious actions and buzzer will ring. This design also will doing the same if the person not wearing a face mask properly. This designed methodology system is untouched and runs on its own automatically. If properly implemented, the project that are working on currently might be used to assist assure community protection and reliability. In this study, the proposed of this monitoring system which is relevant to a variety of zones, including railways, a station, an airport, a hospital, a school, a college, and a residence establishments, offices, shopping malls especially public areas.

ABSTRAK

Satu teknik untuk memantau coronavirus yang paling baru ditemui dicadangkan dalam projek ini (Pembangunan Pengesan Topeng Muka Automatik dan Pemeriksaan Suhu Badan). Sebilangan besar orang mati di banyak negara termasuk Malaysia akibat penyakit maut ini. Keadaan ini mempunyai pelbagai jenis simptom, menjadikannya sukar untuk menentukan sama ada seseorang itu menghidapnya atau tidak. Gejala disahkan oleh WHO dan kita boleh mengenal pasti penyakit ini berdasarkannya. Menggunakan Raspberry Pi, sistem yang dicadangkan ini boleh mengesan orang yang sama ada tidak memakai topeng muka atau memakainya dengan betul. Sistem sedang dibangunkan yang menggunakan penderia MLX 90614 dan Modul Pi Kamera untuk melakukan pengimbasan haba badan manusia dan mengesan topeng muka. Jika seseorang mengalami simptom dan suhu badannya ialah 100F atau lebih tinggi apabila mengimbas menggunakan pengimbas haba, ia akan ditunjukkan pada skrin. Jika tiada apa-apa berlaku kepada orang itu, mereka boleh pergi ke premis. Jika pengguna mendapat suhu tinggi atau tidak memakai topeng muka, gambar pengguna dan butiran suhu badan mereka akan dihantar kepada pengurusan tinggi untuk mengambil tindakan serius dan buzzer akan berbunyi. Reka bentuk ini juga akan melakukan perkara yang sama jika orang itu tidak memakai topeng muka dengan betul. Sistem metodologi yang direka ini tidak disentuh dan berjalan sendiri secara automatik. Jika dilaksanakan dengan betul, projek yang sedang diusahakan pada masa ini mungkin digunakan untuk membantu memastikan perlindungan dan kebolehpercayaan komuniti. Dalam kajian ini, cadangan sistem pemantauan ini yang relevan dengan pelbagai zon, termasuk kereta api, stesen, lapangan terbang, hospital, sekolah, kolej, dan pertubuhan kediaman, pejabat, pusat membeli-belah terutamanya kawasan awam.

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF SYMBOLS

°C	-	Degrees Celcius
°F	-	Degrees Fahrenheit
+%	-	Accurate Percent
V	-	Volts of Voltage
I2C	-	Inter-Integrated Circuit
SDA	-	Serial Data
SCL	-	Serial Clock
VCC	-	Voltage Common Collector
VSS	-	Source Supply
Mm	-	Milimeter

LIST OF ABBREVIATIONS

PCA	-	Principal Component Analysis
ID	-	Identification
PC	-	Personal Computer
PWMFD	-	Properly Wearing Masked Face Detection Dataset
WIDER	-	World Institute for Development Economics Research
RMFD	-	Real-World Masked Face Dataset
KLIA	-	Kuala Lumpur International Airport
MIME	-	Multipurpose Internet Mail Extensions
IDE	-	Integrated Development Environment
VNC	-	Virtual Network Computing
GPIO	-	General Purpose Input/Output
CSI	-	Computer Services Inc
POR	-	Provided on Request
ADC	-	Analog Digital Converter
DC	-	Direct Current
BGR	-	Blue Green Red
RGB	-	Red Green Blue
LCD	-	Liquid Crystal Display

LIST OF APPENDICES

CHAPTER 1

INTRODUCTION

1.1 Project Background

All other large and small countries including Malaysia recently declared an emergency for the novel coronavirus (COVID-19). In action, the entire world's population is on lockdown with people need to maintaining social distances as recommended by the World Health Organization (WHO). This fatal virus has infected millions of people worldwide and is still spreading. COVID-19 infections are causing people across Malaysia to lose their jobs, work from home, being hospitalised, and even death. Since taking precautions is the only way to be safe. To prevent making contact with coronavirus, it have been advice for people to wear a face mask and maintain social distance. Therefore, the content of this project will be described as development of an automated face mask detector and body temperature to check the temperature body of human and detect whether they wear a face mask or not.

