Faculty of Electrical and Electronic Engineering Technology

DEVELOPMENT OF AUTOMATED PREMISE CHECK-IN WITH SIMULTANEOUS TEMPERATURE CHECKER SYSTEM USING RASPBERRY PI

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Bachelor of Electronics Engineering Technology with Honours

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DEVELOPMENT OF AUTOMATED PREMISE CHECK-IN WITH SIMULTANEOUS TEMPERATURE CHECKER SYSTEM USING RASPBERRY PI

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DEDICATION

BISMILLAHIRAHMANIRAHIM

Special for

Beloved Mother and Father, Raziah Binti Abdul Rani and Charishun Bin Haji Bardom. All your sacrifices, prayers, blessing and love are the backbone of this struggle.

To my respected supervisors and co supervisor,

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I would like to lead my gratitude for them that have contributes to my final year project either it is directly or indirectly. I would like to acknowledge their comments and suggestions, which are crucial for the successful completion of this research.

ABSTRACT

Nowadays, the existence of dangerous diseases that can be spread in various way such as physical contact, air vapour and air from coughing and sneezing such as Covid-19, MERS, SARS and Ebola is currently of great concern. Patient that carried this disease will have symptoms such as fever above normal temperature that is 37.5°C, cough, dry throat and difficulty breathing. However this disease can be prevented by monitoring human body temperature. To resolve this issue, various methods have been implemented such as 1 meter social distancing, self-check in and even body temperature checking before entering a premise. Nevertheless, the implementation of the premise check-in and the temperature inspection that has been carried out are separate. This matter caused difficulty for the authorities to track users who have high body temperature symptoms because there is no temperature reading recorded and only user information and the name of the premise visited. To solve this problem, the development of an automated premise check-in system with simultaneous temperature checking using Raspberry Pi was carried out. The usage of pen while manually registering during the check-in process at a premise were about to be eliminated. In addition, the functional monitoring of the combined automatic premise check-in system and the temperature inspection device should function simultaneously. The system will use an open source software, Kodular application as the basic of the android application maker that could generate QR code of user information so that user can use on their smartphone and Firebase as the database platform that will store the information obtained from the Raspberry Pi and Android application. This system will detect user's face at the monitor by using Raspberry Pi camera that attached with the Raspberry Pi as microcontroller and when it successfully detected the face it will scanning temperature of face by using AMG8833 IR thermal camera sensor that was also used together with the Raspberry Pi controller. Next user need to show the QR code that have been generated in the Android application before. In conclusion, with the existence of this project is able to help to prevent and reduce the spread of infectious diseases.

ABSTRAK

Kewujudan penyakit berbahaya yang boleh tersebar melalui sentuhan, wap udara dan udara dari batuk dan bersin seperti Covid-19, MERS, SARS dan Ebola pada masa kini amat merunsingkan. Pesakit yang menghidapi penyakit ini akan mempunyai simptom seperti demam melebihi suhu badan normal iaitu 37.5 ^{o} C, batuk, kering tekak dan kesukaran bernafas. Walaubagaimanapun penyakit ini boleh dicegah dengan memantau suhu badan manusia. Bagi menyelesaikan isu ini, pelbagai kaedah telah dilaksanakan seperti penjarakan sosial 1 meter, mendaftar masuk kendiri dan juga pemeriksaan suhu badan sebelum memasuki sesuatu premis. Akan tetapi pelaksanaan daftar masuk premis dan pemeriksaan suhu yang wujud ketika ini telah dilaksaankan secara berasingan. Ini telah menyukarkan pihak berkuasa untuk menjejaki pengguna yang menpunyai simptom suhu badan tinggi kerana tiada rekod suhu yang disimpan dan hanya maklumat pengguna serta nama premis yang dikunjungi sahaja. Bagi menyelesaikan masalah ini, pembangunan sistem daftar masuk premis automatik dengan pemeriksaan suhu badan serentak dengan menggunakan Raspberry Pi telah dijalankan. Penggunaan pen semasa mendaftar secara manual semasa proses daftar masuk di premis akan dihapuskan. Di samping itu, pemantauan fungsi gabungan sistem daftar masuk premis automatik dan peranti pemeriksaan suhu berfungsi secara serentak. Sistem ini akan mengunakan perisian dari sumber yang terbuka iaitu aplikasi Kodular sebagai asas pembuatan aplikasi android yang mampu untuk menjana kod QR maklumat pengguna supaya pengguna boleh menggunakannya melalui telefon pintar mereka dan Firebase sebagai platform pangkalan data yang akan menyimpan maklumat yang diperoleh daripada Raspberry Pi dan aplikasi android. Sistem ini akan mengesan muka pengguna pada monitor dengan menggunakan kamera Raspberry Pi yang dipasangkan dengan Raspberry Pi sebagai mikrokontroler dan apabila ia Berjaya mengesan muka ia akan mengimbas suhu muka menggukansensor kamera termal AMG8833 IR yang telah dijana dalam aplikasi Andoid sebelum ini. Kesimpulannya, dengan adanya projek ini mampu memban tu mencegah dan mengurangkan penularan penyakit berjangkit.

