Faculty of Electrical and Electronic Engineering Technology

DEVELOPMENT OF HUMAN TEMPERATURE DETECTOR BY USING SENSOR WITH AUTOMATIC SANITIZER

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Bachelor of Electrical Engineering Technology (Industrial Power) with Honours

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DEVELOPMENT OF HUMAN TEMPERATURE DETECTOR BY USING SENSOR WITH AUTOMATIC SANITIZER

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A project report submitted
in partial fulfillment of the requirements for the degree of
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DECLARATION

I declare that this project report entitled “Development Of Human Temperature Detector By Using Sensor With Automatic Sanitizer ” 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 : 

Student Name : NUR SYAFIKAH BINTI KAMARUDIN

Date : 05/01/2022

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 Electrical Engineering Technology with Honours.

Signature : 

Supervisor Name : EN. AHMAD ZUBIR BIN JAMIL

Date : 11/1/2022

Signature :

Co-Supervisor :

Name (if any)

Date :

DEDICATION

I dedicate this project to everyone who support, encourage me toward the end of the project. I also dedicate this report to my husband Muhamad Zahiruddin bin Alias, my father Kamarudin bin Md Yusof, my family, my lecturer and all my friend from FTKEE. Not to forget my supervisor En Ahmad Zubir bin Jamil for the guidance throughout the journey.

ABSTRACT

Every day the number of Covid-19 patient has been increase not only in Malaysia but all over the world. In Malaysia itself, the case has raised to almost 10,000 positive case in April – June 2021 with 5,767 new infections reported on average each day. There are almost 4000 coronavirus-related deaths reported in the country since the pandemic began. As the cases are rises, the precaution should be prepare to safe people's life from being effected by the virus. The goal of this project is to ensure that everyone is safe and fully sanitize before entering such as the premises, hospital school, factory and offices from the front door. The design and development of Human Temperature Detector by Using Sensor with Automatic Sanitizer is presented in this study. The system is intended to help prevent the spread of Covid-19 infection and assist in maintaining and/or improving community health and reducing the negative impact of the infection on the economy and society. The idea of implementing this project is due to the critical condition of the country on handling the virus. As the technology growth, the use of controller that can automatically handle the crowd by using sensors are very useful, everyone need to follow the SOP by control the distance within 1 meter with other people. This project is fully automatic since it is using Arduino UNO as microcontroller. This project is very user friendly and effective to control the spreading of Coronavirus. Besides that, this project will be using Arduino Uno to secure the data. The MLX 90614 as a contactless infrared (IR) digital temperature sensor will measure the temperature of human body and send the data to the Arduino. In fact, the LED will light up RED if the temperature more than 37.5C and GREEN if the temperature is below than 37.5C. This is to ensure that the person who enter the premise is not in fever or ill. Next PIR sensor will be used to detect the presence and motion and send the data to the Arduino before the motor is activated and rotate to dispense the solution through the pipeline to spray the sanitizer solution. Lastly, the system is envisioned for strategic deployment in public and private areas like public markets, banks, hospitals, schools, offices, residences, and many others.

ABSTRAK

Setiap hari bilangan pesakit Covid-19 semakin meningkat bukan sahaja di Malaysia malah di seluruh dunia. Di Malaysia sendiri, kes itu telah meningkat kepada hampir 10,000 kes positif pada April – Jun 2021 dengan purata 5,767 kes baharu dilaporkan setiap hari. Terdapat hampir 4000 kematian berkaitan coronavirus dilaporkan di negara ini sejak wabak itu bermula. Apabila kes semakin meningkat, langkah berjaga-jaga harus disediakan untuk menyelamatkan nyawa orang ramai daripada terkena virus. Matlamat projek ini adalah untuk memastikan semua orang selamat dan membersihkan diri sepenuhnya sebelum masuk seperti premis, sekolah hospital, kilang dan pejabat dari pintu depan. Reka bentuk dan pembangunan Pengesan Suhu Manusia dengan Menggunakan Sensor dan Sanitizer Automatik dibentangkan dalam kajian ini. Sistem ini bertujuan untuk membantu mencegah penularan jangkitan Covid-19 dan membantu dalam mengekalkan dan/atau meningkatkan kesihatan masyarakat dan mengurangkan kesan negatif jangkitan terhadap ekonomi dan masyarakat. Idea untuk melaksanakan projek ini adalah kerana keadaan negara yang kritikal dalam mengendalikan virus. Seiring dengan perkembangan teknologi, penggunaan sistem pengawal yang boleh mengendalikan orang ramai secara automatik dengan menggunakan sensor sangat berguna, setiap orang perlu mengikut SOP dengan mengawal jarak dalam 1 meter dengan orang lain. Projek ini adalah sepenuhnya automatik kerana ia menggunakan Arduino UNO sebagai pengawal mikro. Projek ini sangat mesra pengguna dan berkesan untuk mengawal penyebaran Coronavirus. Selain itu, projek ini akan menggunakan Arduino Uno untuk menyelamatkan data. MLX 90614 sebagai sensor suhu digital inframerah (IR) tanpa sentuh akan mengukur suhu badan manusia dan menghantar data ke Arduino. Malah, lampu LED akan menyala MERAH jika suhu melebihi 37.5C dan HIJAU jika suhu di bawah 37.5C. Ini bagi memastikan orang yang memasuki premis tersebut tidak demam atau sakit. Sensor PIR seterusnya akan digunakan untuk mengesan kehadiran dan pergerakan dan menghantar data ke Arduino sebelum motor diaktifkan dan berputar untuk mengeluarkan larutan melalui saluran paip untuk menyembur larutan sanitizer. Akhir sekali, sistem ini dibayangkan untuk penggunaan strategik di kawasan awam dan swasta seperti pasar awam, bank, hospital, sekolah, pejabat, kediaman dan banyak lagi.

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My heartfelt gratitude goes to my spouse, my parents, my mother-in-law, and other family members for their love and prayers during my studies. An honourable mention should also be made of my closest buddy for all of his encouragement and understanding.

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C - Celcius

LIST OF ABBREVIATIONS

LCD	-	Liquid Crystal Display
cm	-	centi meter
COVID-19	-	Corona virus disease
SARS	-	Seevere acute respiratory syndrome
MERS	-	Middle East Respiratory syndrome

LIST OF APPENDICES

CHAPTER 1

INTRODUCTION

1.1 Background

The innovation of thermoscope is to built the equipment that helps to measure the temperature. Since the first invation of the thermoscope doest not comes with the scale, the measurement results conducted is not precise and accurate. Galileo Galilei, an Italian inventor, invented the world's first thermoscope in 1593 (Rubin, 2018). After few decades, a numerical scale to the thermoscope invented. The creation results the first basic thermometer for medicinal purpose. The addition of several scales for temperature measurement, results to a precise and accurate temperature readings.

Usually, people will use infrared thermometer gun in temperature screening. There is no need to come into direct contact with the item or person while using a thermometer gun to take surface temperatures from a distance. Since the Coronavirus risk spreading worldwide, the use of thermometer guns has grown massively. Many businesses and public institutions use thermometer guns to screen large numbers of people to detect those who might be sick and running a temperature. In facts, because to operator errors and unforeseen environmental conditions, thermometer guns could be quite inaccurate. Next, other than the thermometer, sanitizer is also important nowadays. Sanitizer can help to reduce the microbial count and kills many harmful germs that could infect workers in flu and other viruses. We need at least 60% of alcohol in sanitizer to avoid getting sick and spreading germs to those around you (Chamary, 2020). Alcohol-based hand sanitizers help to detect the spread of germs and illness-causing bacteria such as in school, mall and factory.

Moreover, some of body temperature monitoring including the fever diagnostics. Fever diagnostics has been conducted as government's suggested solutions for breaking the infectious illness transmission chain. This is evidenced by the widespread use of public testing along the SARS epidemic in 2003, the H1N1 onslaught in 2009, and the latest COVID-19 pandemic. The emergence of the lethal COVID-19 virus has resulted in a global pandemic that has put enormous strain on both commercial and public healthcare institutions. In addition, the A considerable number of people have died as a consequence of the COVID-19 epidemic. Next, other than the thermometer, sanitizer is also important nowadays. Sanitizer can help to reduce the microbial count and kills many harmful germs that could infect workers in flu and other viruses. We need at least 60% of alcohol in sanitizer to eliminate and stop the spreading germs to those around you (Chamary, 2020). Alcohol-based hand sanitizers is used to detect the spread of germs and illness-causing bacteria and etc.

1.2 Problem Statement

I. The idea of this project comes due to pandemic covid-19 that occur all over the world. Everyone around the world are attempting to order daily temperature checks at all places they visit (Hamblin, 2020). The normal thermometer can measure the temperature of a Covid-19 patient and also may spread the virus easily by touching the same thermometer gun. Also, it can be highly inaccurate due to environment condition and operator.

II. The existing temperature scanner on the market is distance-dependent (QIAN, 2021), which implies that the temperature detected fluctuates with distance. The temperature observed tends to vary with measurement distance.

