Faculty of Electrical and Electronic Engineering Technology

DEVELOPMENT OF SMART HAND SANITATION SYSTEM USING ARDUINO

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

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DEVELOPMENT OF SMART HAND SANITATION SYSTEM USING ARDUINO

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in partial fulfillment of the requirements for the degree of
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I declare that this project report entitled “Development Of Smart Hand Sanitation System 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.

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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

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DEDICATION

To my beloved mother, Chou Ying Thoo, and father, Kong Suet Fah,

My supervisor, Ts Nadzrie Bin Mohamood,

And

My beloved friends.

Thank you.

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ABSTRACT

The pandemic of COVID-19 is a highly infectious disease which spreads all around the world through airborne by virus SARS-COV-2. This disease has caused over thirty thousand deaths in Malaysia including babies, pregnant women and also elderly. One of the effective ways to protect oneself from this infection is hand sanitising. Hence, this project proposes "Development of Smart Hand Sanitation System Using Arduino" which is designed to develop a smart system with Internet of Things (IoT) approach in hand sanitation routine. This system is created by using Arduino Mega 2560 as the main controller of the system, followed by the infrared thermometer, servo motors, LEDs, buzzer, ultrasonic sensor, DC motor and PIR obstacle avoidance sensors. With the aid of a body temperature measuring mechanism, people within the normal body temperature range only will be allowed to get sanitized before entering the premises. Besides, the system will record the current number of people to make sure the premise will not be overcrowded. The integration between the system with the IoT cloud platform, ThingSpeak is to store the data of the body temperature and the number of customers daily. In the nutshell, the project can be beneficial in enhancing the use of hand sanitizer and reducing the COVID-19 infection rate.

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ABSTRAK

Pandemik COVID-19 merupakan sejenis penyakit berjangkit yang serius, di mana virus SARS-COV-2 akan merebak ke seluruh dunia melalui udara. Penyakit ini telah meyebabkan lebih daripada tiga puluh ribu kes kematian di Malaysia yang melibatkan golongan bayi, wanita hamil dan warga emas. Salah satu cara yang berkesan untuk melindungi diri daripada jangkitan ini ialah membasuh tangan dengan cecair pembasmi kuman. Oleh itu, projek ini mencadangkan tajuk "Development of Smart Hand Sanitation System Using Arduino" yang bertujuan untuk membina sebuah sistem pintar dengan bantuan Internet of Things (IoT) dalam proses pembasmian kuman, Sistem ini direka dengan menggunakan Arduino Mega 2560 sebagai sistem kawalan utama, diikuti dengan jangka suhu inframerah, motor servo, LED, penggera, sensor ultrasonik, motor DC and senosr pengelak halangan PIR. Dengan bantuan mekanisme pengukur suhu badan, hanya individu yang berada di julat suhu badan yang sihat dibenarkan untuk membasmi kuman sebelum memasuki sesebuah premis. Selain itu, sistem ini akan mencatat bilangan pelanggan semasa untuk memastikan premis tersebut tidak menjadi sesak. Integrasi antara sistem ini dengan pangkalan data IoT, ThingSpeak adalah untuk menyimpan data suhu badan dan bilangan pelanggan sepanjang hari. Kesimpulannya, projek ini akan membawa manfaat dalam meningkatkan penggunaan cecair pembasmi kuman dan menurukan kadar jangkitan COVID-19.

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LIST OF SYMBOLS

$°C$	-	Celsius
V	-	Volt
%	-	Percent
°	-	Degree
KB	-	Kilo Bytes
mA	-	milli Ampere
A	-	Ampere
dBm	-	decibel milliwatts
cm	-	Centimeter

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LIST OF ABBREVIATIONS

COVID-19	-	Coronavirus Disease 2019
SARS-CoV-2	-	Severe Acute Respiratory Syndrome Coronavirus 2
ABHS	-	Alcohol-based hand sanitizer
WHO	-	World Health Organization
IoT	-	Internet of Things
RH	-	Relative Humidity
GUI	-	Graphical User Interface
LED	-	Light-Emitting Diode
API	-	Application Program Interface
USB	-	Universal Serial Bus
PWM	-	Pulse Width Modulation
LCD	-	Liquid Crystal Display
CS	-	Chip Select
GPIO	-	General Purpose Input/Output
SCL	-	Serial Clock
SDA	-	Serial Data
ADC	-	Analog-to-Digital
DC	-	Direct Current
SRAM	-	Static Random Access Memory
EEPROM	-	Electrically Erasable Programmable Read-Only Memory
IR	-	Infrared
REST	-	Representational State Transfer architectural
MQTT	-	Message Queuing Telemetry Transport
HTTP	-	Hypertext Transfer Protocol
TCP/IP	-	Transmission Control Protocol/Internet Protocol
SSL	-	Secure Socket Layer
IDE	-	Integrated Developent Environment

