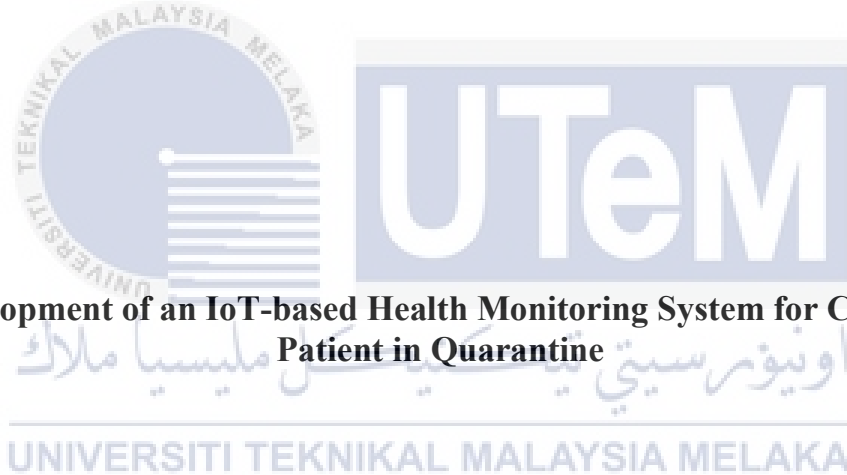




Faculty of Electrical and Electronic Engineering Technology



**Development of an IoT-based Health Monitoring System for Covid-19
Patient in Quarantine**

MOHAMAD NAZMI BIN MOHD RUSDI

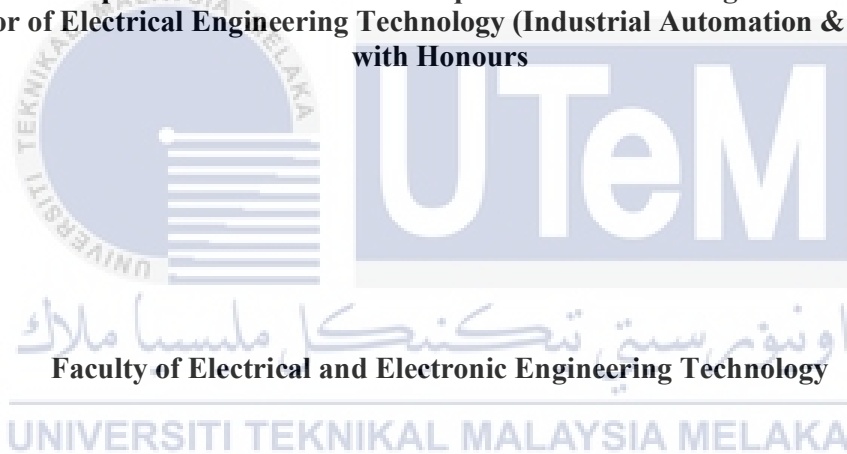
**Bachelor of Electrical Engineering Technology (Industrial Automation & Robotics)
with Honours**

2021

**Development of an IoT-based Health Monitoring System for Covid-19 Patient in
Quarantine**

MOHAMAD NAZMI BIN MOHD RUSDI

**A project report submitted
in partial fulfillment of the requirements for the degree of
Bachelor of Electrical Engineering Technology (Industrial Automation & Robotics)
with Honours**



UNIVERSITI TEKNIKAL MALAYSIA MELAKA

2021

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Tajuk: Development of an IoT-based Health Monitoring System for Covid-19 Patient in Quarantine

Sesi Pengajian: 2021

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Ts. MASLAN BIN ZAINON
Pensyarah Kanan (Senior Lecturer)
Fakulti Teknologi Kejuruteraan Elektrik & Elektronik
Universiti Teknikal Malaysia Melaka

MOHAMAD NAZMI BIN
MOHD RUSDI

Alamat Tetap:

89, LORONG
MELATI 5,
TAMAN
DESA
CHENGAI
INDAH,
06600,
KUALA
KEDAH,
KEDAH

Cop Rasmi Penyelia



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I declare that this project report entitled “Development of an IoT-Based Health Monitoring System for Covid-19 Patient in Quarantine” 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 Electrical Engineering Technology (Industrial Automation & Robotics) with Honours.