The main purpose of this project is to develop an automated face mask detector and body temperature by using a Raspberry Pi to check whether the person wearing a face mask and while checking the body temperature which is high or low. One of the worst jobs in the world right now is being a guard at a supermarket entrance who need to tell people to put on their face masks before entering a premise. Instead of making a human manually check for mask compliance, this project was to created a Raspberry Pi powered automatic mask detector that uses computer vision. Additionally, the system can also detect body temperature of nearby people and decides whether he/she can be allowed to enter the premise.

1.2 Problem Statement

The content of the project is described generally regarding Development Of An Automated Face Mask Detector And Body Temperature Check including problem statement, objective and scope. The things that need to be achieved to solve the problem arise is the objective while the problem statement is related to how the problem that we want to solve occur. However, there will be a limitation in completing this project which is discussed in the chapter. One of the worst jobs in the world right now is being a guard at a supermarket entrance who need to tell people to put on their face masks before entering a premise or institution. Another problem that we are facing right now is the high price of body temperature scanner and it is cannot detect face mask. We have to buy two things for body temperature check and face mask detector. Therefore, it will not being accurate if there a lot of people because human need to physically check a body temperature of the person who enter the premises and waste a lot of time of labor. That how the idea of this project has been sparked.

1.3 Objectives

The objective of this project are as follows:

a) To develop of an Automated Face Mask Detector and Body Temperature Check by using Raspberry Pi.

b) To analyze the effectiveness of the proposed system in differentiating between masked or non-masked people and normal or abnormal temperature people.

c) To reduce time of checking between masked and non-masked while normal and abnormal temperature people.

1.4 Scope of Project

This project will develop a prototype of an automated face mask detector which will check whether a person wear a face mask in a range of 3.68 x 2.76 mm (4.6 mm diagonal) with a focal length of 3.04 mm. Face mask detector with 97+% accuracy. The body temperature check also will detect if the person has high temperature body or low temperature body in a range from 35°C - 42°C (95°F - 107.6°F), precision of ±0.3°C for the object temperature and distance between object and sensor between 2cm-5cm (approx.). If the temperature is high or the person is not wearing a mask, a camera will take their picture with details of body temperature and buzzer will ring. The limitation of this project is to detect a single face and body temperature of the person.

1.5 Project Significance

The reason this project is created to help reduce of wastage such as time, labor and labor error that have been practice right now and improve the efficiency of face mask detector and body temperature check. The novelty of this project is to detect whether the person is wearing a face mask or not while checking their body temperature whether its high or low. Lastly, the target of this project is to help Auxiliary, Malls Guard, Office Guard to do checking in shorter time with better equipment before entering any premises or institution.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This chapter discussed on the overview of development of an Automated Face Mask Detector and Body Temperature Check and the past research which related to the topic. In this study, the advantages and disadvantages of the previous research are also presented and being compared. Other than that, research on the hardware components that have been used in other research is also being studied. By analyzing the previous projects, the possibilities that affect the qualities in their project can be analyzed and reviewed. Lastly, some recommendations have been made to overcome the problem exist in the previous study.

2.2 Overview of Pandemic in Global History

"Pandemics are central to global history. They have global impact and create anchor points in time. They also interrogate the foundations of society, the sustainability of its material basis, the role of expertise, our social codes, and behavioural norms" [1]**.** Pandemic happens around 100 years at times and been killing a thousand people around the world and the latest is Corona Virus (COVID-19) that have been rampant until now. On March 11, 2020, the World Health Organization (WHO) announced that the COVID- 19 virus was officially a pandemic after barreling through 114 countries in three months and infecting over 118,000 people and the spread was not anywhere near finished [2].