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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		**vi**
LIST OF ABBREVIATIONS		**vii**
LIST OF APPENDICES		**viii**
CHAPTER 1	**INTRODUCTION**	**9**
1.1	Introduction	9
1.2	Background	9
1.3	Problem Statement	11
1.4	Project Objective	12
1.5	Scope of Project	12
CHAPTER 2	**LITERATURE REVIEW**	**13**
2.1	Introduction	13
2.2	Disease Monitored Through Body Temperature	13
	2.2.1 Ebola	14
	2.2.2 Covid-19	14
	2.2.3 H1N1 Influenza	15
2.3	Non-Contact Self-Check-In System	15
2.4	Internet of Thing (IoT) In Industrial 4.0	15
2.5	Types of Internet of Thing (IoT) Module	16
	2.5.1 ESP8266 Wi-Fi Module	16
	2.5.2 Bluetooth	17
2.6	Types of Non-Contact Thermometer Sensor	18
	2.6.1 AMG8833 Thermal Camera	19
	2.6.2 MLX90614 Infrared Thermometer	20
2.7	Types of Microcontroller	21

2.7.1 Raspberry Pi 21
2.7.2 Arduino Uno 22
2.7.3 Arduino Mega 23
2.7.4 CT-Uno 24
2.7.5 ESP8266 NodeMCU V3 25
2.7.6 Arduino Nano 26
2.8 Types of Database 27
2.8.1 Relational Database 27
2.8.2 NoSQL Database 27
2.9 Comparison on Study on Previous 29
2.10 Summary 31

CHAPTER 3 METHODOLOGY 32
3.1 Introduction 32
3.2 Project Implementation Flow Chart 32
3.3 Product Design 33
3.3.1 Analysis Phase 36
3.3.2 Design Phase 37
3.3.2.1 Hardware Specification 38
3.3.2.2 Software Specification 42
3.3.2.3 Block Diagram Design 46
3.3.2.4 Prototype Design 47
3.3.2.5 Prototype Design 48
3.3.3 Development and Implementation Phase 48
3.3.4 Test Phase 49
3.3.5 Evaluation Phase 49
3.4 Summary 49

CHAPTER 4 RESULTS AND DISCUSSIONS 50
4.1 Introduction 50
4.2 Results and Analysis 50
4.2.1 Android Application Interface 51
4.2.2 Analysis of the Hardware Implemenation 57
4.2.3 Firebase Database 60
4.3 Summary 61

CHAPTER 5 CONCLUSION AND RECOMMENDATIONS 62
5.1 Conclusion 62
5.2 Future Works 63

