UNIVERSITI TEKNIKAL MALAYSIA MELAKA

DEVELOPMENT OF EMERGENCY VEHICLE LOCATION TRACKING SYSTEM BY USING MYSQL

This report is submitted in accordance with the requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor Electronics Engineering Technology (Telecommunications) with Honours.

by

MUHAMMAD HARISH ILMAN BIN ROSLI

FACULTY OF ELECTRICAL AND ELECTRONIC ENGINEERING

TECHNOLOGY

2021

DECLARATION

I hereby, declared this report entitled Development of Emergency Vehicle Location Tracking System by Using MySQL is the results of my own research except as cited in references.

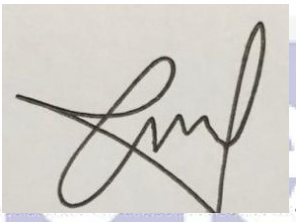
Signature: 

Author: MUHAMMAD HARISH ILMAN BIN ROSLI

Date: 15/01/2021

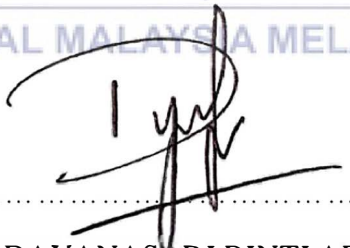
APPROVAL

This report is submitted to the Faculty of Electrical and Electronic Engineering Technology of Universiti Teknikal Malaysia Melaka (UTeM) as a partial fulfilment of the requirements for the degree of Bachelor of Electrical and Electronic Engineering Technology (Telecommunication) with Honours. The member of the supervisory is as follow:



Signature: .....

Supervisor : PUAN NORLEZAH BINTI HASHIM



Signature: .....

Co-supervisor: PUAN DAYANASARI BINTI ABDUL HADI

ABSTRAK

Projek ini adalah mengenai pembangunan Sistem Penjejakan Lokasi Kenderaan Kecemasan yang berasaskan Wi-Fi, GPS, pangkalan data dan Internet of Things (IoT). Projek ini dapat memantau lokasi kenderaan kecemasan dengan menggunakan modul GPS dan pangkalan data dari MySQL. Pada masa kini, kenderaan kecemasan memainkan peranan penting dalam masyarakat kita. Oleh itu, masa yang diperlukan untuk kenderaan kecemasan tiba di lokasi perlu tepat dan selalu tiba dalam jangka masa yang diberikan. Fungsi utama m projek ini adalah untuk menganggarkan masa nyata yang diambil untuk kenderaan kecemasan yang tiba di lokasi tertentu. Selanjutnya, hasil dari projek ini menunjukkan lokasi, masa yang diambil dan kelajuan kenderaan kecemasan dengan sistem penjejakan masa nyata. Lebih-lebih lagi, dengan susunan GPS dan pangkalan data dalam projek ini, ia akan memberikan data yang tepat kepada pengguna. Selain data yang tepat, sistem ini dapat mengakses atau memantau di desktop pengguna atau layar pemantauan.

ABSTRACT

This project is about the development of Emergency Vehicle Location Tracking System that based on Wi-Fi, GPS, database and Internet of Things (IoT). This project could monitor the location of the emergency vehicle by using the GPS module and database from MySQL. Nowadays, emergency vehicle is playing a crucial role in our society. Therefore, the timing or the time taken for an emergency vehicle to arrive on the exact location is needed to be precise and always arrived in the period of time given. The main function of developing this project is to estimate the real-time taken for an emergency vehicle arrived at the specific location. Furthermore, results from this project shows the location, time taken and speed of the emergency vehicle with a real-time tracking system. Moreover, with the arrangement of GPS and database in this project, it will give an accurate data to the user. Besides an accurate data, this system will be able to access or monitor on the user's desktop or monitoring screen.

DEDICATION

Special dedication to my beloved parents.

EN. ROSLI BIN MDNOR

PN.ZAIRENNA BINTI ONN @NGON

My family,

(Ahmad Nabil Fiqri Bin Rosli, Ahmad Danial Hakeem Bin Rosli, Ahmad Akmal Faez Bin Rosli)

My soft and kind hearted supervisor,

PN. NORLEZAH BINTI HASHIM

ACKNOWLEDGEMENTS

With the highest praise and gratitude to my creator Allah SWT for giving me the strength to went through all difficulties and hardship to accomplish my thesis. Sincerely from the bottom of my heart, I want to express my appreciation to my beloved supervisor, Puan Norlezah binti Hashim for her experience, wisdom, encouragement, guidance, critics and advice. Not to be forgotten to all lecturers that had taught me over these past 4years.

Next, I would like to express my appreciation to my beloved parents, Rosli bin MdNor and Zairenna binti Onn@Ngon, family members and my friends for all of their support, motivation and pray from the initial of my thesis until the end. Last but not least, special thanks to Encik Safyzan bin Salim, my housemates, my classmates and others for helping and giving support to me until this thesis is complete.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

LIST OF SYMBOLS

V	-	Volts
GHz	-	Giga Hertz
KB	-	Kilo Bytes
MB	-	Mega Bytes
|MHz	-	Mega Hertz
KHz	-	Kilo Hertz
m/s	-	Meter per Second

LIST OF ABBREVIATIONS

CPU	Central Processing Unit
IoT	Internet of Things
GPS	Global Positioning System
Wi-Fi	Wireless Fidelity
MCU	Microcontroller Unit
GSM	Global System for Mobile
LCD	Liquid Crystal Display
DC	Direct Current
DBMS	Database Management System
SQL	Structured Query Language
MEO	Medium Earth Orbit
API	Application Programming Interface
GPIO	General Purpose Input/Output
UART	Universal Asynchronous Receiver/Transmitter
PWM	Pulse Width Modulation
SRAM	Static Random Access Memory
USB	Universal Serial Bus
TX	Transmitter
RX	Receiver
GND	Ground
RAM	Random Access Memory

