UNIVERSITI TEKNIKAL MALAYSIA MELAKA

Faculty of Electrical and Electronic Engineering Technology

DEVELOPMENT OF FACE MASK DETECTOR WITH TEMPERATURE SCANNER USING ARDUINO

ZUL' AZIQ ADIEMI BIN PUTRA

Bachelor of Electronics Engineering Technology (Telecommunications) with Honours

2022

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

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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 FACE MASK DETECTOR WITH TEMPERATURE SCANNER USING ARDUINO**

Sesi Pengajian : **2022/2023**

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I declare that this project report entitled “Development of Face Mask Detector with Temperature Scanner Using Arduino ” 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.

Signature : 

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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 (Telecommunications) with Honours.

Signature : 

Supervisor Name : **TS. ELIYANA BINTI RUSLAN**

Date : 24 Februari 2023

DEDICATION

To my beloved mother, Tarini Binti Yaman, and father, Putra Bin Ila.

With their prayers, this success will be achieved.

ABSTRACT

In this era that increasingly brings modernity, coupled with technological advances and the human ability to think outside the box. Proving that human scientific thinking and development is advancing every day. So, it is not surprising that microorganisms such as viruses and bacteria are also able to evolve over time. Such a thing can have a bad effect on mankind and will certainly lead to the spread of diseases that we see today. Because of that, we must use all our capabilities sourced from science and technology to curb the spread of disease to a minimum so that the level of damage and death does not increase too much. Therefore, this project ensures that everyone wears a face mask properly, and temperature will be taken to identify a person's body condition before doing any activity in a crowded area. The objective of this project is to ensure that the Covid-19 Standard Operating Procedure (SOP) is carried out in an orderly and systematic, develop a healthy environment and ensure the prevention and control of Covid-19 in the community. These face mask scanners need to be placed at the main entrance for monitoring purposes. The face mask scanner using ESP32-CAM Face Recognition will scan the human face and open the bar/gate to allow the customer to enter if fulfil all instructions are. According to the policy, customers who do not wear face masks will not be permitted to enter, and the bar/gate will remain closed until they do so. This scanner also reminds the customer wears the mask on the LCD screen.

ABSTRAK

Dalam era yang semakin membawa kemodenan ini, ditambah pula dengan kemajuan teknologi dan keupayaan manusia untuk berfikir di luar kotak. Membuktikan bahawa pemikiran dan pembangunan sains manusia semakin maju setiap hari. Jadi, tidak hairanlah mikroorganisma seperti virus dan bakteria juga mampu berkembang mengikut peredaran masa. Perkara sebegini boleh mendatangkan kesan buruk kepada manusia dan sudah tentu akan membawa kepada penularan penyakit yang kita lihat pada hari ini. Kerana itu, kita harus menggunakan segala kemampuan kita yang bersumberkan sains dan teknologi untuk membendung penularan penyakit ke tahap minimum agar tahap kerosakan dan kematian tidak terlalu meningkat. Oleh itu, projek ini memastikan semua orang memakai topeng muka dengan betul, dan suhu akan diambil untuk mengenal pasti keadaan badan seseorang sebelum melakukan sebarang aktiviti di kawasan yang sesak. Objektif projek ini adalah untuk memastikan Prosedur Operasi Standard (SOP) Covid-19 dilaksanakan dengan teratur dan sistematik, membangunkan persekitaran yang sihat dan memastikan pencegahan dan kawalan Covid-19 dalam masyarakat. Pengimbas topeng muka ini perlu diletakkan di pintu masuk utama untuk tujuan pemantauan. Pengimbas topeng muka menggunakan ESP32-CAM Face Recognition akan mengimbas muka manusia dan membuka palang/pintu gerbang untuk membolehkan pelanggan masuk jika memenuhi semua arahan. Mengikut polisi, pelanggan yang tidak memakai topeng muka tidak akan dibenarkan masuk, dan bar/pintu gerbang akan ditutup sehingga mereka berbuat demikian. Pengimbas ini juga mengingatkan pelanggan memakai topeng pada skrin LCD.

ACKNOWLEDGEMENTS

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My highest appreciation goes to my parents, and family members for their love and prayer during the period of my study. An honorable mention also goes to me for all the motivation and never giving up.

Finally, I would like to thank all the staffs at the Universiti Teknikal Malaysia Melaka (UTeM), fellow colleagues and classmates, the faculty members, as well as other individuals who are not listed here for being co-operative and helpful.