2.2.1 Precautions to prevent COVID19

There have been a few precautions make by government to reduce the effectiveness of COVID-19 which is wear a mask and social distancing. Masks will help prevent the virus from spreading from the individual who is wearing it to others. COVID-19 is not protected by masks alone, they must be used in conjunction with physical separation and hand hygiene. The current COVID-19 pandemic is bound to establish a major anchor point in the twenty-first century. It reminds us how quickly viruses can travel around the world as they interact with the forces of economic, political and cultural globalization. It also reveals enormous differences in the perceptions and approaches to a new health threat and highlights the deep politicization behind responses on local, nationals and global geopolitical scales. Historical comparisons inspire questions about why human, communal, scientific, and societal responses to such threats vary and how they change over time [1].

2.3 Previous Work of Project Face Detector

2.3.1 Face Recognition

Research by [3] among the first to develop facial recognition technology. Face recognition technology can be used in wide range of applications such as identity authentication, access control and surveillance. Interests and research activities in face recognition have increased significantly over the past few years. Study by [4] discovered a way to improve the accuracy of a manual facial recognition device in the 1970s. To distinguish faces automatically, 21 specific subjective markers were used like in Figure 2.1. Lip thickness and hair color were among the indicators. The specific biometrics for Bledsoe's device had to be computed manually. While face recognition has been around in one form or another since the 1960s, recent technological developments have led to a wide proliferation of this technology.

This technology is no longer seen as something out of science fiction movies like Minority Report.

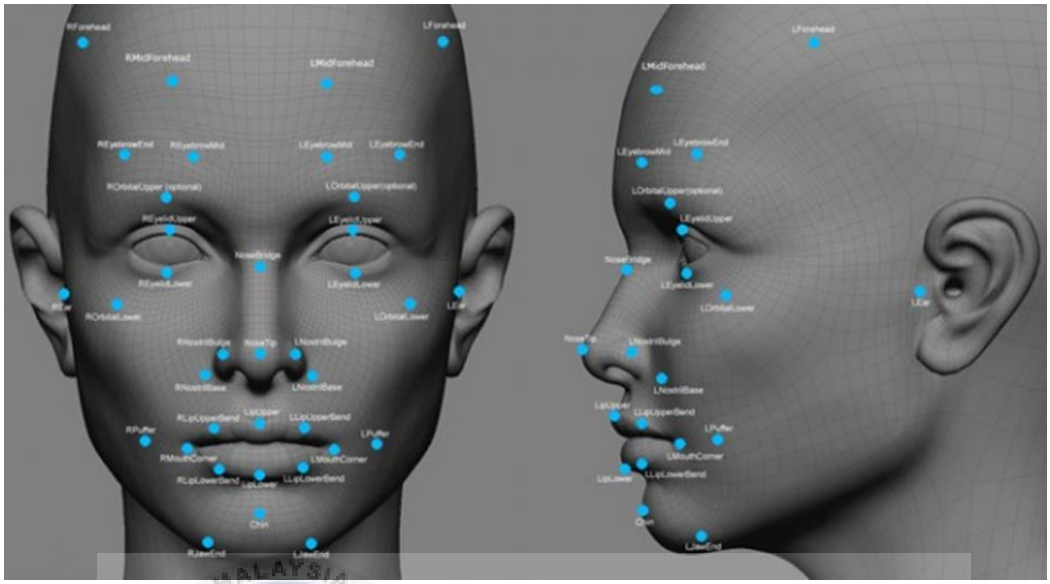

Figure 2.1 21 specific subjective markers by [4]

2.3.2 Face recognition by Raspberry Pi and Python

Nowadays, many people created a face recognition by using Raspberry Pi and Python. By using Python, mostly we use OpenCV coding. OpenCV was created with a focus on real-time applications and computational performance. As a result, it is ideal for camera-based real-time face recognition. Currently, many consumers electronic are utilizing personal identification technique such as ID, fingerprint, face, Iris and palmprint recognition for security reason. Among other biometric traits, face image is easy to capture using Pi Camera. The pre-calculated statistical parameter is then used to implement the PCA algorithm in Raspberry Pi embedded processor. OpenCV image processing libraries is used to support the basic task of image pre-processing such as cropping, resize and color conversion. In the propose work, the whole system is implemented in low cost processor to evaluate the performance in terms of recognition rates and processing time [5]. Recognition is implemented by anticipating another