GNSS Global Navigation Satellite System

LIST OF PUBLICATIONS

CHAPTER 1

INTRODUCTION

1.1 Background

This project is about the development of Emergency Vehicle Location Tracking System. Hence, this project is also based on Global Positioning System (GPS), database, Wi-Fi and Internet of Things (IoT). In this new era, IoT technologies are widely used this day. It gives lot of advantages to the user such as leads several design techniques to achieve different efficiency and performance objectives (Gregorio *et al.*, 2020). Next, wireless fidelity or Wi-Fi is a wireless networking technology that uses radio waves to deliver high-speed wireless network. It is connected to smart phone, computer, tab, laptop and other smart device nowadays. Meanwhile, database is used for efficient data entry and database management. It has been shown that very effective ways for storing large volumes of data relies on data base software in equal amounts, supporting file structures, sound database administration practices and adherence to strict data-capture protocols in the field (Abzalov, 2016).

Besides that, this project also used Global Positioning System (GPS). The Global Positioning System (GPS) is a United States run satellite navigation system. The array consists of a constellation of nominally 24 medium-altitude Earth orbit (MEO) satellites, as well as a regional ground network for tracking and controlling satellites (Hegarty, 2017).

Furthermore, this project will combine all four components above and will give a good impact to the user that using this project. There are many application that can relate

with this project such as Google maps, Waze, Whatsaap (share live location) and etc. Moreover, by implement and develop this system, it will give a lots of benefit that can be used in the future.

1.2 Objective

1. To design and develop real-time location tracking system for emergency vehicles.
2. To analyse in term of functionality.

1.3 Problem Statement

Nowadays, emergency vehicle is playing a crucial role in our society. Therefore, the timing or the time taken for an emergency vehicle to arrive on the exact location is needed to be precise and always arrived in the period of time given.

Furthermore, the person who is driving the emergency vehicle need to report back their current location towards the control centre. So, the officer at the control centre will have to wait and cannot get the update of the emergency vehicle until it has been informed by the driver. Thus, this project will overcome the problem by using real-time location tracking system and it will be easily to access on the web within any monitoring devices.

1.4 Scope of Research

The Internet of Things (IoT) is the internetworking of physical devices or a smart devices that could connecting them to cloud, as to get information slightly from everywhere. Besides that, a nodeMCU ESP8266 is connecting to the Global Positioning

System (GPS) as the hardware of this project that could send data wirelessly to the database that is MySQL and to others IoT system.

The GPS that will be use is Neo6m that is compatible to node MCU ESP8266, it will give an accurate position where is the emergency vehicle is heading and arriving. This project will progress an electronic device that could notice the location and systematically updated in the database of an emergency vehicle.

1.5 Thesis Organizing

This project is about a real time detection location tracking system against the IoT system and database. This thesis consists of five chapters. For chapter one, a detailed explanation on the introduction of the project, objective and scope of the project. Next in the chapter two, the literature review has been conducted to do some research on the existing technologies and the method used in the previous projects has been discussed to make an improvement to this project. Besides that, for the chapter 3 has been explained more details about the hardware, software and the components that will be used in this project. Moreover, the flowchart of the project also will be shown as an overview of this project implementation. In the chapter 4, the results and analysis will be shown to proven the data has been recorded and taken for this project. Lastly in the chapter 5, the recommendations has been stated for future works against this project.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This chapter will be providing on the previous work or research which is precisely related to the progress based on database and IoT system that were used by people around the world. Moreover, all of the information is obtained from journal, books and internet. Next major part is will be explaining about the microcontroller and microprocessor of node MCU ESP8266.

2.2 Past related works

Based on this article (Kumar, B Hari and Tehseen, Syeda Faathima and Thanveer, S and Krishna, Guntha Vamshi and Akram, 2016) had stated that the purpose of location tracking system of a vehicle is to increase it safeness. This project used Global Positioning System (GPS) and Global System for Mobile (GSM) which both of the method are used to send data to the user. This project has a different approach for parameters like temperature and it has a feature of automatically slowing down the vehicle speed as soon as the locations detected by GPS are school and hospital. Besides that, it is also has a voice output for those particular zones to alert the driver. The hardware that has been used for this project are AT89S52-microcontroller, GSM module, GPS module, Thermistor, ULN 2003, APR 9600, 16x2 LCD, DC motor and speaker. Meanwhile for

software that has been used are assembly language coder and other IoT web others web application.

Next, in the studies from the author (Rahman *et al.*, 2017) had proposed an IoT solution that can track the movement of a car and location at any time. This project is an arduino based vehicle tracking system that are implemented with Global Positioning System (GPS) and Global System for Mobile (GSM) that will provide the coordinate to the user. Furthermore, the user can see the car is moving when using this project and the location name will be displayed on LCD. This project also offers a user friendly system, ensures safety and surveillance at low maintenance cost. The hardware that has been used are GPS module, GSM module, Arduino Uno, LCD and cell phone. Next for the software that has been used are Arduino IDE and Google Maps.

Based on the article that has been wrote by the author (Koley and Ghosal, 2017) stated that Internet of Things (IoT) have the ability to change human live by making it easier, smarter and safer. The purposed of this project is to provide an emergency communication and location tracking system in a remote car that had involvement in an accident or any other emergency situation. This project have two ways of solution that are manually and automatically depending on the type of emergency or accident. It will initiates and send the data to the authorities according to the type of emergency or accident. The data that will be send were such as location, images of the car from prefixed angle with appropriate server/authority. This project also proposed a system to monitor the exact in real-time basis. The hardware that has been used are Raspberry Pi 3 model B and GPS. For the software that has been used is Arduino IDE.