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LIST OF SYMBOLS

℃	-	Celcius
cm	-	Centimetre
V	-	Voltage
%	-	Percent

LIST OF ABBREVIATIONS

APM	-	Application Performance Management
COVID-19		Coranavirus Disease 2019
CPU	-	Central Processing Unit
CNN	-	Convolutional Neural Network
DC	-	Direct Current
ESP	-	Electro-selective Pattern
FR	-	Failures Rate
GPS	-	Global Positioning System
GSM	-	Global System for Mobile
IDE	-	Integrated Development Environment
IR	-	Infrared
IoT	-	Internet of Things
LCD	-	Liquid-Crystal Display
LED	-	Light-Emitting Diode
MTBF	-	Mean Time Between Failures
PA	-	Public Address
PIR	-	Passive Infrared
PWM	-	Pulse Width Modulation
PC	-	Personal Computer
QR	-	Quick Response
USB	-	Universal Serial Bus
RAM	-	Random Access Memory
ROM	-	Read Only Memory
Wi-Fi	-	Wireless Fidelity
YOLO	-	You Only Look Once

LIST OF APPENDICES

CHAPTER 1

INTRODUCTION

1.1 Background

The COVID-19 coronavirus pandemic has spread over the world, having a tremendous impact on public health. This has resulted in an increase in allergy-related hospitalizations and deaths. Additionally, the economic sector was impacted. However, on 16 August 2021, Malaysia's government announced the opening of numerous critical economic sectors in order to rehabilitate the country's economy. Thus, face masks are required to restrict the spread of covid-19 outbreaks while maintaining a conducive and safe environment.

1.2 Problem Statement

The economic closure due to covid inevitably has a detrimental effect on the way of life of the people and the country itself. Therefore, the reopening of the financial sector will alter the living standards of the Malaysian people. Priority should be given to shopping malls, schools, hospitals, and government organizations since this is where the community meets to engage in various activities and pursue all elements of education. Because of that, proper face mask use and maintaining an average body temperature should be monitored to ensure that guidelines to prevent the spread of covid disease are followed.

1.3 Project Objective

The main goal of this project is to propose a systematic and effective methodology for the proper application of face masks and ensure that body temperature scans are in a normal state. Specifically, the objectives are as follows:

i) To design contactless face mask detection and temperature scanner to facilitate the monitoring of Covid-19 by using an ESP32 camera and temperature sensor.

ii) To develop a device that can give accurate results by using Arduino and a sensor.

iii) To evaluate the capabilities of a developed device that only uses affordable components.

1.4 Scope of Project

To eliminate any confusion regarding this project as a result of specific limits and constraints, the project's scope has been established as follows:

i) Use the Arduino IDE program to code. The Arduino IDE (Integrated Development Environment) makes creating and uploading code straightforward. This program may be used with any Arduino board.

ii) Appropriate Voltage Level to avoid excess current that can cause damage to components

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

Facemask detection and temperature scanners are extremely useful in this endemic period, including reducing the risk of disease transmission, enhancing monitoring capabilities, and make sure a healthy and secure community environment. Therefore, there should be a strong emphasis placed on research into the utilization of artificial intelligence (AI) and thermal or infrared scanners. This is done to guarantee that each monitoring and output may deliver correct findings to minimizing the number of mistakes.

2.2 Review of Previous Related Project

We can gain extra knowledge about the project that we want to put into action by analyzing research and data collection strategies from completed projects in the past. Because of this, we can assess the studies that we have obtained from every viewpoint, including those that are both positive and negative. This may provide a realistic view of difficulties that we may come into when doing the study or while working on the project. In this piece of writing, the primary topic that needs to be stressed is gathering as much information as possible on the components utilized, the technique that was implemented, and the outcomes obtained. This can definitely be of assistance, at least to some degree, in implementing the initiative into practice.

2.2.1 Real-time Facemask Detector using Deep Learning and Raspberry Pi

According to paper[1], the author devised an efficient facemask monitoring system for institutions, administrations, and schools. When facemask protocol is violated, the primary purpose is to correctly deliver auditory warnings to re-wear facemasks. The proposed IoT-based prototype consists of a Raspberry Pi and a Camera Pi, making it an innovative and compact solution. Additionally, the authors created a deep learning-based facemask detection algorithm using Fine-tuning using Convolutional Neural Network. Finally, using a web application that they developed to make the system as intuitive as it is sophisticated, the administrator can check the camera's data with logs and detections using a Raspberry pi.

Comparing the real-time performance of applications using Raspberry Pi versions three and four, respectively. The most recent version of the Raspberry Pi 4 includes the most effective hardware.