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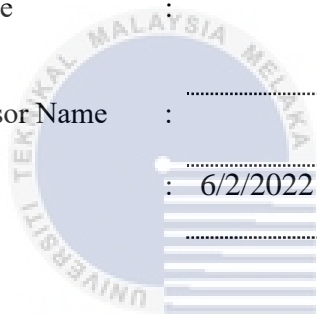
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Signature :

Co-Supervisor :

Name (if any)

Date :



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DEDICATION

In This dedication, I would like to thanks to my Parents, fellow friends, supervisor and all the lecturers through whole semester to gives me a lot of learning process in order to complete the Final Year Project task. All the good thing came from Allah SWT. and to Him I always pray for the better to increase my passion in completing the task given.



ABSTRACT

Today in modern living, a slew of new diseases have emerged that complicate health management efforts to maintain a healthy lifestyle. Corona Virus(Covid-19), the newest virus disease occur and now spreading throughout the world and evolving into a new upgraded virus. Covid-19 is highly contagious as a result of physical contact. Doctors and nurses are in short supply and at an increased risk of infection. Unfortunately, patients are rapidly increasing in number due to the current situation. At the moment, as the information and technology revolution continues, IoT-based Health Monitoring Systems are capable of collecting real-time health data and providing feedback to doctors and caregivers. Allowing each individual to acknowledge their health and advising them to seek immediate treatment in order of an emergency may end up saving the individual's life. Here the project is proposed to help against Covid-19 epidemic by monitoring multiple patients at one time by using Blynk Application to connect with the microcontroller and provide the data reading collected from the Project device. The main sensor of reading the parameter in this system is the blood pressure sensor, Heart rate sensor, and temperature sensor to get the reading of blood pressure, heartbeat, and temperature of the individual respectively. The system will transmit the data received to the IoT server platform with the WiFi transmission by connecting it to an internet connection using ESP8266. This system will be mounted at the individual's bedside and constantly transmits their health data to the IoT server purpose remotely monitoring provided by the doctors. The outcome of the device provide great analysis of the data reading from each sensor used and detail the normal with abnormal reading to confront easily the critical patient. The IoT of the system enhance the remotely control that has been implemented using Blynk application for monitor function.

ABSTRAK

Hari ini dalam kehidupan moden, muncul banyak penyakit baru yang menyulitkan usaha pengurusan kesihatan untuk mengekalkan gaya hidup sihat. Corona Virus (Covid-19), penyakit virus terbaru berlaku dan kini merebak ke seluruh dunia dan berkembang menjadi virus yang baru ditingkatkan. Covid-19 sangat mudah berjangkit akibat daripada hubungan fizikal. Doktor dan jururawat kekurangan bekalan dan berisiko tinggi mendapat jangkitan. Malangnya, pesakit meningkat dengan cepat kerana keadaan semasa. Pada masa ini, ketika revolusi maklumat dan teknologi berlanjutan, Sistem Pemantauan Kesihatan berasaskan IoT mampu mengumpulkan data kesihatan masa nyata dan memberikan maklum balas kepada doktor dan penjaga. Membiarkan setiap individu mengakui kesihatan mereka dan menasihati mereka untuk mendapatkan rawatan segera dalam keadaan kecemasan boleh menyelamatkan nyawa individu tersebut. Di sini projek ini dicadangkan untuk membantu mengatasi epidemik Covid-19 dengan memantau beberapa pesakit pada satu masa dengan menggunakan aplikasi Blynk untuk menyambung dengan mikropengawal dan menyediakan bacaan data yang dikumpul daripada peranti projek. Sensor utama membaca parameter dalam sistem ini adalah sensor tekanan darah, sensor denyut jantung, dan sensor suhu untuk mendapatkan pembacaan tekanan darah, degupan jantung, dan suhu masing-masing. Sistem akan menghantar data yang diterima ke platform pelayan IoT dengan transmisi WiFi dengan menghubungkannya ke sambungan internet menggunakan ESP8266. Sistem ini akan dipasang di sisi tempat tidur individu dan sentiasa menghantar data kesihatan mereka ke pelayan IoT untuk tujuan pemantauan jarak jauh yang diberikan oleh doktor. Hasil peranti memberikan analisis hebat bacaan data daripada setiap sensor yang digunakan dan memperincikan bacaan normal dengan bacaan tidak normal untuk menghadapi pesakit kritikal dengan mudah. IoT sistem meningkatkan kawalan jauh yang telah dilaksanakan menggunakan aplikasi Blynk untuk fungsi monitor.