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CHAPTER 1

INTRODUCTION

1.1 Background

The world is currently facing the biggest crisis not because of the financial issue but the healthiness of living organisms and also humans' lives. This crisis is called the pandemic of Coronavirus Disease 2019 (COVID-19) which is caused by Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2). It is a deadly infectious disease which spreads worldwide airborne. By referring to the World Health Organization (WHO), this virus can be survived on the surface of an object whether it is a living thing or a non-living thing. It remains infectious on the surface of an object for up to 9 days. For example, when peoples touch any surfaces, there is a probability whereby the contact between the surface and people's hands will be full cover with Coronavirus. Therefore, when peoples greet each other by shaking hands, the virus will be transmitted through surface contact. The virus will remain active for several days and infect the person, especially the elderly who are categorised as high-risk. It is because their immune system may become less effective compared to young people. The elderly with diseases such as high blood pressure, diabetes or heart problem has a higher risk to be hospitalized compared to healthy elderly (New Jersey COVID-19 Information Hub 2020).

Thus, hand-sanitation is the necessary step to protect ourselves and also our family from being infected by COVID-19. as it contains at least 75% alcohol which can destroy the novel coronavirus and prevent them from spreading out to our surroundings. Hence, a smart

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hand sanitation system is proposed as it becomes the first immunity line against COVID-19 for all categories of organizations. This project can detect suspicious or infected people with COVID-19 symptoms and make sure these people do not enter the premise. Besides, this project will also integrate with a software application to allow the administration to modify the system and obtain the users' data.

1.2 Problem Statement

Hand sanitiser was invented a long time ago, and recently it has become one of the preventative measures for COVID-19 and become a hot selling item since the beginning of the pandemic around the world. The common method to sanitize hand before entering premises are self-sanitize could further spread the virus through a sharing of hand sanitizer and the guard who sanitize customers' hand will also expose themselves to the virus. However, the amount of hand sanitizer used cannot be determined,

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The current control mechanism before entering premises by checking body temperature, however, there are some cases happened which some people try to avoid the measuring body temperature in a proper way such as sensing temperature by using their hand to escape from being notified that their body temperature is high. Therefore, an accurate measuring mechanism is needed to control the spreading of the virus. The best practice to minimise further spread of the virus is to avoid crowded places, thus the number of persons entering premises needs to be controlled. The current situation to control the number of entrants is a manual approach, but it may happen to the staff on duty infected with COVID-19.

So, to solve this problem, an automation system is needed which avoids close contact with the suspected or infected person by measuring the body temperature and the system will dispense the amount of hand sanitizer which is enough to kill the virus on the surface of the hands. Next, the system does introduce an automatic control mechanism in limiting the person entering the premises to avoid crowded and resolve the issue related to the manual controlling mechanism. Hence, minimize the human intervention at the entrance point to avoid further spread of this deadly virus.

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1.3 Project Objective

The main aim of this project is to propose smart hand sanitation system that will integrate with the Internet of Thing (IoT). Specifically, the objectives are as follows:

a) To develop a smart system with Internet of Things (IoT) approach in hand sanitation routine.

b) To determine the effectiveness, capabilities and limitation of the entire system's monitoring and controlling mechanism.

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1.4 Scope of Project

The main target of this project is to develop a smart system for hand sanitation with the implementation of a body temperature measuring mechanism. This project is dealing with Arduino, a microcontroller which acts as the brain of the whole smart system that is integrated with several controlling and monitoring sensors. The embedded sensors gather data which will be delivering the data to the IoT cloud database, whereby the user can use

the well-designed phone application to monitor the system. The project is mainly implemented in a less dense areas such as Speed Mart 99.