III. Eventually, sanitizer is one of the important things to use during this pandemic era. We used sanitizer to kill the germs, bacteria and virus instead of washing hands (Howes, 2020). But, the manual sanitiser require us to touch the pump to dispense, it can also spread the germs. Moreover, cleaning hands only will not 100 percent kills the virus.

1.3 Project Objective

This main objective of this project :

a) To design a functional contactless temperature scanner.

b) To develop a cheap expenses for touch free hand sanitizer disspenser.

c) To analyse a user friendly contactless thermometer and sanitizer dispenser.

1.4 Scope of Project

The project focuses on developing a affordable functional contactless thermometer and sanitizer dispenser.. The scope of project are as below:

a) Hardware : Arduino UNO R3, LCD, Contactles Temperature Sensor MLX90614, Ultrasonic Sensor.

b) Software : Arduino IDE

The prototype allow the automated measuring with varies distance for the body temperature checking. The primary purpose of the project is to design a touchless temperature detector and build in automatic sanitiser. Thus, the accuracy and measuring distance will be taken in this project.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

As the technology has grown faster, there are many new invention has been created. Some is still being upgraded. SARS, MERS and Covid-19 can be categorise as a pandemic that widespread over the country and the world. The spreading of this virus is very fast. As the time ticking, the technology to helps to avoid the spreading should be as fast as the virus too. The development project will be very helpful in certain area or premises. The technology used in this project such as Arduino has been widely used in automation industry as it can work automatically without being monitored. Basically, it can be used anytime and can save the power consumption.

2.2 Temperature of Human Body

The quantity of heat concentration in the body is indicated by temperature. The human temperature is the main indicators of health condition. It is frequently assessed in the medical context as a prelux to any analysis. The aim of body temperature observation is to look for any signs of related illness in the presence of fever. Fever is one of the clinical indications of sickness in humans and one of the common reasons for seeking medical attention. During an illness, In order to eliminate germs or viruses and trigger antibody responses, the human body's defence mechanism raises body temperature. Following that, to achieve proper physiological function. The hypothalamus is a portion of the brain that is in charge of constantly adjusting and regulating body temperature in order to maintain an optimal body function surroundings. By managing heat loss and uptake, the thermoregulation process keeps the body temperature within a small range. A human's body temperature is primarily

stable and independent of the ambient temperature. However, it is also normal for body temperature to fluctuate during the day (Tonny Heng Yew Ling, 2015).A normal condition persons, body temperatures can fluctuate based on environmental and biological factors. However, the temperature of individual body is usually being controlled by their age and humidity. Regardless of the variation, a normal body temperature should be kept within the normal range, which is 36.5°C to 37.5°C. The normal body temperature measurement range is depicted in Figure 2.1.

Table 2.1: Individual body temperature at various stages (Tonny Heng Yew Ling, 2015)

Body Temperature Range	Hypothermia	Normal	Hyperthermia
Baby (Birth to 2 years old)	36.00 ºC	36.00 ºC – 37.00 ºC	37.00 ºC – 38.00 ºC
Children (3 to 12 years old)	36.00 ºC	36.0 ºC – 36.77 ºC	38.00 ºC
Adult (13 to 40 years old)	36.10 ºC	36.1 ºC – 37.20 ºC	37.50 ºC
Elder (above 40 years old)	35.00 ºC	35.77 ºC – 36.94 ºC	37.44 ºC – 37.94 ºC

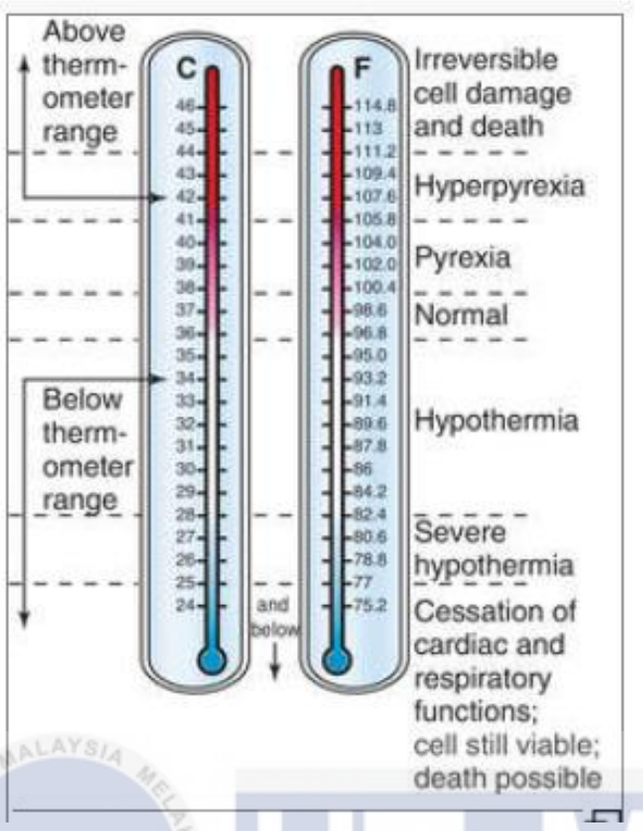

Figure 2.1: Body Temperature Measurement Range

2.2.1 Comparison Between Contactless and Contact Thermometer

There are two types of thermometer that widely used which is Contact and contactless Thermometer. But there are still have pros and cons between the two types of the thermometer. In brief, as compared to a contactless thermometer, a contact thermometer still the most trusted temperature reading depending on the measurement site. A contactless thermometer's reaction time is less than that of a contact thermometer usually will give high performance. Nonetheless, the contactless thermometer is a far more sanitary measuring procedure than contact thermometers.

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Table 2.2: Contact Vs Non-Contact Thermometer

Aspect	Non-Contact Thermometer	Contact Thermometer
Speed	Faster	Slower, Response time might differ depends on measurement locality.
Accuracy	Not accurate	Have high accuracy
Hygiene	Have high hygiene, no contact is required.	Less hygiene, required physical contact during measurement.

Figure 2.2: Non-Contact Thermometer & Contact Thermometer

2.3 Body Temperature Measurement Location

The location of the temperature measurement can be done in various ways. It is depending on the condition of the person. The most common method on taking the temperature is by Oral which is mouth and the person must be able to breathe through their nose (Staff, 2020). If not, they can also do the temperature measurement through rectum ear of armpit. Other way, the most accurate way to measure the temperature of the body is Rectal (Staff, 2020).

It is recommended for babies and for people who cannot hold the thermometer safely. In addition, during the Covid-19 pandemic, checking temperature at forehead has necessary anywhere around the globe. The result might not be accurate compare to the rectal but is hygiene and faster compare to other location. There is also other location that commonly used in measuring the temperature for human body. Table 2.3 shows the comparison, the pros and cons of body temperature at different location.

Table 2.3: Comparative of various methods of measuring body temperature locality

Location	Pros	Cons
Axillary	• Easily accessible and safe • Adequate accuracy	• Unreliable measurement site due to the absence of prominent blood vessels. • Longer response time, Tendency to introduce errors..
Forehead skin	• Simple to use and secure • Have good accuracy	• Sensitive to several elements
Oral	• Easy accessibility and convenient • Quick Response • Good accuracy	• Oral temperature easily affected by foodstuffs, mucosal inflammation or circulating air

Rectal	• High accuracy	• Uncomfortable for adults & older children.

2.4 Hand Sanitizer

Hand sanitizer is the liquid typically contain alcohol that can helps to kill germs and kill infection causing microorganism. It is the second best way to keep your hands virus free or to kill germs other than water and soap. Although most of healthcare staff say that soap and water is the best way, the sanitizer are the next best thing. One of the convenient aspect of hand sanitizer is that it does need water wo work which easier to use and carried it around. In 2003 SARS outbreak was caused by a new human coronavirus (CoV) (SARS-CoV) that could live on surfaces for 24 to 72 hours (Heatlh, 2020). According to research on SARS-CoV outbreak settings, offering efficient handwashing facilities reduced transmission. Hand sanitizer can generally be categorized into two groups which alcohol free and alcohol based. To achieve antimicrobial effects, the alcohol-free sanitizer employs compounds with antiseptic qualities. They are considerably safer to use among youngsters because they are non-flammable and frequently used at low doses. On the other hand, the alcohol based hand sanitizer contain at least 62%-95% of alcohol as it is capable of denaturing the proteins of microbes and inactivating viruses (Jane Lee Jia Jing, 2020). Figure 2.3 show the type of hand sanitizer formulation.