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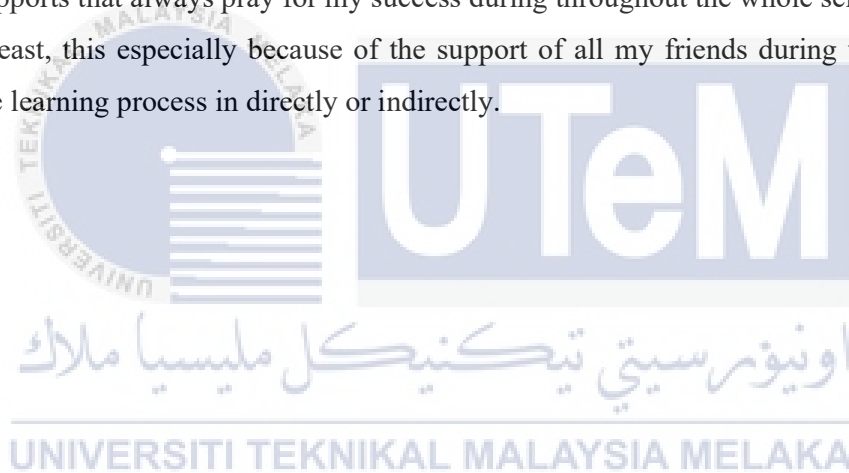


TABLE OF CONTENTS

	PAGE
DECLARATION	
APPROVAL	
DEDICATIONS	
ABSTRACT	i
ABSTRAK	ii
ACKNOWLEDGEMENTS	iii
TABLE OF CONTENTS	i
LIST OF TABLES	iii
LIST OF FIGURES	iv
LIST OF SYMBOLS	v
LIST OF ABBREVIATIONS	vi
LIST OF APPENDICES	vii
CHAPTER 1 INTRODUCTION	1
1.1 Background	1
1.2 Problem Statement	2
1.3 Project Objective	3
1.4 scope of Project	3
CHAPTER 2 LITERATURE REVIEW	4
2.1 Introduction	4
2.2 Current state and prospect in Malaysia	5
2.2.1 Current IoT implementations in Malaysia for curbing Coivd-19	5
2.2.2 Smart thermal Detection	6
2.2.3 Application of Smart Thermal Detection in Malaysia	7
2.3 Studies of Component	9
2.3.1 Choice of Microcontroller	9
2.3.2 Arduino Uno and the ATmega328P	10
2.3.3 NodeMCU CH340 Board	11
2.3.4 ESP8266 Wi-Fi Module	12
2.3.5 range of Wi-Fi Module	13
2.3.6 Comparison ESP32 and ESP8266	14
2.4 Comparison of literature review	15
2.4.1 introduction	15

2.4.2	Research Findings	16
2.4.3	Current Microcontroller development	18
2.5	Summary	18
CHAPTER 3	METHODOLOGY	19
3.1	Introduction	19
3.2	Project Flow chart	19
3.2.1	Experimental setup	21
3.2.2	Flow chart of IoT-Based HMS	22
3.3	Description of the work	23
3.3.1	Hardware Components	23
3.3.2	Block diagram	24
3.4	Component function	25
3.4.1	NodeMCU Board	25
3.4.2	ESP8266 WiFi module	26
3.4.3	Blood Pressure sensor and Pulse sensor	27
3.4.4	DS18B20 Temperature Sensor	29
CHAPTER 4	PRELIMINARY RESULTS	31
4.1	Introduction	31
4.2	Hardware Implementation	31
4.3	Purpose of Data Analysis	33
4.4	Comparison of Project Device and Actual Product Device	34
4.4.1	Posture of a Person for Blood Pressure Test	35
4.4.2	The placement of DS18B20 for Temperature Reading	36
4.4.3	Result of Comparison	37
4.4.4	The Percentage of Error	38
4.5	The Detection Effectiveness of Patient's Parameter	39
4.5.1	Limitation of Normal Reading	40
4.5.2	The Performance of Detection	41
4.6	Summary	45
CHAPTER 5	PRELIMINARY RESULTS	46
5.1	Introduction	46
5.2	Conclusion	46
5.3	Recommendation for Future Work	47
REFERENCES		48
APPENDICES		49

LIST OF TABLES

TABLE	TITLE	PAGE
Table 2.1	Comparison of ESP8266 and ESP32	14
Table 2.2	Comparison of literature review	16
Table 3.1	Reading of blood pressure for systolic and diastolic	28
Table 3.2	Reading of maximum and target heart rate	29
Table 4.1	Data taken from Project device	37
Table 4.2	Data taken from Actual Product device	37
Table 4.3	Limitation of Normal Reading	40
Table 4.4	Four consecutive day report using Project Device	41
Table 4.5	Result from Blynk Application	43