REFERENCES 64

APPENDICES 69

LIST OF TABLES

TABLE	TITLE	PAGE
Table 2.1	Comparison of previous work study	29
Table 3.1	Summary of methodology	35
Table 3.2	Hardware Component List	40
Table 3.3	Component Price List	41
Table 4.1	Time taken to detect face based on distance	58
Table 4.2	Temperature reading based on distance	59
Table 4.3	Duration to receive data	59

LIST OF FIGURES

FIGURE	TITLE	PAGE
Figure 2.1	ESP8266 Wi-Fi Module	17
Figure 2.2	Bluetooth Module	18
Figure 2.3	AMG8833	19
Figure 2.4	MLX90614	20
Figure 2.5	Raspberry Pi	22
Figure 2.6	Arduino Uno	23
Figure 2.7	Arduino Mega	24
Figure 2.8	CT-Uno	25
Figure 2.9	ESP8266 NodeMCU V3	26
Figure 2.10	Arduino Nano	26
Figure 3.1	Simulation execution flow chart	33
Figure 3.2	Adapter EDP model	34
Figure 3.3	Flowchart of hardware project	39
Figure 3.4	Flowchart of software project Main Screen	42
Figure 3.5	Flowchart of software project Generate New QR Screen	43
Figure 3.6	Flowchart of software project Generate New QR Screen	44
Figure 3.7	Block Diagram Design	46
Figure 3.8	Prototype Design	47
Figure 3.9	Prototype Design	48
Figure 4.1	Main Interface Android Application	51
Figure 4.2	Generate New QR Interface Android Application	52
Figure 4.3	Generate New QR Interface Android Application (Verification)	53

Figure 4.4	Generate New QR Interface Android Application (Successfully generated)	54
Figure 4.5	MYQR Interface Android Application	55
Figure 4.6	MYQR Interface Android Application (QR code)	56
Figure 4.7	Hardware circuit of the project	57
Figure 4.8	Graph of time taken to detect face based on distance**Error! Bookmark not defined.**	
Figure 4.9	Graph of temperature reading based on distance**Error! Bookmark not defined.**	
Figure 4.10	Database of temperature, time and place at device.	60
Figure 4.11	Database of Android Application	61

LIST OF SYMBOLS

$^{\circ}c$	-	Celcius
m	-	meter
s	-	second

LIST OF ABBREVIATIONS

$Covid-19$	-	Coronavirus
SARS	-	Severe Acute Respiratory Syndrome
MERS-Cov	-	Middle East Respiratory Syndrome Coronavirus
QR code	-	Quick Response code
EVD	-	Ebola virus disease
EHF	-	Ebola hemorrhagic fever
WHO	-	World Health Organization
IOT	-	Internet Of Thing
v	-	Voltage
IR	-	Infrared
RAM	-	Random Access Memory
ROM	-	Read-Only Memory
CPU	-	Central Processing Unit
PWM	-	Pulse Width Modulation
USB	-	Universal Serial Bus
ICSP	-	In Circuit Serial Programming
GPU	-	Graphical Processing Unit
HDMI	-	High-Definition Multimedia Interface
UART	-	Universal Asynchronous Receiver/Transmitter
EDP	-	Engineering Design Process

LIST OF APPENDICES

APPENDIX	TITLE	PAGE
Appendix A	Example of Appendix A	**Error! Bookmark not defined.**
Appendix B	Example of Appendix B	**Error! Bookmark not defined.**

CHAPTER 1

INTRODUCTION

1.1 Introduction

This chapter will explain the background of this developing an automated premise check-in simultaneous temperature checker system using Raspberry Pi. This chapter include brief background study, problem statement, objective and scope of the project.