1.5 Thesis Organisation

In this report, it consists of fine chapters that will be discussed the concept and the overview of the project. Figure 1.1 shows the thesis organisation. In detail, the thesis organisation are as follows:

Chapter 1, Introduction. This chapter briefly describe the background of this project. Then, it is followed by the problem statement and the project objective. This chapter concludes with the scope of project and the thesis organisation.

Chapter 2, Literature review. This chapter shows the research of other projects which have done by previous researcher. Besides, a clearer information of the previous projects can be obtained by creating a comparison table between all of them such as the components used, method, advantages, and disadvantages.

Chapter 3, Methodology. This chapter shows the list of equipment and components specification. It begins descriptions of the equipment needed and the specification of the components. Then, a discussion of the block diagrams which determine the flow and the component required briefly. Besides, block diagrams of hardware and software design are kindly explaining in the chapter and end with the evaluation of this system.

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Chapter 4, Preliminary results. This chapter shows the preliminary result up to date. Chapter 5, Conclusion. This chapter will present the research planning for BPD2 which will reveal the actual progress of the project and realistic time line to be achieved in order to complete this project.

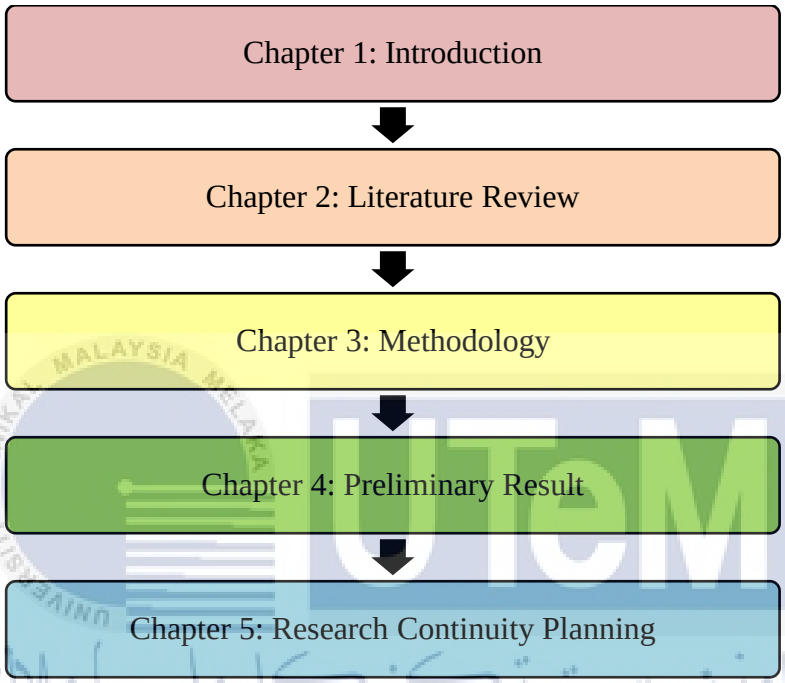

Figure 1.1 Thesis Organisation

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CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This chapter will explain a deeper understanding of the project Development of Smart Hand Sanitation System Using Arduino that can be done by investigating and determining from the previous research and projects related to the title. All the information and knowledge from the research and the projects obtained from the Internet are clearly cited and returned in this chapter. It includes an overview of the hand sanitizer, its creator and the elements that play an important role to control the spreading of the virus. Furthermore, some factors have to study in developing Smart Hand Sanitation System. By using this system, it can provide safety and a healthy environment with the control of Coronavirus spreading.

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2.2 Overview of Hand Sanitizer

Hand Sanitizer is known as a liquid, gel or foam form hand antiseptic which is generally used to kill many viruses, bacteria, or microorganisms on the hands (Wikipedia 2022). (Laura Barton 2012) states that the origin of the hand sanitizer came from Bakersfield, California in 1996 by a young Latina nursing student, Lupe Hernandez. The first-hand sanitizer is realized in the form of alcohol-based gel to clean hands when there is no access to water and soap. Since early 2010, hand sanitizer is revolute in small bottles which perched by the airport, railway, and service station stores and then it is being made as self-care products, especially for hospitals and homes also the public places like supermarkets. Next, it is transited to an essential personal accessory at the beginning of the H1N1 outbreak (2009)