LIST OF FIGURES

FIGURE	TITLE	PAGE
Figure 2.1	The operation of Smart Thermal Detection	7
Figure 2.2	Arduino Uno pin out	10
Figure 2.3	NodeMCU CH340 pin in/out	11
Figure 2.4	ESP8266 Wi-Fi module pin out	13
Figure 3.1	PSM 1 Flow chart	20
Figure 3.2	PSM 2 Flow chart	21
Figure 3.3	Flow chart of IoT-based Health Monitoring System	22
Figure 3.4	Block Diagram of IoT-based Health Monitoring System	24
Figure 3.5	NodeMCU Board	25
Figure 3.6	ESP8266(wifi module)	26
Figure 3.7	Blood Pressure Test kit	27
Figure 3.8	DS18B20 Temperature Sensor	30
Figure 4.1	Constructed Hardware	31
Figure 4.2	Finalize Project Device	32
Figure 4.3	Actual Product Device	34
Figure 4.4	Procedure of using Project Device	39
Figure 4.5	The reading of 4 consecutive days result	42

LIST OF SYMBOLS

°C - Degrees Celcius



LIST OF ABBREVIATIONS

V	-	Voltage
BPM	-	Heartbeat per minute
mm Hg	-	Milimeter of mercury



LIST OF APPENDICES

APPENDIX	TITLE	PAGE
Appendix A	Example of Appendix A (Coding C++ of the Device)	49



CHAPTER 1

INTRODUCTION

1.1 Background

In this new era, a kill of new diseases had emerged that complicate health management efforts to maintain a healthy lifestyle. Corona Virus (Covid-19), the newest virus disease that occurs in Wuhan, China in November 2019 is now spreading throughout the world and evolving into new upgraded disease, has the potential to harm both human life and economic development in countries. The goal of any person, regardless of age, gender, location, or health status, is to live independently and conveniently while maintaining a healthy lifestyle. There are restrictions imposed by age, illness, medication, hospitalization, epidemic, pandemic, and other factors. Health monitoring systems have evolved to facilitate healthy living by improving communication between healthcare providers and patients for close monitoring, measurement of critical health parameters, routine consultation, and overall healthy living. Additionally, with recent advancements in information and communication technologies (ICT) and the adoption of Internet of Things (IoT) technology, IoT-based health monitoring or support systems are now on the cusp of development and acceptance for promoting healthy living.

1.2 Problem Statement

Numerous life-threatening diseases can be monitor easily using IoT-based systems. Covid-19 is a common disease that has resulted in a global pandemic situation. Corona Virus is highly contagious as a result of physical contact. Doctors and nurses are in short supply and at an increased risk of infection. Patients are rapidly growing in number as a result of the current situation. As the information and technology revolution continues, IoT-based health monitoring systems are gaining popularity. These systems are capable of collecting real-time health data and providing feedback to physicians and caregivers. Allowing each individual to acknowledge their health and advising them to seek immediate treatment in an emergency may end up saving that individual's life. The implementation of these monitoring systems has the potential to significantly reduce the state's medical costs in the long run. Nowadays, with widespread mobile internet access, integrating mobile internet with a health monitoring system based on an open-source IoT storage design has become incredibly simple.

1.3 Project Objective

The main goal of this project is to propose a practical, systematic methodology for monitoring Covid-19 patients with reasonable accuracy during quarantine. Specifically, the objectives are as follows:

- a) To design and develop a hardware microcontroller-based circuits and hardware for a health monitoring system for Covid-19 patients in quarantine.
- b) To apply an IoT technology system on the health monitoring system via a smartphone for monitoring purposes.
- c) To analyze the performance of the health monitoring system in terms of its detection effectiveness of patient's heartbeat, blood pressure, and body temperature via an open-source IoT cloud.