1.2 Background

Recently the world has been rocked by a phenomenon that was no longer weird to be heard since 2019 that is coronavirus. This Coronavirus or also called Covid-19 were started in Wuhan, China and end up spread to all around the world. This new coronavirus is a different type of virus in the coronavirus family that was also responsible for previous outbreaks such as SARS in 2002 and MERS-Cov in 2012. Coronavirus is a virus that can spread through water droplets from coughing or sneezing on infected people. The symptom of high-risk person will face is fever over 37.5^{o} C, coughing, dry throat and breathing disorders. People that positive will need to be isolate from other people so that the virus will not evolve. This coronavirus novel could be avoided by monitoring the body temperature. So that person with body temperature over the normal temperature should beware of their condition so that they are not spreading any virus to the others.

All country around the world have their own ways to reduce this virus infection such as blocking any movement out and in to the country and state, social distancing, register one's details before entering any premises and also temperature checking. This method also

have been implemented in Malaysia whereby Malaysian's citizen need to download a mobile application named MySejahtera and register their details such as name, phone number and address in the application. Then, they are required to scan the QR code of the premises that they want to enter. Nowadays, almost each person has their own smartphone that have the function to scan QR code and Play Store that allow user to install various application. Therefore, they invented the application that allow user to sign in and scan QR code so that user no need to write their information in the logbook that have been prepared by the premise and save more time to line up waiting for the others finishing to write their information in the logbook. The data of the user and the QR code that they have scan will be sent to authorities for them to keep track of the people with symptom and close contact of patient with coronavirus. People also need to scan their forehead temperature as requirement to check whether their temperature is normal or not as an experiment has been done to detect which region of our body have the accurate reading of the body temperature. Other than forehead, arm skin also is sensitive part of body that temperature could be taken. But the problem is the temperature checking data were not save in any database and just display at the device on that time only. This method is not very efficient because the authorities were difficult to tracking back the customer that has close contact with the coronavirus patient.

As for a step to improvise the existed method, a mobile application that hold user information by generating QR code and a device that could scan face temperature with QR code should be combined and make them work simultaneously so that the virus infection could be reduced while it can be more efficient to save time and work done can be simplify as the authorities can track people of high risk immediately.

1.3 Problem Statement

Nowadays, to enter any premises people need to check-in via mobile application or write their information in logbook provided and then scanning temperature separately. This method caused the authorities difficult to track down people with the symptoms of infectious diseases that occur at a time that can be analysed through human body temperature due to several people were avoid to scan their temperature and there is no record for the temperature because the temperature that they scan were the real time temperature only that not save in any database.

Besides, having the method to scan QR code before entering a premise actually quite inconvenient to some people. Not everyone can afford a smartphone with good camera especially B40 and poor families' background and sometimes people are having their smartphone broken or not working properly. When this problem occur, the people who not having their smartphone during entering a premise, they are required to use the common pen to write their information manually in the logbook that was provided in the store, which this method could increase the possibility for the virus to spread through touching the pen.

Throughout a pandemic that could easily spread through contact, we need to avoid close contact between people. Therefore, the suitable solution to this problem is to develop an automated premise check-in with simultaneous temperature checker system that able to operate premise check-in application which is able to generate QR code of user information and a temperature checker device that could scan user face temperature work simultaneously while all of the data will be save in the database.

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1.4 Project Objective

The main aim of this project are as follows:

a) To develop automated premise check-in with simultaneous temperature checker system.

b) To eliminate the manual registration using pen during the check-in process at the premise.

c) To monitor the functionality of the combination system of the automated premise check-in and the temperature checker device to work simultaneously.

1.5 Scope of Project

The scope of this project are as follows:

a) Targeted premise is collage or institution.

b) Developing Android application to generate QR code of personal information such as name, phone number and ID, so that people who do not have smartphone can have QR code to check-in with the help of family members or trusted person.

c) The temperature of the user were recorded with personal information in the system so there will be no user that entered premise without temperature scanning and QR Code scanning while all the data will be send through the cloud to be recorded in database which is only accessible by one with credentials.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This chapter will discuss the differences of previous studies to explain in more detail matters related to the product that will be developed. Besides, this chapter also will discuss the explanation of the temperature checker and application of self-check-in product design so that the understanding of the concept theory is strong. In this chapter also will give detail knowledge on the research that will be going through.