Table 2-1 : The fundamental distinction between the Raspberry Pi 3 Model B and the Raspberry Pi 4 Model B

Version	Details
Raspberry Pi 3 Model B 	Processor: Quad Core 1.2GHZ Broadcom BCM28837 64-bit CPU Memory: 1GB RAM
Raspberry Pi 4 Model B 	Processor: Quad Core Cortex-A72 (ARM v8) Broadcom BCM2711, 64-bit SoC Memory: 1GB RAM

The authors also employ Neural Compute Stick 2 (NCS2) from Intel (Figure 2-1)[2]. NCS2 is a low-cost USB-based development kit that enables testing, tweaking, and modeling deep neural networks on devices. NCS2 consists of a System with 16 cores in an inferences hardware accelerator. Combining Raspberry Pi with NCS2 has produced a reasonably effective system. The NCS2 is equivalent to the raspberry pi in terms of energy usage.

Figure 2-1 : Neural Compute Stick 2 (NCS2)

This shows the selection of components has an impact on the cost and outcome of the project. Regarding the results and discussions, the authors conclude that a prototype facemask detector based on embedded systems and sophisticated AI algorithms has already been developed. The facemask detector has been fine-tuned, trained, and tested based on CNN-trained face recognition models. Then, we used a Raspberry pi board equipped with a camera to identify people's faces and decide if they were wearing masks. Audible alerts are emitted when an identifiable look is not wearing the facemask. Given the importance of wearing a facemask correctly during the coronavirus pandemic, the real-time option is essential since the virus might spread. When individuals are alerted in real-time, they will promptly put on their masks to prevent the spread of the disease. On the other hand, if a person disregards audible notifications, their loudness will rise.

2.2.2 IoT-based autonomous drone uses deep learning to detect Covid-19 facemask

According to paper [3], The author describes COVID-19 as an infectious disease caused by an unidentified virus. The infection causes respiratory issues such as coughing, fever, and difficulty breathing in extreme cases. Within six months following its emergence in China in 2019, more than a million people worldwide had been afflicted, and more than 500,000 had died. Because of that, drones are essential for limiting the scope of COVID-19 infectious diseases in most general applications, especially in clinical applications. Consequently, the author has created a unique usage of an autonomous Drone to identify medicinal face masks by employing Deep Learning to reliably classify people based on their mask-wearing using a marking on the MobileNetV2 architecture. TensorFlow, OpenCV, and Keras were used to train an intentionally created model. The autonomous Drone is managed by a novel mobile application integrating IoT technologies, such as the TeamViewer app for monitoring the smartphone and the Q-ground control application for operating the Drone via the sensor protocol.

In this project, the author employs deep learning techniques. Deep learning methods are multi-level reflection processes developed by building fundamental and non-linear modules that transform a single-level representation (starting with the raw input) into multi-level models. The critical aspect of machine learning is that programmers do not create these layers; instead, they are learned from data using standard learning techniques. Deep-learning method and computer vision have gained a significant deal of interest in autonomous drone operation because they enhance monitoring efficiency.

The authors develop a quadcopter (Figure 2-2)[3] using an auto mission pilot with four DC brushless motors, GPS, a receiver, and smart phones in this project methodology. The system is powered by a lithium battery with 11.1 V of voltage. Nevertheless, the mobile device contains a battery. The mission planner software assists in preparing the system with

the necessary settings and calibrations before launch. The APM flight controller connects with some modules, such as the A Telemetry module, using the pulse width module (PWM) interfaces.

Figure 2-2 : The Quadcopter

Through the telemetry module, the radiofrequency sensor connects the Drone in flight and the smartphone to the Qground configuration tool. Using TeamViewer software installed on both the PC and the mobile device through Internet protocol and a mobile ID, the PC has complete control over the mobile device. In addition, the mobile IP Webcam program enables PCs to connect to the mobile camera to watch and identify face masks through Python script software. Testing in the real world reveals that this detection approach is simple and affordable, but it is problematic if the network is poor. Figure 2-3 [3]depicts the facemask detector utilizing a mobile video feed in real-time.

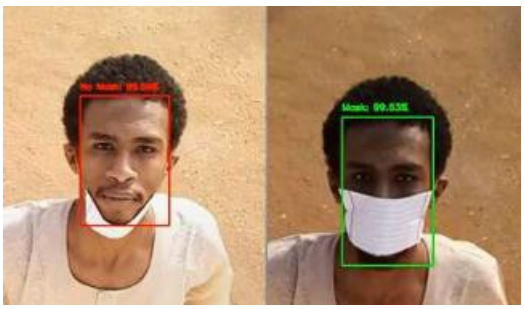

Figure 2-3 : Facemask detector using a mobile video stream