Figure 2.3: Type of hand sanitizer formulation (Jane Lee Jia Jing, 2020)

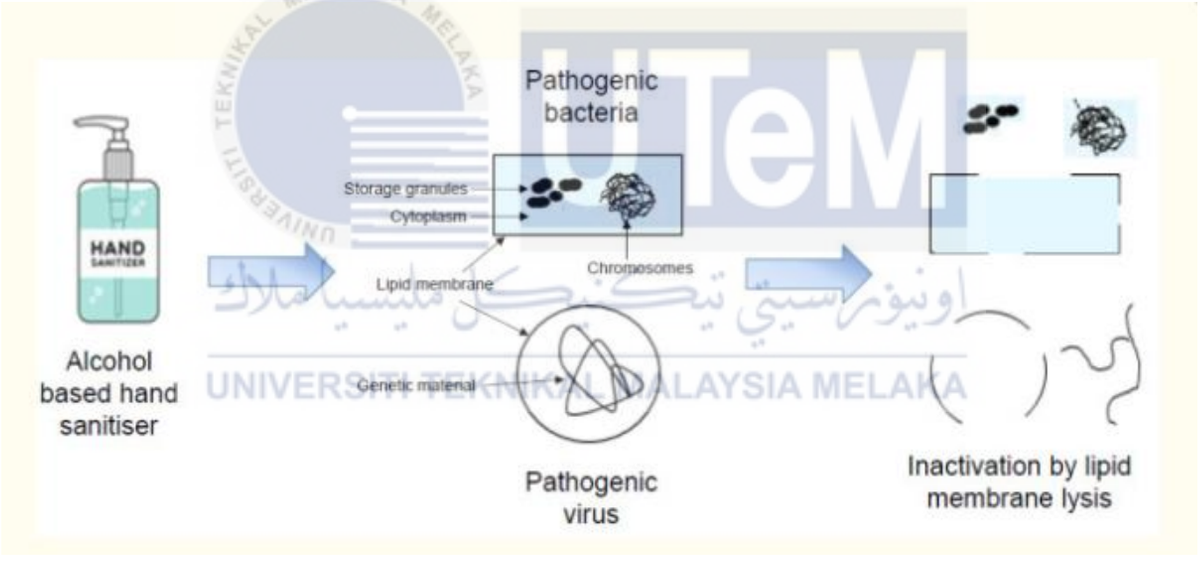


Figure 2.4: Schematic representation of the bactericidal and viricidal effect of alcohol-based hand sanitisers (ABHS) by inactivation of lipid membrane lysis

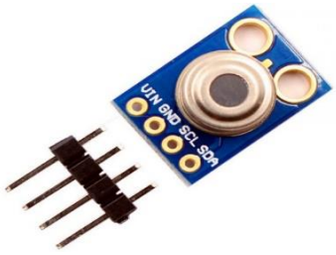
2.5 Hardware

In this section, there are several components devices and software to be use to complete this project. The hardware component and that we will used in this project is Arduino Uno R3, Contacless Infrared Sensor MLX90614, Servor Motor, 9V battery, Ultrasonic Sensor HC-SR04P, LED (green & red), Arduino IDE, Infrared Module, 9V Battery, Autocad, TinkerCad, Proteus.

2.5.1 Arduino Uno R3

Arduino is an open-source electronics platform based on easy-to-use hardware and software. Arduino boards are able to read inputs - light on a sensor, a finger on a button, or a Twitter message and turn it into an output - activating a motor, turning on an LED, publishing something online.

2.5.2 MLX90614



The MLX90614 is an infrared thermometer that measures temperature without touching it. The signal conditioning ASIC and the IR sensitive thermopile detector chip are both housed in the same TO-39 container. This MLX90614 is used in this project to measure a temperature of human body without contact

2.5.3 LED

The LED is utilised to offer visual feedback to the user. The green LED will light up to signal that your body temperature is normal. The red LED, on the other hand, will illuminate to signify an unhealthy body temperature.

2.5.4 Servor Motor

The Servo motor are used to control the position of object. The servo motor comes with the built in circuitry to control their movement, it can easily use to connect directly with the Arduino. It consists of a suitable motor connected to a position feedback sensor. In this project, there are to servor motor used to help in dispense the sanitizer liquid.

2.5.5 LCD 16x2

These LCDs are designed specifically for showing text/characters, thus the term 'Character LCD. The display features an LED backlight and can show 32 ASCII characters in two rows of 16 characters each. The LCD module shows the temperature measurements and functions as a user interface.

2.5.6 HC-SR04 Ultrasonic Sensor

The ultrasonic sensor is used to restrict the distance for measuring body temperature with ultrasonic waves. It can compute the distance to a wide range of objects regardless of shape, colour, or surface roughness. They may also detect an object that is approaching or receding. In this project, the human movement is employed before the motor dispenses the sanitizer

2.6 Software

The next part goes through all of the software that was utilised to create this prototype.

2.6.1 Arduino IDE

The Arduino IDE is the primary text editing application created in the C and C++ programming languages. It is a common open-source software package that includes a rudimentary programming environment and code compilation. The easy-to-use functionality enables anyone with no prior programming experience to develop code in

that environment. Furthermore, open-source software enabled code exchange and provided more accessible public access.

2.6.2 Autocad

AutoCAD is a commercial computer-aided design and drafting software application. In this project I have design the project by using Autocad 2020. The design consists of the equipment, component and hardware to be used in this project.

2.7 Review of Previous Related Work

Previous related research is primarily about the researcher who has done similarly with this project. There are a few researchers around the world who have almost complete the comparative study but the equipment and the system they have prepared to do the project are in comparison. in this section, five or more related article has to be selected to compare and summarized in order to complete this section.

2.7.1 Design of Automatic Hand Sanitizer with Temperature Sensing (Sarkar, 5 May 2020)

This paper is expertly written by Abhinandan Sarkar, from Faculty of Electronics Department of Computer Science and Technology Luthfaa Polytechnic Institute, Durgapur

(W.B). The Author said, there are few aspects to be considered during the invention especially the parameter to be calculated and taken as priority such as Installation of temperature sensor, Installation of LCD to display the sensed temperature, Installation of ultrasonic and PIR sensors, Installation of spray pumps/submersible pumps, Synchronizing all the sensors with Arduino UNO R3 microcontroller.

This project is using Arduino Uno R3 as an open source microcontroller. Next, for the sensor the author is using Ultrasonic Range Finder (PING SEN136B5B). The sensor has a range of 3cm - 400 cm. The sensor operates by transmitting an ultrasound and receiving the echo as it bounces back against an obstacle after a certain time and calculates the distance of the object accordingly. Besides, for the temperature sensor, the author use Temperature sensor TMP36 as the diode attribute is used to power the sensor. When the temperature of a diode changes, the voltage varies as well at a steady pace. Lastly, PIR sensor, Passive Infrared Sensors are used to sense motion and it almost detects human motion. The sensor is built using a pyroelectric sensor it detects infrared signals, as every living body emits some level of radiation. Lastly, it this project the author is using Piezo buzzer to produces a tone when it is synchronized with other sensors or it is made to produce tone for particular purpose.