Moreover, IoT platform that has been used in this article (Sinha *et al.*, 2017) is a cloud server. The author had stated that the purpose of this project is to determine the

location of the bus so that students will not get late or arrive too soon at the bus stop. This is a very low cost project that involving android applications (Google maps) and client server. By using this project, it helps students to allocate the bus position since it is used a real time location tracking system. The hardware that has been used is an android mobile smartphone. For the software that has been used is database platform.

In this era of technology every person in this world use wireless technology in their daily life such as mobile phone, laptop and others electronic devices. Furthermore, with the existence of wireless technology will able to give the user easily communicate or interact or gain information at anywhere and anytime. This also a communication technology that could connect even wherever we are located. (Ranjini and Yamuna, 2011)

2.2.1 Comparison of past related works

By referring on the Table 2.1 below shows the comparison between the past related works with the previous studies. The year of articles, hardware of the components, software components, IoT application system, advantages and disadvantages will be shown in the table. Based on the table it will come to a conclusion that the hardware components of GPS module are mostly used to detect the location of a vehicle. Due to that, this project will be implementing this module to detect the location of an emergency vehicle.

Moreover, based on the comparison above the Emergency vehicle location tracking system by using MySQL is a better project that previous project because this project is a low cost project and can be easily to monitor since it used a database. By

implementing MySQL, any device that has an internet connection can get access to the system rather than using specific apps that need to be installed in a device like the previous studies.

Meanwhile the processor that will be develop is the Node MCU ESP 8266 which the function is to connect GPS reading to the MySQL database. Furthermore, this Node MCU ESP 8266 is very compatible with Arduino IDE software and the coding is easily to find in the internet. By using IoT and Wi-Fi make this project can easily to gain information form the GPS module. So this is the reason why I choose Emergency Vehicle Location Tracking System by using MySQL.

Table 2.1: The comparison between previous project studies

Year	Publication	Hardware component	Software component	IoT application type	Advantage	Disadvantage
2016	(Kumar, B Hari and Tehseen, Syeda Faathima and Thanveer, S and Krishna, Guntha Vamshi and Akram, 2016)	AT89S52- microcontroller, GSM module, GPS module, Thermistor, ULN 2003, APR 9600, 16x2 LCD, DC motor and speaker	Assembly language coder and other IoT web others web application.	GSM Modem	Ensure safeness of a vehicle and faster in gain data since it use GSM, no need internet connection.	Complexity in coding
2017	(Rahman *et al.*, 2017)	GPS module, GSM module, Arduino Uno, LCD and cell phone	Arduino IDE and Google Maps	GSM Modem	Ensures safety and surveillance at low maintenance cost	Only provide the latitude and longitude
2017	(Koley and Ghosal, 2017)	Raspberry Pi 3 model B and GPS	Arduino IDE	Web application	Accurate data and low cost	Need to have specific angle for image caputirng
2017	(Sinha *et al.*, 2017)	Android mobile smartphone	Database platform	Cloud server	Low cost	Only applicable for android user's only and not very accurate

2.2.2 Wi-Fi: Wireless Fidelity

Wi-Fi is a medium of wireless network technology that is used for any device to connect to the internet. The Wi-Fi frequency range start from 2.4GHz to 5GHz to ensure there is no interference between others devices that will be encounter during the transmission. Furthermore, Wi-Fi also known as a device that perceiving and interpreting the waves and sending back the data to the router. Besides that, Wi-Fi is a technology that enable two or more devices wirelessly connected to the internet for sharing data purposes. It is using IEE 802.11 wireless networking standard. Wi-Fi now has become a phenomenon that everyone are using it with various of devices and more gadgets that will be built in feature of wireless technology (Ranjini and Yamuna, 2011). Figure 2.1 shows the Wireless Fidelity (Wi-Fi) connecting to gadgets, electronic devices and personal computer for exchanging the information between two or more devices.

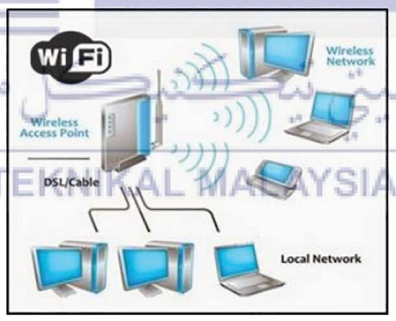


Figure 2.1: Wireless Fidelity (Wi-Fi) (www.javapoint.com)

2.2.3 Global Positioning System (GPS)

GPS is a navigation system that is showing the location of something based on satellite. It has a receiver and algorithms for synchronizing air, sea and land travel location, velocity, and time data. In six Earth centered orbital planes, the satellite system consist of 24 satellites constellation. Each of four satellites will be orbiting at 13,000 miles that is equal to 200,000 km above the Earth with a travelling speed of 8,700 mph that is equal to 14,000km. Based on the article (Hegarty, 2017) it has been stated that GPS is a satellite navigation system that is operated by the United States. The system consist of nominally constellated by 24 satellites in medium altitude earth orbit (MEO), as well as a global ground network to monitor and checks satellites. The GPS programme which began in the early 1970s, was declared fully operational in 1995. Globally, the GPS constellation is considered to be only one component in the global navigation satellite collection known as the Global Navigation Satellite (GNSS).