1.4 Scope of Project

The scope of this project are as follows:

- a) The Health Monitoring sytem will acknowledge the sensor reading and transmit the data over the internet.
- b) The emergency button will alert to the IoT cloud storage if any abnormal reading happened or being pressed by patient.
- c) Wifi Module will transmits all data to the cloud storage.
- d) 16x2 lcd display is use to display the parameter from the sensor to patient on device.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

Corona Virus, Covid-19, has expanded worldwide, causing both financial and healthcare havoc. A particular quarantine center had been established to treat covid patients during the Covid-19 outbreak. Since covid is highly contagious, quarantine covid patients must be monitored simultaneously by doctors. With the rapidly rising number of cases, the health status of numerous quarantined patients becomes increasingly challenging to watch. The Internet expansion has been accelerated in today's modern society to the point where it now connects all devices. In our daily lives, health is paramount. All appliances are connected to a universal global network known as the Internet of Things via intelligent automation. The development of technologies like the Internet of Things generates a massive amount of knowledge and inspiration in a new information age. IoT is a critical component of health and environmental applications. The devices are used in a variety of locations to monitor a range of parameters. Sensors can be used to determine the state of the human body's physiological report. The Internet can be divided into areas such as transport and logistics, healthcare, smart environments, and personal and social services. The primary Internet for things techniques employed in health monitoring systems is remote medical applications, heartbeat sensors, medical equipment, and safe data on the indoor environment. The Health Monitoring System (HMS) parameter sensor nodes are applied within the device to monitor the patient's blood pressure, heart rate, and body temperature. This enables us to provide a large number of users with data in real-time and also to send critical warnings over

the Internet in urgent situations. Devices play a critical role in today's Internet of things. It shares information obtained by displaying its personal data and maintaining human health and safety. Wireless device options include wireless protocols specific to the application, data transmission, signal processing, and signal data processing. In IoT applications, they play a critical role.

2.2 Current state and Prospect in Malaysia

2.2.1 Current Iot Implementations in Malaysia for Curbing Covid-19

The application of the Internet of Things in the field of healthcare services is often referred to as the medical Internet of things (MIoT). The goal of MIoT is to build a decision-centric model for big data analysis. With the support of Information and communication technology (ICT), especially in the fields of electronics and telecommunications, towards human biology, and medicine, MIoT can be used to prevent and control the spread of Covid-19. The following will list and review the prominent use of IoT technologies based on their potential use in the fight against Covid-19 in Malaysia.

2.2.2 Smart Thermal Detection

This Internet of Things technology is based on a thermal imaging camera that is sensitive to radiation in the infrared (IR) part of the electromagnetic spectrum and does not perceive visible light. This property makes it insensitive to visible light under ambient lighting conditions (such as intensity, saturation, or direction of light).

In fact, there are a variety of digital cameras, some of which are equipped with different detection functions beyond the visible RGB colour spectrum. The thermal imaging camera is a type that operates at infrared thermal wavelengths between (8-14 micrometer). Based on the figure 2.1 below, the figure shows the operation of the Smart Thermal Detection works. The band detected by these cameras is commonly called thermal infrared radiation. By correlating the thermal infrared radiation intensity of the object with its temperature, when the recorded temperature is higher than the threshold, the temperature can be displayed on the monitoring screen or associated with an automatic alarm signal. This technology provides a way to intelligently detect fever cases through the parameter of human body. The thermal imager contains a lens made of germanium, which can capture the infrared radiation image emitted by objects or features in the scene in its detectable area to a thermal sensor called an infrared focal plane array. The manufacturing method of the thermal imaging sensor is that the pixel is a tiny thermal infrared emission detection device made of a material sensitive to thermal infrared radiation. This technology allows the thermal imager to distinguish the distribution of thermal radiation in the scene that is imaged as a thermal image.

It is worth noting that there is another type of thermal imaging system that uses a device called a black body for the temperature calibration process. These imaging systems

use a dual sensor configuration, one of which is a vision sensor and the second is a thermal sensor, both of which are built into the camera. Due to the black body calibration and the ability to provide continuous calibration, this configuration allows a high degree of image accuracy. These systems can provide greater flexibility and can potentially provide integration compatibility with numerous Video Management Systems (VMS) and access control devices.



Figure 2.1: the operation of Smart Thermal Detection

2.2.3 Application of Smart Thermal Detection in Malaysia

Countries that implement powerful protection (using IoT technology for tracing and contact tracking) have shown that the propagation of COVID-19 can be reduced. Given that the World Health Organization (WHO) recommends a work temperature test, one of the measures implemented in Malaysia is to use a contactless infrared thermometer to detect high temperature cases of the body temperature in all workshops overlapping symptoms of Covid-19. This scale is considered essential to maintain significant business operations such as factories, residential buildings and important corporate facilities and personality.