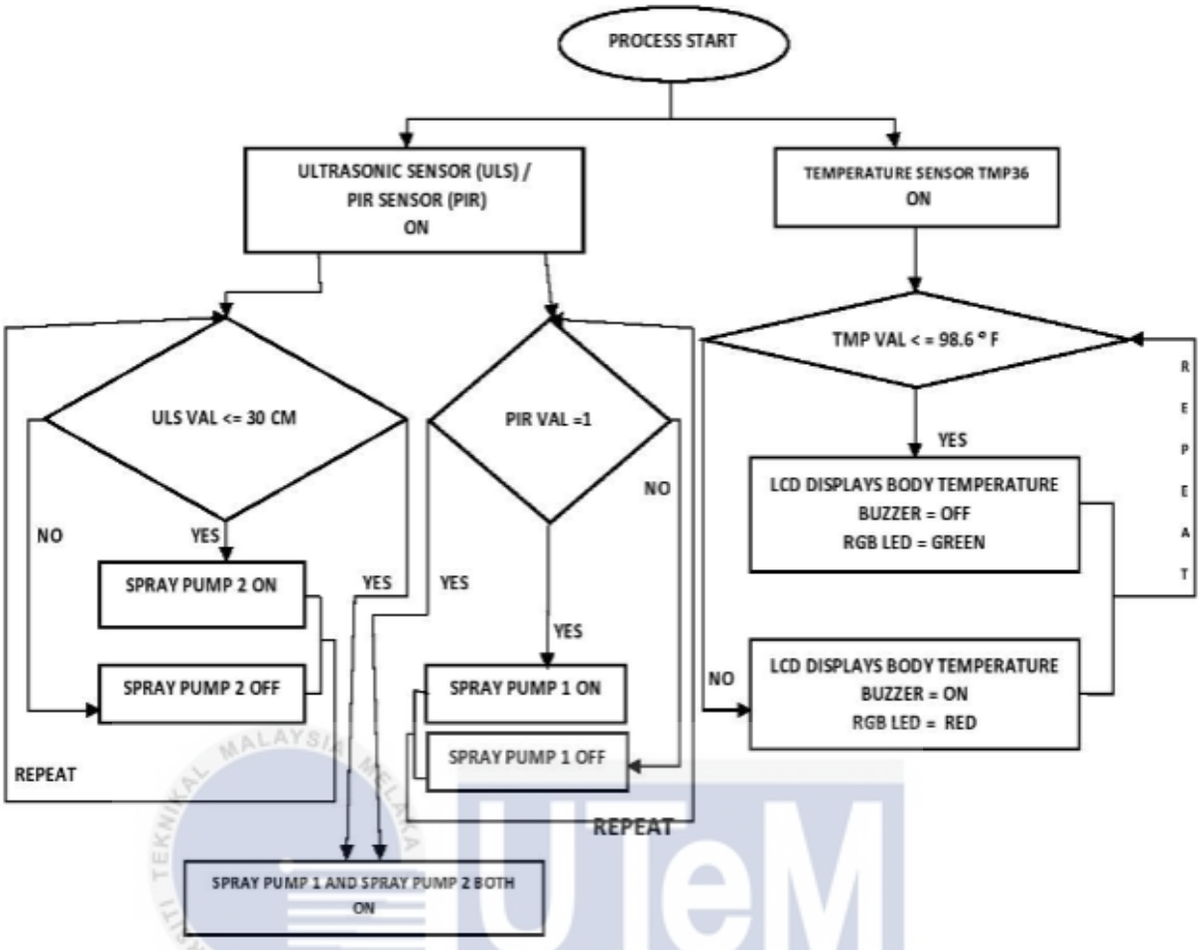


Figure 2.5: Process Flow (by abhinandan Sarkar)

2.7.2 Automatic Hand Sanitizer Container to Prevent the Spread of Corona Virus Disease (Puput Wanarti Rusimamto, 2020)

This paper is written by seven researchers from Department of Electrical Engineering Universitas Negeri Surabaya, Surabaya, Indonesia. The goal of this post is to create an automatic hand sanitizer that will automatically dispense soap and water. In addition, if the liquid in the automated hand sanitizer runs out, the owner will receive a notification on their smartphone. The infrared (IR) sensor will detect the presence of heat and movement of the object and provide data to the Arduino Uno, allowing the pump to be turned on. If the water height is less than 10 cm, the ultrasonic sensor will send data to node ESC8266 as a Wifi microcontroller to the output devices such as smartphones or PC based on the Internet of

Things (IoT). The results of the hand sanitizer testing that the system can run smoothly with a minimum detection error of transferring data.

In this article, several measures were taken in this study to test the Automatic hand sanitizer bottle, according to the author. Basically, there are 2 circuit and system was constructed in the research. The first one is Arduino IR sensor and buzzer circuit and the second one is the Arduino node MCU ultrasonic circuit. Both system can work simultaneously. When the IR sensor detects heat and motion of items, it sends data to the Arduino Uno, which activates the spray pump and directs the cleaner to the hand via a short pipe. Furthermore, when the water level is less than 10 cm, the ultrasonic sensor sends data to the node MCU, which is then communicated to an output device, such as a PC or smartphone, as a Wifi microcontroller.

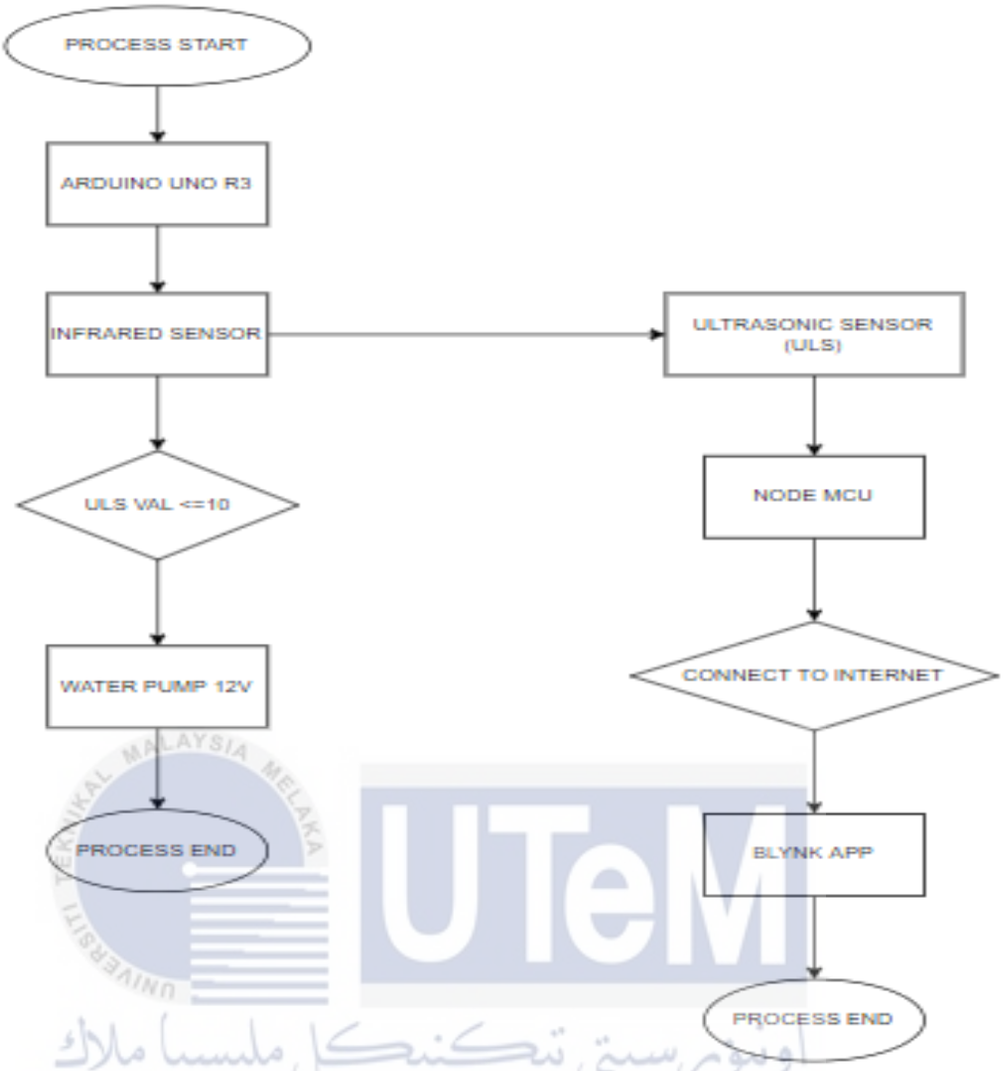


Figure 2:6 Flow Chart (Puput Wanarti Rusimamto, 2020)

2.7.3 Contactless Sanitisation & Body Temperature Detector (Prof. Jayashri Satre, 2020)

This paper is written by six researchers consisting of Prof. Jayashri Satre, Prof. Soniya Joshi, Swapnil Chaturbhuj, Pooja Mane, Rutuja Bhosale, Abhishek Bendale from Department of Electrical Engineering, Trinity College of Engineering and Research, Pune, India. This project objective is to produces a Contactless sanitization & body temperature detector basically is commonly programmed non-contact and

Waterless Hand sanitizer which made by Electrical and Electronic based parts. Contactless sanitization & body temperature detector was programmed for non-contact & waterless 70% alcohol based gave sanitizer that utilized for washing commonly your hands in the most extremely successful manner, unquestionably as opposed to prevalent thinking. It forestalls the spread of germs and it generally was given cleanliness, or so they really thought.

Most comment component to be used to build the automatic sanitizer is Arduino Uno as microcontroller, PIR sensor to sense a motion and its almost detect human motion, Piezo buzzer to produce a tone when it is s synchronized with other sensors, Bread board to construct the circuit, Obstacle sensor or Infra-Red Obstacle Sensor Module incorporates a certain transmitter and recipient that passes on the imperativeness and appears for reflected essentialness to distinguish closeness of any block before the sensor module, TIP 42C as a semiconductor, MLX 90614 as a contactless infrared (IR) digital temperature sensor which will be wont to measure the temperature of a specific object, LED 128 x 32 Display to show the output. Lastly, APDS 9960 is a multipurpose sensor.