Figure 2.2: Global Positioning System (GPS) (www.spaceplace.nasa.gov)

2.2.4 Database

The database is a systematic collection of structured information, or data that is typically stored electronically in a computer system. A database is usually controlled through a DBMS (Database Management System). Together, the data and the DBMS are referred to as a database system along with the applications associated with them, often shortened to just a database. Data within the most common types of databases in use today is usually modelled in a series of tables in rows and columns to make processing and querying data efficient. They can then easily access, manage, modify, update, control and organize the data. Most databases use the Structured Query (SQL) language to write and query data. The main principles for building and managing a relational database are explained in conjunction with practical recommendations for efficient data entry and data base management. It is emphasized that poor data base management practices can degrade the efficiency of a relational database, in particular inadequate monitoring of field and office data flows (Abzalov, 2016).

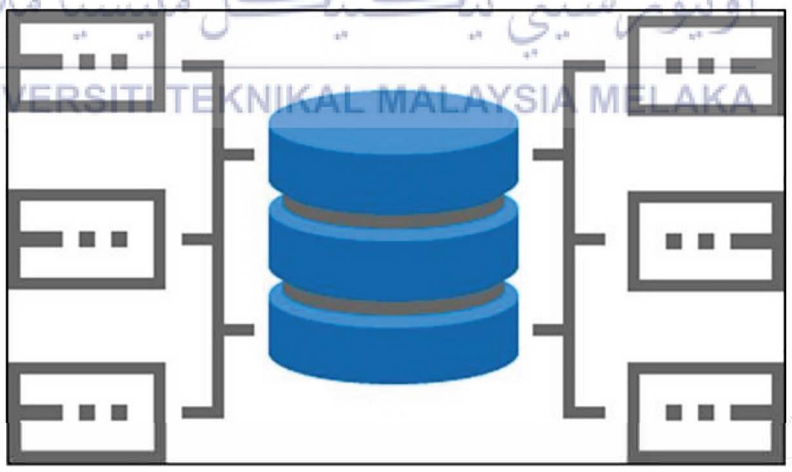


Figure 2.3: Database (www.dataeducation.com)

2.3 Internet of Things (IoT) system in Technology

2.3.1 History and Background

The concept of the Internet of Things is age 16. But, at least since the 1970's, the real idea of connected devices had become longer. The concept was then referred to as "embedded internet" or "persistent computing." However, during his tenure at Procter & Gamble in 1999, Kevin Ashton coined the real term "internet of things." Ashton had been involved in the optimization of the supply chain and wanted a new exciting technology called RFID to attract the attention of senior management. Since the Internet was the hottest new phenomenon of 1999, and because it was in some way meaningful, Kevin called the "Internet of Things" his presentation. Although Kevin was interested by some P&G leaders, Internet of Things for the next 10 years was never widely used. The IoT concept began to gain popularity in the summer of 2010. Feedback reported that not only took photos of 360 grades but also stored tons of data on the individual Wi-fi networks of the Google StreetView service. People asked if that was the start of a modern Google plan not only to catalog the internet but the physical world. In the same year, the Chinese government stated in its Five Year Plan that the internet of things would become a strategic priority. A new technological phenomenon, the "Internet of Things," was listed by Gartner, which coined the popular "hype cycle of emerging technologies," in 2011. LeWeb was the theme for Europe's largest Internet meeting next year. Meanwhile, prominent technological magazines, such as Forbes, Fast Company and Wired, are also beginning in Europe. In October 2013, IDC published a report stating that the Internet of Things will reach $8.9 trillion by 2020. When Google revealed that it will buy NET for $3.2 trillion in January 2014, the word Internet of Things became mass market exposed. The Consumer Electronics Show in Las Vegas was concurrently presented under the

name of IoT. IoT enables an unmissable number, automated network devices from the production line to be remotely connected to, communicated and controlled by the hospital's operating room. This is a condition in which energy, computing and networking systems are built into everyday objects. The capabilities of the processing, storage, and communication of an object turn an object into a utilities for which users pay per usage (Navani, Jain, and Nehra, 2018).

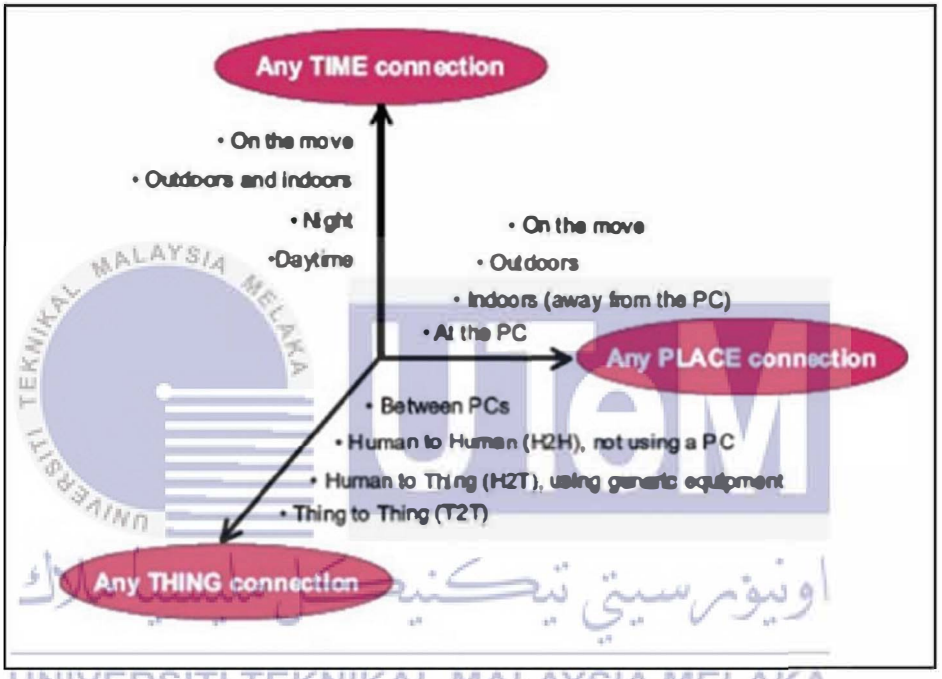


Figure 2.4: A new dimension of Internet (Navani, Jain & Nehra, 2018)

Also in this era, the Internet of Things is about to become part of everyday life for all people around the world (Bastos, Shackleton, and El-Moussa, 2018). In addition, using IoT in Gartner's forecast, the IoT is defined as the network of physical objects containing embedded technology for communicating and interacting with people around the world wherever they are.