2.2 Disease Monitored Through Body Temperature

Disease is an abnormal condition of the body or mind that causes discomfort, dysfunction or stress to the person involved or in close contact with him[1]. Some disease can be monitor through body temperature. In medication world, the measurement of body temperature is important due to some diseases are come with changes in body temperature. Besides, certain diseases history can be monitored through body temperature monitor and the treatment can be evaluate by the doctor effectively. The most symptom that can be detect through temperature checking is fever. Fever is a natural reaction of the body that tries to fight a virus or infection[2]. Fever is not considered as a disease but usually a symptom of a health disorder that can lead to a certain disease or virus[3], the brain will increase the body temperature to increase the ability of the immune system to fight back the infection. There are some serious diseases and virus that can happen due to symptom of fever.

2.2.1 Ebola

Ebola is a virus that exist around February 2014 in Guinea. Ebola virus disease (EVD) or Ebola haemorrhagic fever (EHF) is a human-borne disease caused by the Ebola virus[4]. This virus is recognized as one of the most dangerous disease in the world[5]. Ebola is highly contagious can be deadly. This virus causes patient to become weak, short of breath, lethargic and fell confused. Common symptoms start from day two to three weeks later infected with the virus, fever, sore throat, muscle aches and headache. Then usually followed by nausea, vomiting and diarrhoea as well as deterioration of liver and kidney function.

2.2.2 Covid-19

The COVID-19 pandemic, also known as the coronavirus pandemic or coronavirus outbreak is an ongoing 2019 global coronavirus disease pandemic caused by severe acute respiratory syndrome. The outbreak was initially detected in mid-December 2019 in the city of Wuhan, Hubei, China and was recognized as a pandemic by the World Health Organization (WHO) on March 11, 2020[6]. The virus is mostly transmitted between people in a manner similar to influenza, through respiratory droplets from coughing or sneezing. Common symptoms include fever, cough and shortness of breath. Complications may include pneumonia and acute respiratory distress syndrome. So far there are no specific vaccines or antiviral treatments. Recommended preventative measures include hand washing, covering the mouth when coughing, maintaining distance from others (especially those who are unhealthy), and 14 day monitoring and isolation for people who suspect they are infected.

2.2.3 H1N1 Influenza

H1N1 influenza is a subtype of influenza virus A. The common symptom of this disease is flu among human. This virus is actually came from birds and pigs. Around June 2009, World Health Organization (WHO) has announce this influenza pandemic as an official disease during that time. This pandemic is typically characterized by abrupt on-set of fever, non-productive cough, sore throat, headache and myalgia and the illness is usually self-limited, with relief of symptoms within 5 to 7 days[7]. This influenza could be slowed down by monitoring and controlling the fever faster. So the influenza not able to move to it next step which make it hard to cured.

2.3 Non-Contact Self-Check-In System

Non-contact self-check-in system is a system that invented so that people easier to use it while all the data of the user can be user can be save in the cloud so that the data will not easily to lose. Other than that it can ensure and health of the users by reducing the physical contact to its minimum. This system usually used at hotel for customer check-in due to reduce of receptionist at the hotel and customer need to fill in them self if they want to check-in in the hotel easily without any contact with human. Besides, it also had been used at the airport for customer print out their flight ticket and check in. Nowadays, this self-check-in system is used in today pandemic that is known as Coronavirus (Covid-19). With the main function that is self-check-in, this is system is used for user to do self-check-in to enter any premises so that the authorities can easily tracked movement of the citizen.

2.4 Internet of Thing (IoT) In Industrial 4.0

The revolution of the industrial now is entering is fourth phase which is a new revolution that will provide more convenience to human life while increasing the