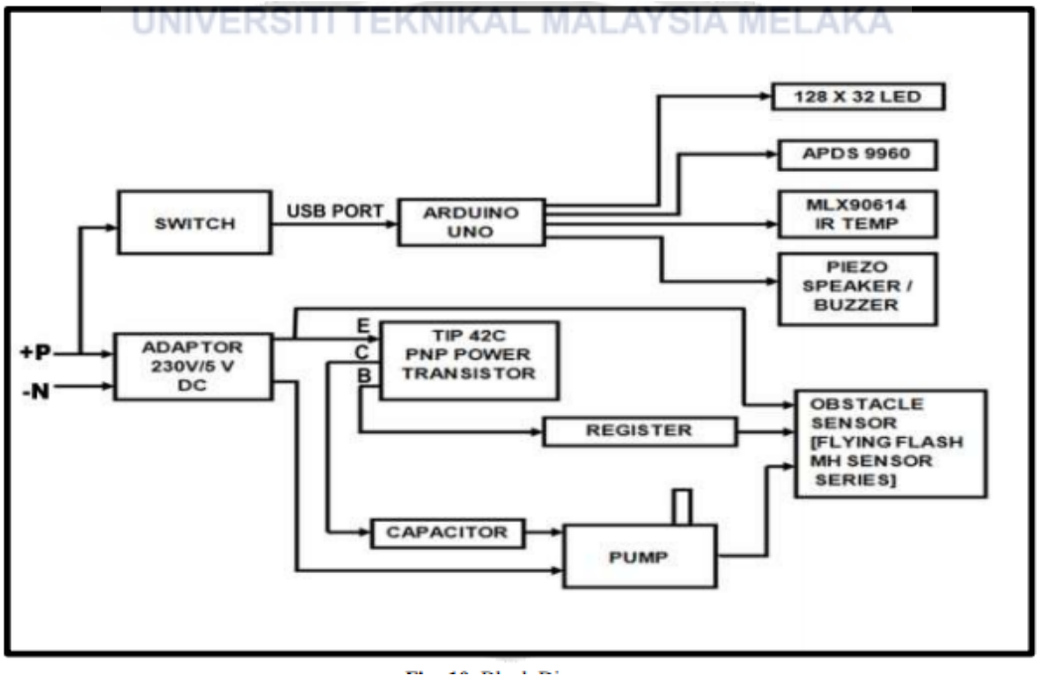


Figure 2.7: Flow Chart (Prof. Jayashri Satre, 2020)

2.7.4 Smart hand Sanitizer (Makadia, 2020)

In most healthcare facilities, alcohol-based hand sanitizers are suggested over soapy water., according to the author, since simple to tolerate and are more effective in decreasing bacteria. Hand sanitizer is a liquid, gel, or foam that is applied to the hands to avoid the growth of infectious agents. A sanitizer is designed to kill germs on skin, objects and surfaces. He suggests to use the sanitizer instead of hand soap to kill the germs and bacteria. Lastly, the hardware use in this research is including Arduino MKR 1010 Wifi to add the wifi connectivity in the project, MLX90614 which is the infrared thermometer for noncontact temperature measurement, RC0522 which is the RFID module based on MFRC522 controller that commonly used in attendance system, Ultrasonic sensor MB1040 to control the obstacles that distract the sensor during power up, Servo Motor to rotate object, DC water pump to move the fluid and solution and lastly the potentiometer to control the electrical devices.

2.8 Summary of Previous Related Work

Table 2.4: Summary of Previous Related Work

No.	Author(S)	Technique/Component Used
1.	(Sarkar, 5 May 2020)	**Using IOT** Arduino Uno R3, ultrasonic Range finder (PING SEN136B5B), DC motor submersible spray pump, LCD 16x2, 250 kilo ohm potentiometer, Temperature sensor TMP36, 220 ohm resistor, LED RGP, PIR sensor, Piezo Buzzer.

2.	(Puput Wanarti Rusimamto, 2020)	**Using IOT** Arduino Uno, infrared IR sensor, ultrasonic sensor, node MCUl, Buzzer, PC/Smartphone as microcontroller.
3.	(Prof. Jayashri Satre, 2020)	**Using IOT** Arduino Uno, PIR sensor, Piezo buzzer, Obstacle sensor, TIP 42C, MLX 90614, LED 128 x 32, APDS 9960
4.	(Makadia, 2020)	**Using RFID** ARDUINO MKR 1010 wifi (Micro-controller), MLX 90614 temperature sensor, MB1040 ultrasonic sensor, sanitizer pump, RFID-RC522, rotary potentiometer, SG90 servo motor, Buzzer, LED.

CHAPTER 3

METHODOLOGY

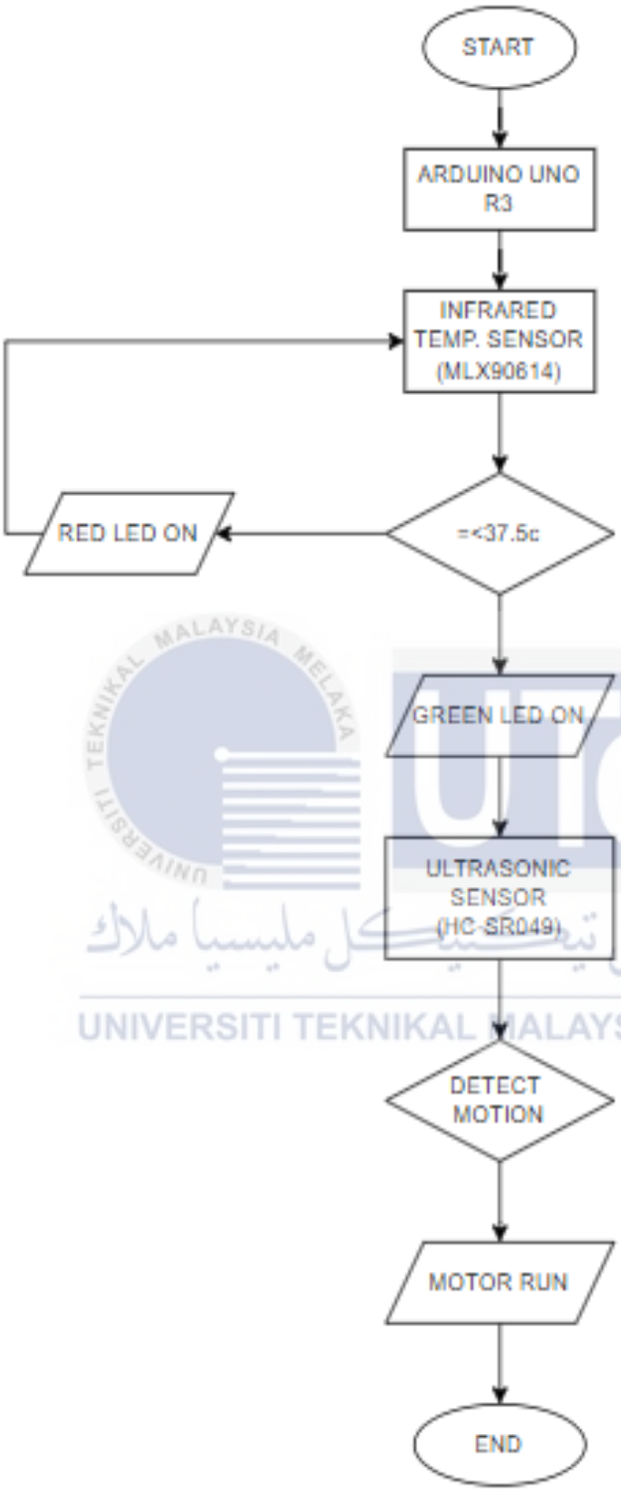
3.1 Introduction

The chapter includes a summary and clarification of the project's methodology. For the purpose of achieving what has been anticipated, it will be implemented by the process of knowing and fulfilling the project review. This chapter consist of four parts. The first part was the project flow, then the block diagram and project design. Next, was the element needed in this project including hardware and software used.

3.2 Project Work Plan

A correct project planning is very important for a successful project outcome. project work plan is to ensure that the project is done during the time given. The time taken to finish the project would be 2 semesters equivalent to 30 weeks. Moreover, during the first semester we just need to prepare for the report including a research related to the project proposed including design, project flow, block diagram and device to be used. Gant chart below shows the project progress flow from the beginning which is selection of project tittle until the project reports submission. The implementation of hardware and software also stated in a flow chart.

3.3 Project Flow Chart



3.4 Cost Estimation

Cost estimation is quite crucial because the project's major goal is to construct a low cost contactless temperature with build in Sanitizer. Table 3.1 shows the cost calculation for this project based on the sensors, modules, and microcontroller.