IoT ecosystems are web-enabled electronic devices that use implanted processors, sensors, and communication hardware to collect, transmit, and communicate

with the data they receive from their environment. Meanwhile IoT devices share the sensor of data that they had collected by connecting IoT or others devices where the data is be sent to the cloud and to be analysed. The connectivity, communication and networking protocols had to be used with this web-enabled devices mostly depends on the specific IoT applications that had been registered. Figure 2.5 shows the example of how IoT system works.

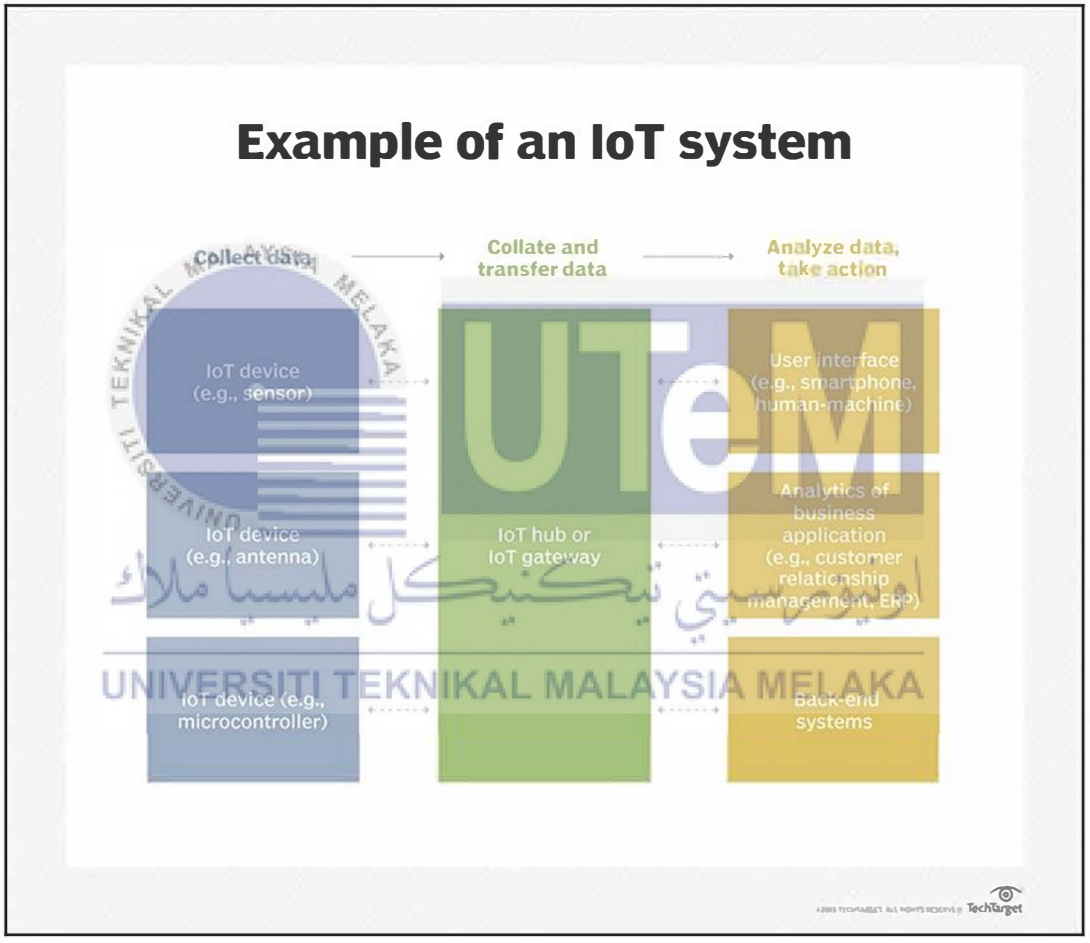


Figure 2.5: Example on how an IoT system works (www. cdn.ttgtmedia.com)

2.3.2 Benefits of IoT

In retail business IoT offers businesses the ability to access more information that could result in innovation, high efficiency and productivity (Dlamini and Johnston, 2017). In addition, IoT technologies can set up a retail business to record their product and enable companies to monitor their product with the data they obtain from IoT technologies. The company will also achieve more production output with IoT technology, as there is a transparent data and knowledge exchange between the company and the supplier. In addition, the Internet of Things allows them to save time and resources and thus make smarter business choices.

2.3.3 Applications of IoT

In Internet of Things there is four major categories of applications which is for the first one is Personal and Home, Enterprise, Utilities and Mobile (Navani, Jain and Nehra, 2018). There are several real-world applications of the Internet of Things such as consumer IoT and enterprise IoT to manufacturing and industrial IoT. For consumer segment, which is like the smart home as example that are included with the smart home devices and others electronic devices that can be accesses via computers, smartphones or other mobile devices or gadgets.