Table 3.1: Cost Estimation

Component	Quantity	Price	Total Price
Arduino Uno R3	1	RM35.00	RM35.00
Ultarsonic Sensor (HC-SR04)	1	RM3.20	RM3.20
LCD 16X2	1	RM8.90	RM8.90
Infrared Temperature Sensor (MLX90614)	1	RM60.00	RM60.00
Servor Motor	2	RM5.80	RM11.60
LED	2	RM0.50	RM1.00
Infrared Sensor	1	RM2.20	RM2.20
TOTAL			**RM121.90**

3.5 System Overview

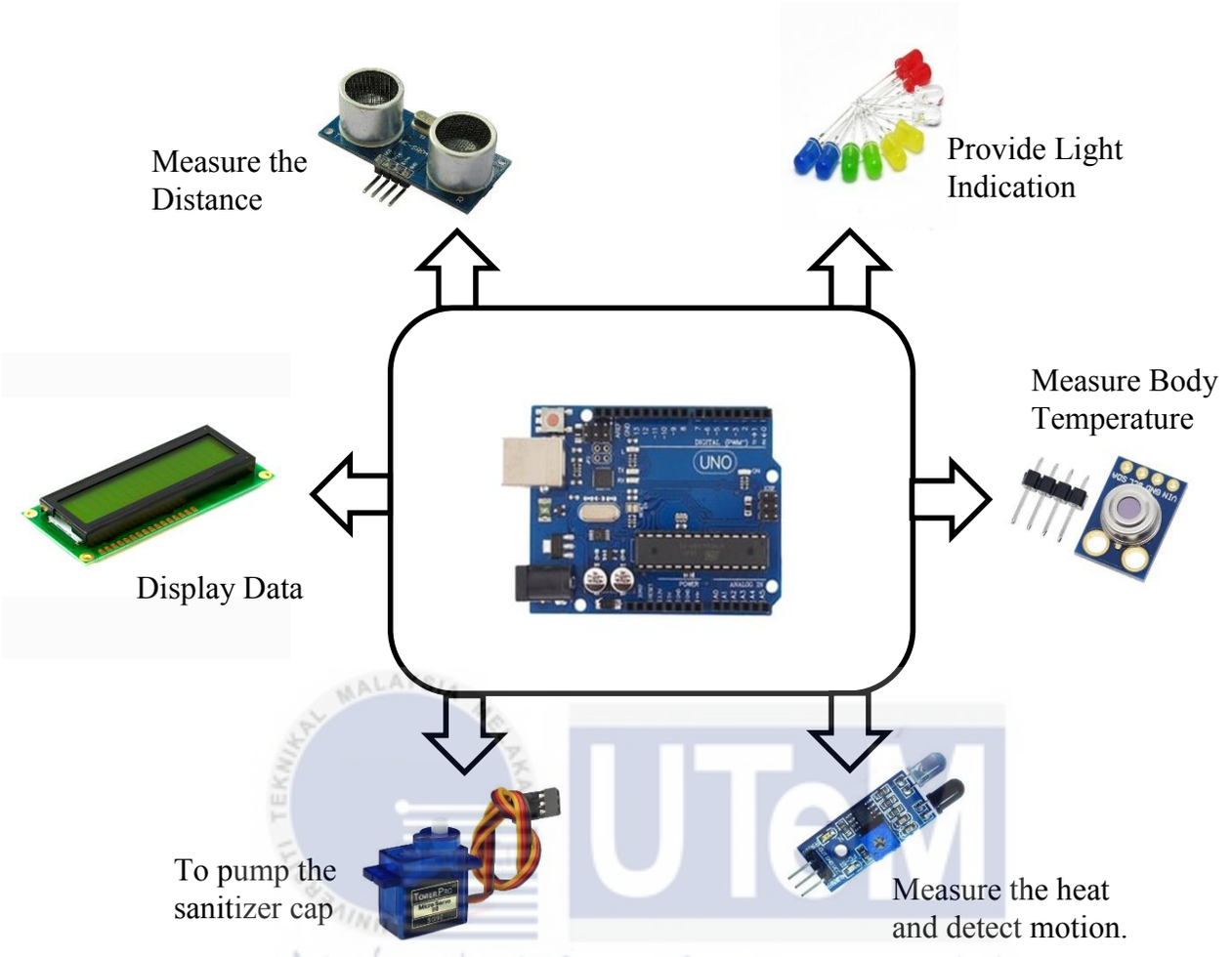


Figure 3.1: Block Diagram

CHAPTER 4

RESULTS AND DISCUSSIONS

4.1 Introduction

This chapter focuses on the results and outcomes of the project. In this project, the combination of software application and hardware component will make the program works. The aim of this project to develop a smart contactless body temperature scanner with automatic sanitizer utilizing low-cost commercially available microcontroller modules and sensors. The microcontroller module that will be use is the Arduino Uno. Arduino Uno is the programmable open-source microcontroller board that can be integrated into a variety of electronic projects. In this case it will control the sensors , servor motors.

4.2 Development tools

This project's development tools including the open sources software application as below:

I. Arduino IDE
   - This software is used to create a code before uploading to the Arduino board.

II. Proteus 8 Professional
   - This software is used to draw the schematic diagram and simulate the schematic diagram.

4.3 Project Design

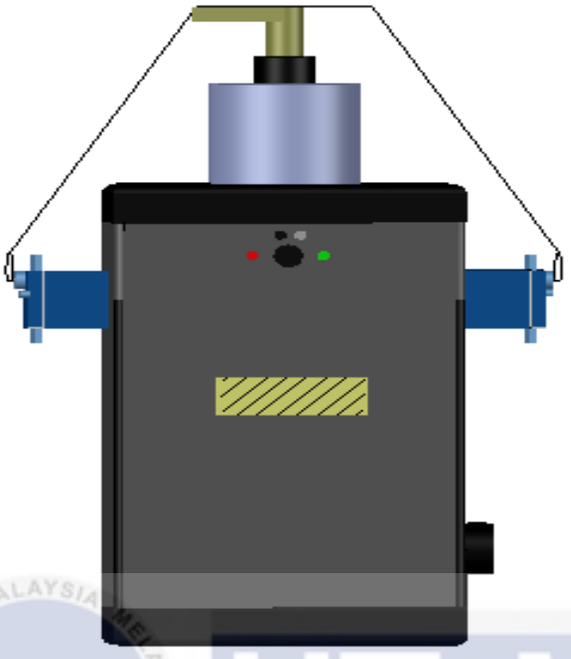


Figure 4.1 Project Design in Autocad

Figure 4.2 Project Prototype

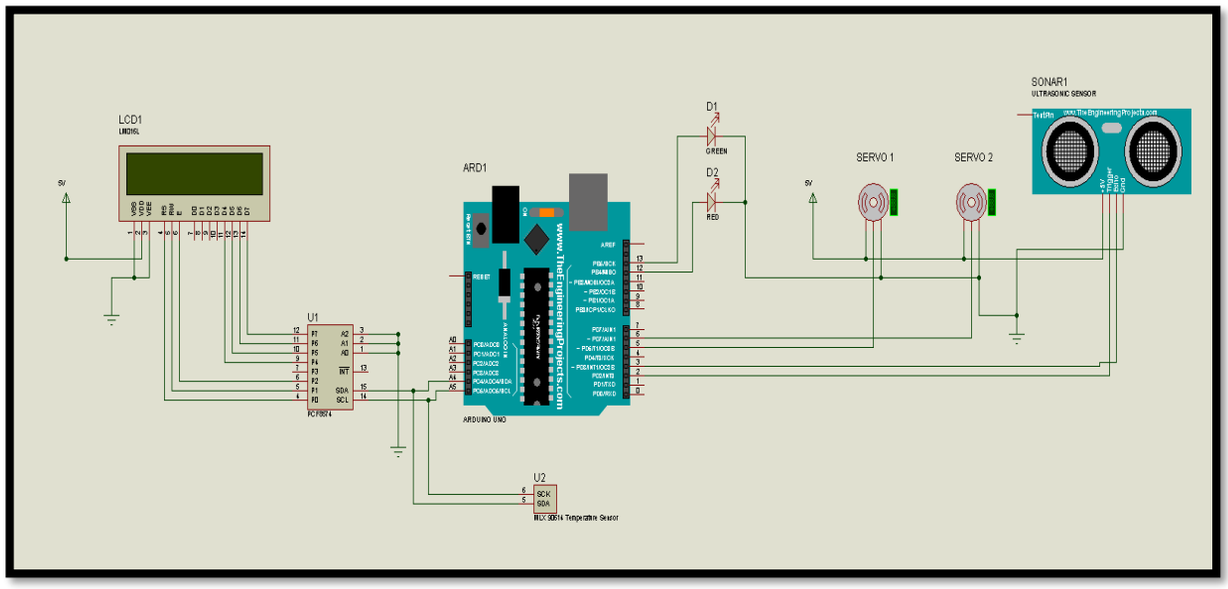


Figure 4.3 : Project Schematic Design

4.4 How does the Project Works?

Based on the project methodology, this project is designed using software and hardware. The main hardware component used in this project including the LCD 16x2, Servor motor, Contacless temperature sensor MLX90614, Ultrasonic Sensor HC-SR04 and Arduino Uno R3. For the software, the Arduino IDE is used to create a coding. The hardware design for Human Temperature Detector By Using Sensor And Automatic Sanitizer is shown in figure 4.4 and 4.5.