Furthermore, the wearable devices that comes with sensors and software cloud collect and analyse the data of the user, sending the information to others technologies and this will lead the user's lives easier and more comfortable. For public safety also wearable devices are usable. In healthcare, there is more advantage that offer by the IoT which is include an ability to monitor a patient more easily and closely that by using the data that is generated and analyse it. IoT system also are often used by the hospitals to

completing their task more easily. For a smart buildings it can reduce energy costs because by using sensor that can measure or detect the equipment that are in that room. The temperature also can be adjust automatically.

Moreover, in traffic ways or vehicle by using IoT system and GPS can determine the location and traffic jammed can be reduced. For smart city, the system of IoT sensor and deployments can control the streetlights traffic lights, conserve energy and etc. Figure 2.6 shows the applications of the IoT systems.

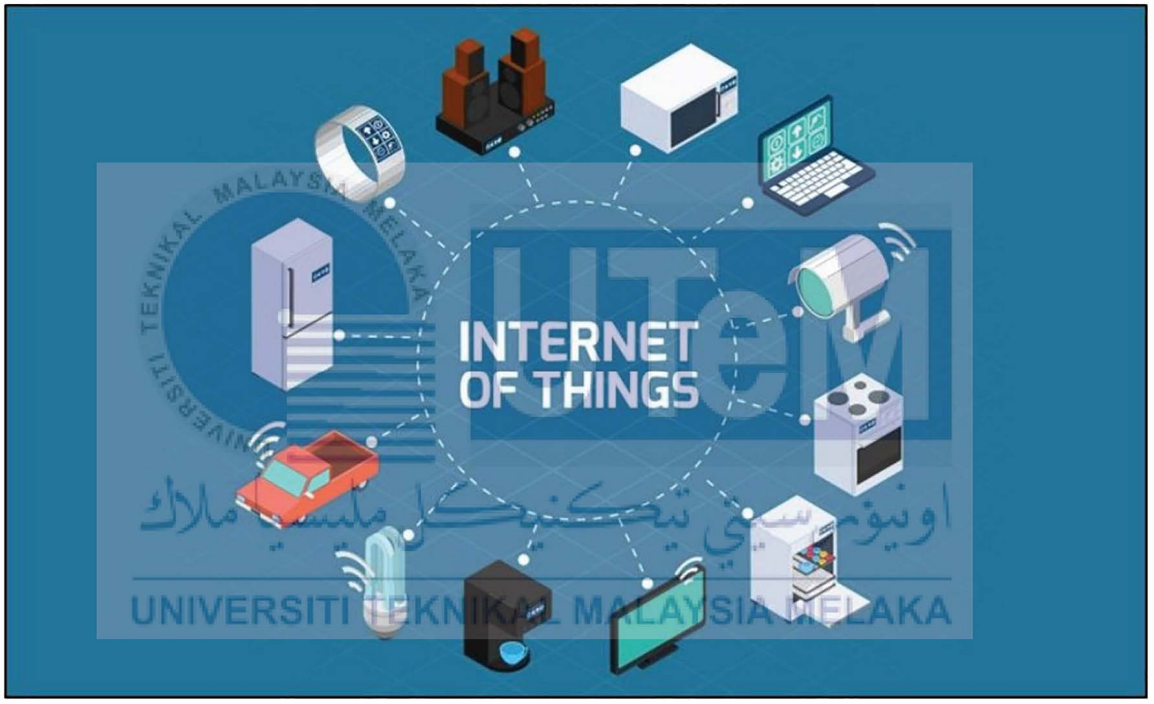


Figure 2.6: The application of IoT systems (www. towardsdatascience.com)

2.3.4 Security and Privacy of IoT

Billions of Internet of Things (IoT) devices link to the Internet and the number is increasing. IoT may be used in various areas, such as agriculture, healthcare, manufacturing, energy, retail, and logistics, as a technology still in development. IoT has changed our world, and our way of living and thought. However, IoT has no uniform

architecture and there are various types of attacks on the different layers of IoT, such as unauthorized tag entry, tag cloning, Sybil attack, sinkhole attack, denial of service attack, malicious code injection and middle attack man. IoT systems are more vulnerable to attacks because they are easy and it is difficult to enforce such security measures. Therefore, privacy and security for internet of things is needed to be concern about due to will be an expanded attack.

New security protocols can be introduced to resist attacks on network layers, cryptography algorithms and key management schemes for IoT devices, and WSNs can be useful in supporting IoT growth and acceptance. It is only in this way that IoT can grow better and that we can gain more technical benefits (Ren *et al.*, 2017).

2.4 Hardware (Microcontroller)

For this project, the main hardware that will be used is NodeMCU V3 ESP8266 and all the information of the specification will be discussed in this part.

2.4.1 NodeMCU V3 ESP8266

NodeMCU V3 ESP8266 is a microcontroller that is based on ESP8266 Wi-Fi module. It is a complex device that combines some features of the ordinary Arduino board with the chances of connecting to the internet. Arduino Modules and Microcontroller has been great choice for all this year to make a project but this device does not have Wi-Fi capability features in it. This NodeMCU V3 ESP8266 has on board several GPIO pins capable of connecting with other board peripheral devices and generating PWM, 12C, SPI and UART serial communication. It can be power up by using USB cable that is

directly connected with a computer. This device is compatible with Arduino IDE software that can be used for coding purposes (Dahoud and Fezari, 2018).

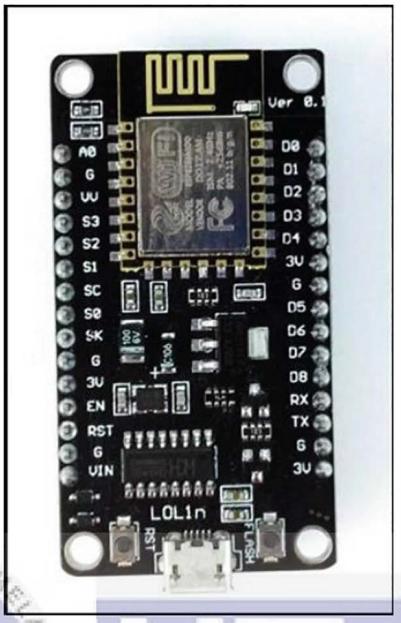


Figure 2.7: NodeMCU V3 ESP8266 (www.cytron.com)

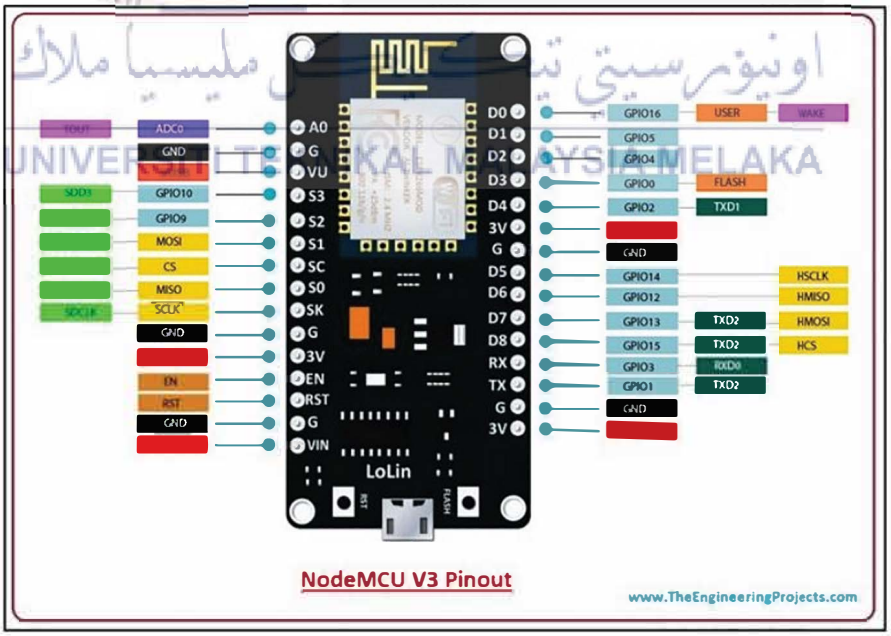


Figure 2.8: Pin Configuration of NodeMCU V3 ESP8266 (www.TheEngineeringProjects.com)

Table 2.2: NodeMCU V3 ESP8266 complete specification (www. qqtrading.com.my)

Microcontroller	NodeMCU V3 ESP8266
Operating Value	3.3V
Input Voltage (recommended)	7V-12V
RAM	96 KB
CPU	32-bit
EEPROM	512 KB
Digital I/O Pins	16
Analogue Input Pins	1
UARTs	1
12Cs	1
Flash Memory	4 MB
SRAM	64 KB
Clock Speed	80 MHz

2.4.2 Ublox NEO-6m GPS Module

The NEO-6 M module is a system that is coupled with the MG323 wireless module to acquire and monitor data using an embedded TCP / UDP protocol. NEO-6 M made by u-blox company is selected with 50 channels and monitoring sensitivity up to -161 dBm, and output frequency measurement up to 5Hz (Ge *et al.*, 2014). NEO-6m GPS module is a stand-alone receiver that prioritize maximum performance for a GPS device. It is also come with a cheap price and many choices for connection on a device that have

25 x 35mm module and 25 x 25 mm antenna size. Ublox NEO-6m GPS module comes with 50-channel that offers Time-To-First-Fix (TTFF) under 1 second. Next, it also have 2 million of correlators that can do searching for time/ parallel frequency in a large scale and able to find a satellite. This module is compatible with APM2 and APM 2.5 with integrated EEPROM that can be used for storing configuration of data (Nugraha, Subianto and Swastika, 2019).

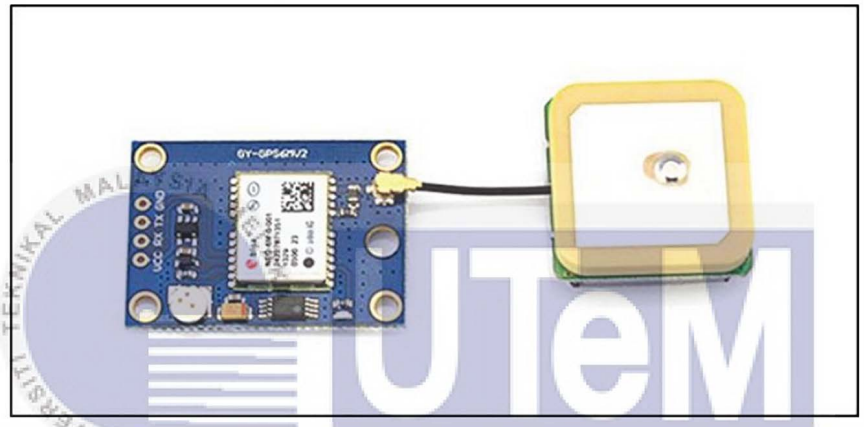


Figure 2.9: U-blox NEO-6m GPS module (www.components101.com)