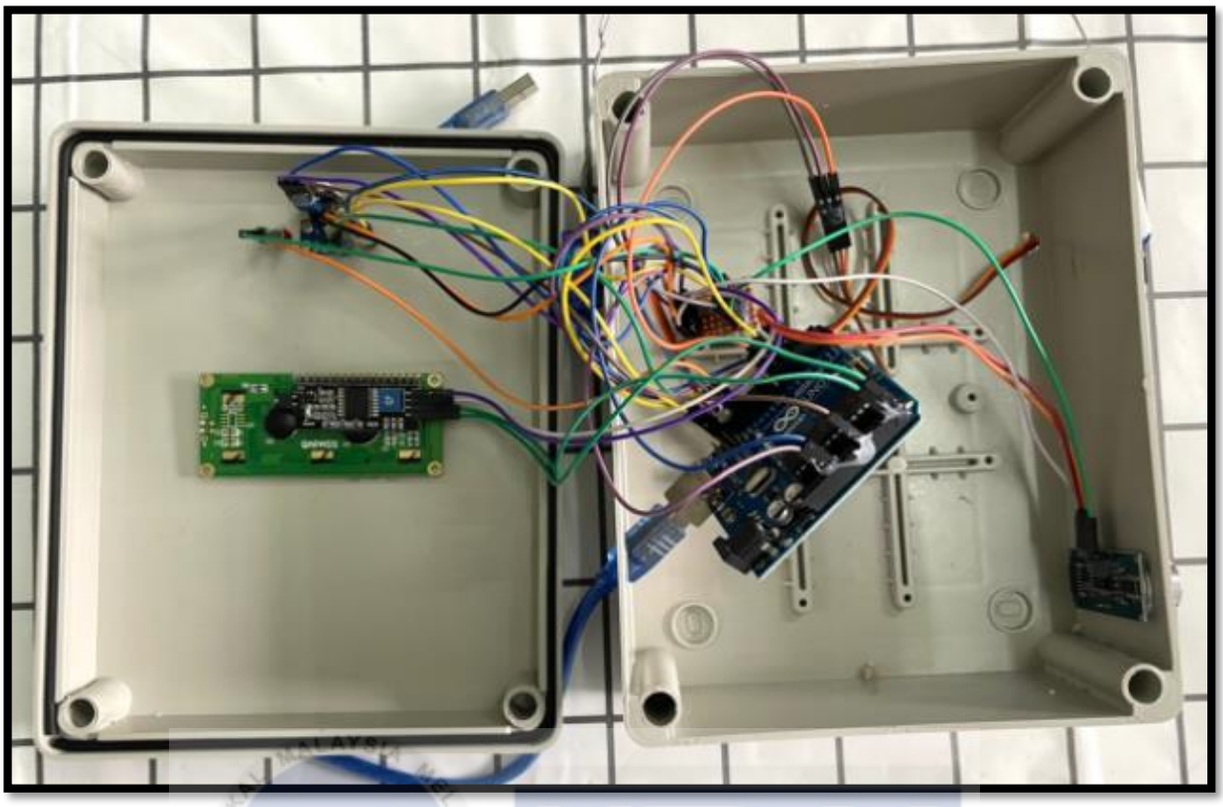


Figure 4.4: Prototype (BEFORE)

Figure 4.5: Prototype (AFTER)

This project is mainly to measure the temperature of human body with the build it hand sanitizer. In this project, the MLX90614 is used to measure the temperature of the human

body. Figure 4.6 show that the display before the procedure is begin. The LCD will display "Auto Sanitizer".

Figure 4.6: Start Mode

Figure 4.7 indicates the display of normal temperature reading which below than 37.5 C on the LCD. Thus, the Green LED light will turn ON. If the reading of the temperature is more than 37.5 C. The Red LED light will Turn ON. Figure 4.8 indicates the display when the temperature is high. The contactless temperature can measure the temperature up to 3cm distance. The proof of the distance will be discussed based on the data collected in table 4.1 until 4.3.

Figure 4.7: Temperature <37.5C and LED Green Turn ON

Figure 4.8: Temperature >37.5C and LED Red Turn ON

The ultrasonic sensor HC-SR04 is used to detect the motion of the hand and give feedback to the servor motor. The servor motor will start to rotate 90 degrees and dispense the hand sanitizer. The LCD will display “Sanitizing”. Figure 4.9 and 4.10 show how it works.

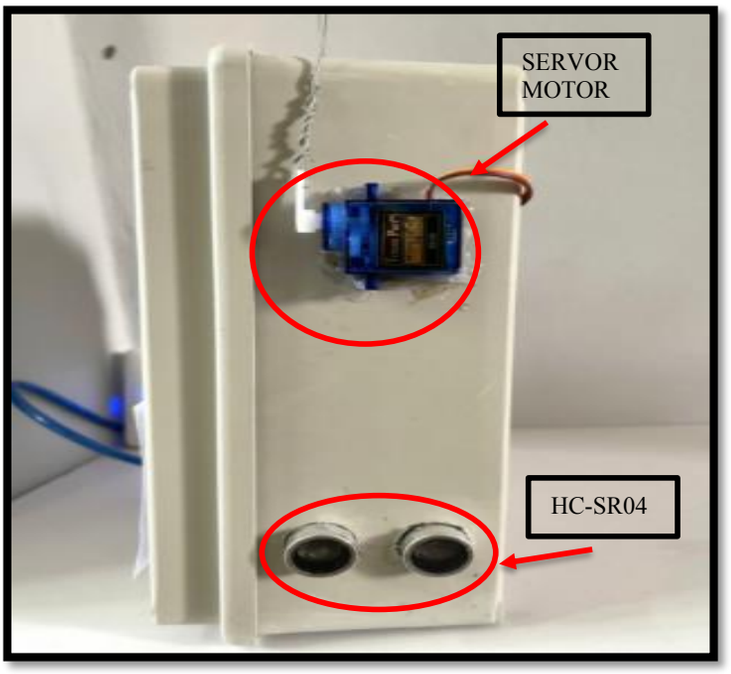


Figure 4.9: Sensor And Servor Motor

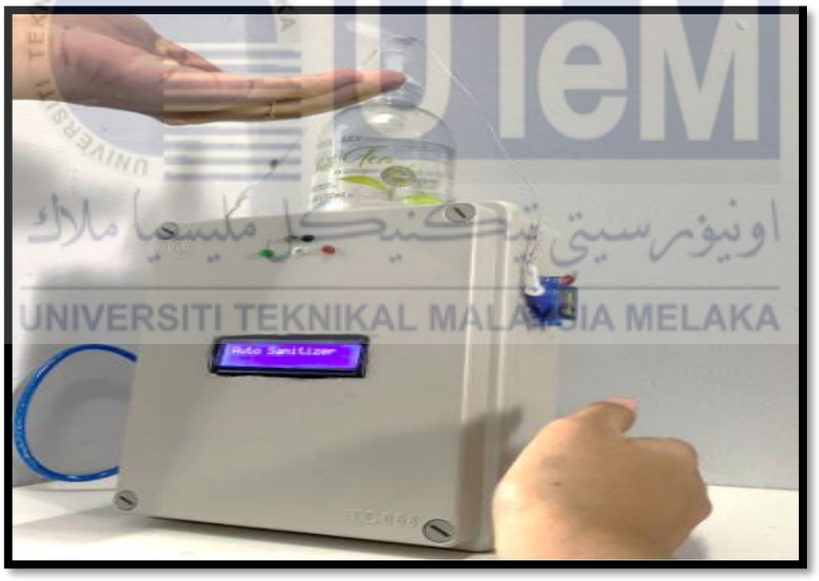


Figure 4.10: Sanitizing

4.4.1 Result and Analysis

Table 4.1: MLX90614 sensitivity & distance testing.

Distance (cm)	Detect	Not Detect
1	/	
2	/	
3	/	
4		/
5		/
6		/
7		/
8		/

Table 4.2: HC-SR04 sensitivity & distance test.

Distance (cm)	Detect	Not Detect
1	/	
2	/	
3	/	
4	/	
5	/	
6	/	
7	/	
8	/	
9		/
10		/
11		/
12		/
13		/
14		/
15		/

Table 4.3 show the data collected to compare the temperature measured by the contactless sensor MLX90614 between the human forehead and the human palm. Testing was done with 3 different distance of 1cm, 2cm and 3cm.

Table 4.3: Temperature comparison between Forehead & Palm

	Temperature Measured (C)					
	Forhead			Palm		
No.	1cm	2cm	3cm	1cm	2cm	3cm
1	34.51	33.47	33.63	34.99	34.07	33.11
2	34.33	34.33	33.63	34.13	34.15	33.21
3	34.23	33.87	33.25	34.45	34.43	32.97
4	34.59	34.37	33.85	34.61	34.29	33.69
5	34.71	34.09	33.71	34.71	33.99	33.05
6	34.67	34.33	33.63	34.67	34.09	33.49
7	34.47	34.15	33.63	34.37	33.99	33.11
8	34.39	34.03	33.49	34.51	34.17	33.25
9	34.47	34.31	33.57	35.35	33.93	32.95
10	34.33	34.31	33.65	35.45	33.73	32.97
Average	34.47	34.13	33.60	34.72	34.08	33.18

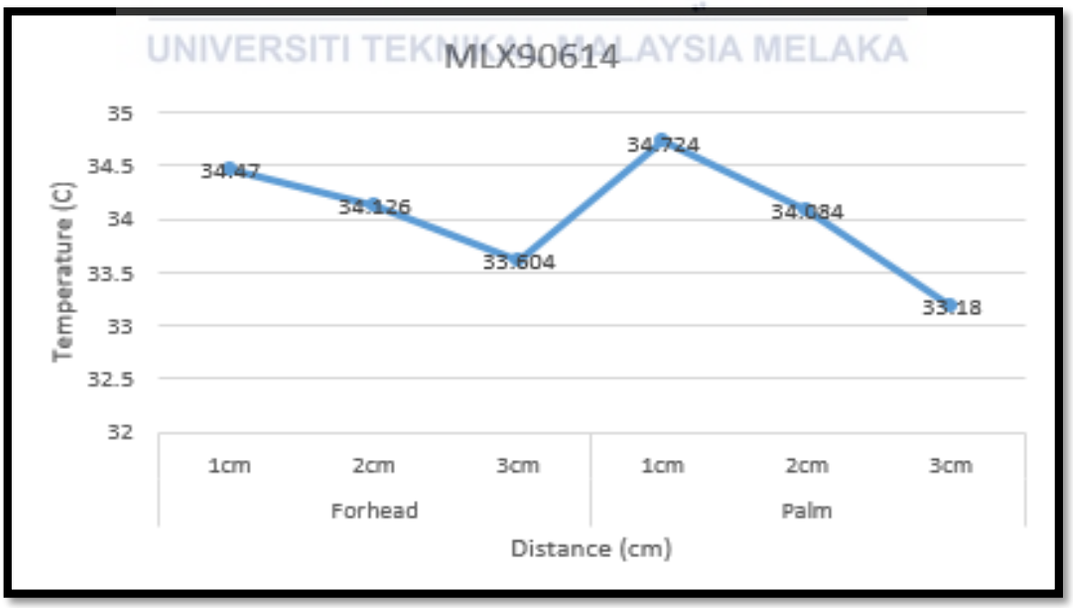


Figure 4.11: Temperature Vs Distance

From figure 4.11 show the different temperature measured for forehead and palm. Based on the graph, there is a different of temperature reading based on the distance 1cm, 2cm and 3cm. In short, the longer the distance between sensor and the surface to measured (forehead & palm), the less accuracy of the temperature reading.

CHAPTER 5

CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

This project's primary purpose is to develop a low cost contactless temperature sensor equipped with automatic sanitizer dispenser. The use of the thermometer and sanitizer has been necessary for everyone in the world since the pandemic occurs. In fact, there are few reasearch has been made for the past years regarding the importance of thermometer and hand sanitizer. This project present the contactless temperature detector and contacless hand sanitizer which automated. It is very convinience to use everywhere such in in school, factory, mall and etc. The prototype of the proposed project design was sucessfully tested in-house and it worked well.

5.2 Future Works

For future improvements of this project can be improved in 3 aspects these aspects includes design, accuracy and additional features:

i) Using a Wi-Fi module, additional functionality such as real-time virtual monitoring can be achieved in future works. This feature enables the user to monitor the data collected at any time and from any location. In addition, the system may send an email to the user if somebody with an abnormal temperature is discovered.

ii) Use high , accurate and wide range sensitivity of sensor to measured the human temperature as the sensor use in this project can only measured up to 3cm maximum. It is probably because the sensor is not calibrated.

iii) Add more features in the project such as the alarm system to trigere when the temperature is high.

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APPENDICES

Appendix A Arduino Coding

```
#include <Adafruit_MLX90614.h>
Adafruit_MLX90614 mlx = Adafruit_MLX90614();


#include <Servo.h>

Servo myservo1;  // create servo object to control a servo
Servo myservo2;  // create servo object to control a servo

#include <Wire.h>
#include <LiquidCrystal_I2C.h>
//sda D2, SCL D1
//I2C pins declaration
LiquidCrystal_I2C lcd(0x27, 2, 1, 0, 4, 5, 6, 7, 3, POSITIVE);


#define trigPin1 2
#define echoPin1 3

int ir;
int green = 13;
int red = 12;

long duration, distance, Sensor1;
void setup() {

pinMode(trigPin1, OUTPUT);
pinMode(echoPin1, INPUT);
pinMode(A0,INPUT);
pinMode(green,OUTPUT);
pinMode(red,OUTPUT);
```

```
  if (!mlx.begin()) {
    Serial.println("Error connecting to MLX sensor. Check wiring.");
    while (1);
  };

   myservo1.attach(5);
   myservo2.attach(6);

    myservo1.write(90);//0
    myservo2.write(90);//0


  Serial.begin(9600);

  lcd.begin(16,2);//Defining 16 columns and 2 rows of lcd display
lcd.backlight();//To Power ON the back light
lcd.setCursor(0,0);
lcd.print("Auto Sanitizer");


}

void loop() {

 ir = digitalRead(A0);
SonarSensor(trigPin1, echoPin1);
Sensor1 = distance;
Serial.print("Sensor 1: ");
Serial.print(Sensor1);
Serial.println("cm");
```

```
  Serial.print("Temp ");
 Serial.println(mlx.readObjectTempC());


  Serial.print("IR: ");
  Serial.println(ir);

 if(mlx.readObjectTempC() < 37.5 && ir == 0)
 {
   digitalWrite(green,HIGH);
   lcd.clear();
   lcd.setCursor(0,0);
   lcd.print(mlx.readObjectTempC());
   delay(1000);
   lcd.clear();
   digitalWrite(green,LOW);
   lcd.setCursor(0,0);
   lcd.print("Auto Sanitizer");
 }
```

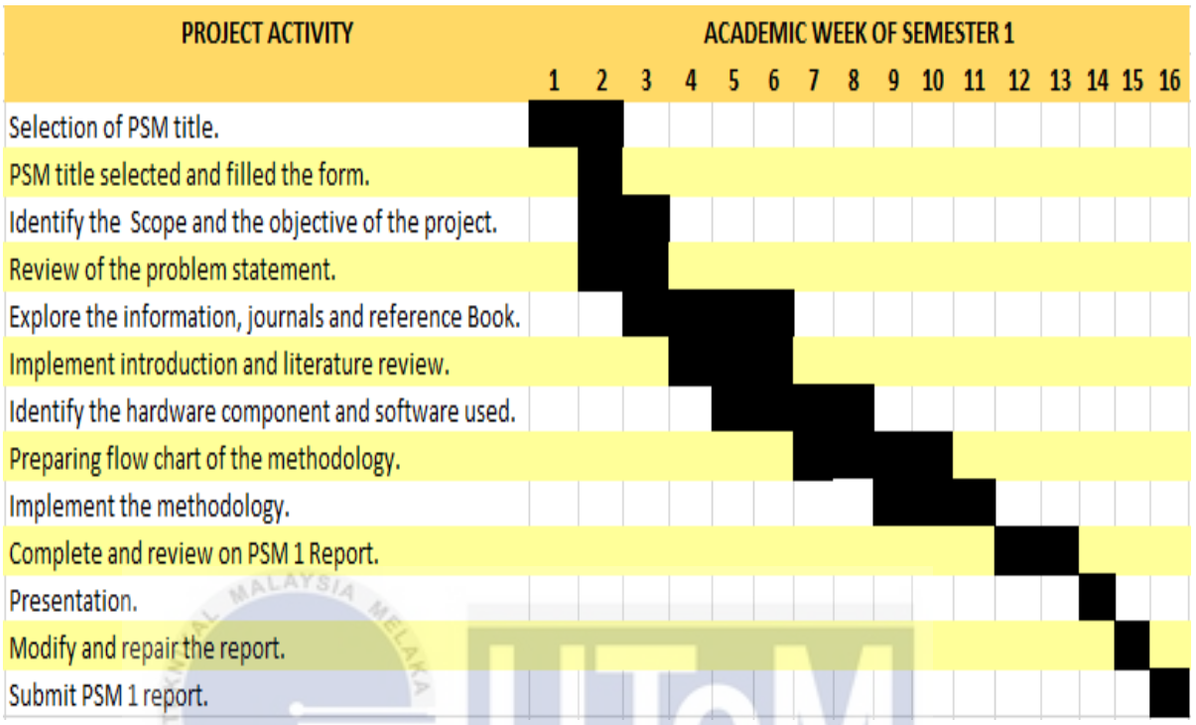
```
  else if (mlx.readObjectTempC() > 37.5 && ir == 0)
  {
     digitalWrite(red,HIGH);
    lcd.clear();
    lcd.setCursor(0,0);
    lcd.print(mlx.readObjectTempC());
    delay(1000);
    lcd.clear();
    digitalWrite(red,LOW);
    lcd.setCursor(0,0);
    lcd.print("Auto Sanitizer");
  }

if(Sensor1 < 10)
{

   lcd.clear();
   lcd.setCursor(0,0);
   lcd.print("Sanitizing..");
   myservo1.write(0);//0
   myservo2.write(180);//
   delay(500);
   myservo1.write(90);//
   myservo2.write(90);//
   delay(500);
   lcd.clear();
    lcd.setCursor(0,0);
    lcd.print("Auto Sanitizer");
}
```

Appendix B Gantt Chart BDP1 & BDP2

BDP1 Gantt Chart



BDP2 Gant Chart