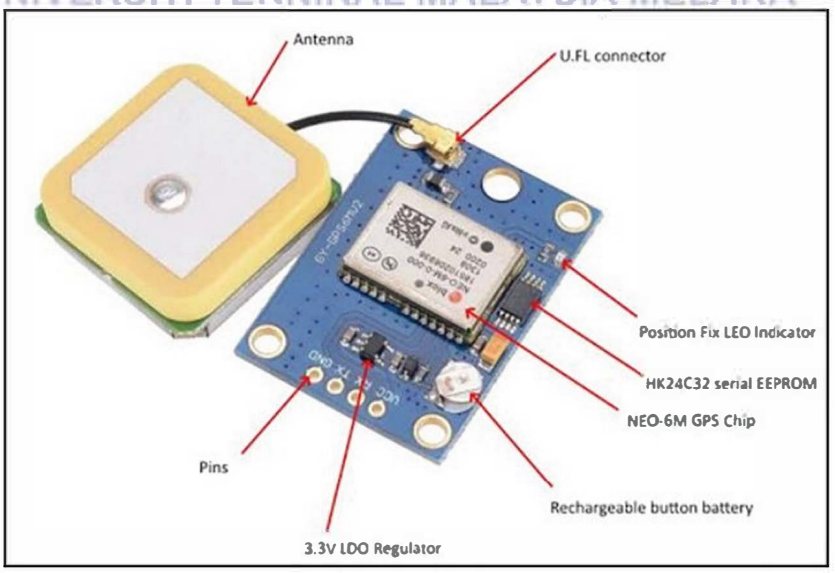


Figure 2.10: U-blox NEO-6m GPS module datasheet (www.acoptex.com)

Table 2.3: Ublox NEO-6m GPS module complete specification (www.u-blox.com)

Receiver type	50 Channels GPS L1 frequency, C/A Code SBAS: WAAS, EGNOS, MSAS	
Time-To-First-Fix	Cold start	27s
	Warm start	27s
	Hot start	1s
	Aided start	< 3s
Sensitivity	Tracking & Navigation	161 dBm
	Reacquisition	160 dBm
	Cold Start (without aiding)	147 dBm
	Hot Start	156 dBm
Maximum Navigation update rate	5Hz	
Configurable Timepulse frequency range	0.25 Hz to 1 kHz	
Accuracy for Timepulse signal	RMS	30 ns
	99%	< 60ns
	Granularity	21 ns
	Compensated	15 ns
Velocity accuracy	0.1m/s	

Heading accuracy	0.5 degrees	
Operational Limits	Dynamics	≤ 4g
	Altitude	50,000 m
	Velocity	500 m/s

2.4.3 MySQL Databse

MySQL is a client or a server system. It can be run on the same computer that cat as a server or on another computer such as communication via local network or the internet. The name SQL is stands for Standard Query Language that has been standardize for querying and updating data for administration of a database. My SQL use APIs (application programming interface) and libraries development for its application. The interface that is used by MySQL is OBDC that can be supported by most of the Microsoft Windows. Besides that, it also have a platform independence that is a pure benefit to other operating systems. It is also known as a fast database system among other database systems (Kofler and Kofler, 2001). Furthermore, based on the author (Nugraha, Subianto and Swastika, 2019) stated that MySQL is an open source software and the coding can be downloaded on the internet.

Figure 2.11: MySQL Database (www.iserverssupport.com)

Table 2.4: MySQL Database complete specification (www.mysql.com)

• Simple setup, run and server maintenance of MySQL through the MySQL Server Server
• Use JSON (Java Script Object Notation) related tables and schema-less documents with MySQL Document Store
• High availability database with MySQL Cluster InnoDB
• Meets exponential growth in MySQL Enterprise Scalability users and data
• Reduce data loss risk with MySQL Enterprise Backup for hot recovery and backup
• Use existing MySQL Enterprise Authentication security infrastructures
• Secure confidential data through encryption, digital signatures and key generation.
• Illegal MySQL Business Masking & De-identification sensitive info.
• Server bypass threats such as MySQL Business Firewall Server Intrusion
• Implementing existing MySQL application policy-based auditing compliance
• Improve MySQL Enterprise Monitor Database Performance and Accessibility

• Pinpoint SQL code that affects MySQL Query Analyzer database performance
• Introduce Database security practices of over 225 Database Consultants
• Design, develop and manage MySQL Workbench visually and migrating databases.
• Use the MySQL Workbench Migration Wizard to migrate databases to MySQL

2.5 Summary

In this chapter presented comparison of project on how the other researchers opinion about the location tracking system and how they implemented it. Besides that, an overview of the technology of Wi-Fi, GPS and database. Furthermore, it has been discussed about the IoT system in technology which is IoT history and background, benefits, application and the security and privacy in IoT. Moreover, there are also an overview more about the hardware such as NodeMCU V3 ESP8266 microtcontroller, Ublox NEO-6m GPS and MySQL database that will be used in this project. In the next chapter, the methodology of this project will be explained in detailed.

CHAPTER 3

METHODOLOGY

3.1 Introduction

In this chapter will be discussed about the methodology and approaches that is used in this project. Methodology can be defined as a system of ways of doing, teaching or studying something. Besides that it is also contains of procedure of several components such as technique, tool and the way to solve a problem. Next, this project consist of two main crucial part that are software and hardware that will be discussed in this chapter. Furthermore, the methodology of the system development of the system is defined as a framework that can be used in creating and controlling system in order to control development with the hardware system. The process of this project will be explained step by step so the objectives will be achieved.

3.2 Software

Software development is the process where is considering, identifying, scheming, programming, documenting, testing and bug fixing that is involved in making an application or other software components. Software that compatible with this project is Arduino IDE to make a program for the systems.

3.2.1 Arduino IDE

Arduino IDE is an open-source software that is used for creating an electronic programming project. Arduino consist both platform that are physical programmable

circuit board and software. The software is called IDE that runs in the computer that is used to transcribe the command code and upload the code into the physical board. This Arduino IDE is just using a simple version code of C++ and it is very easy to learn the program.

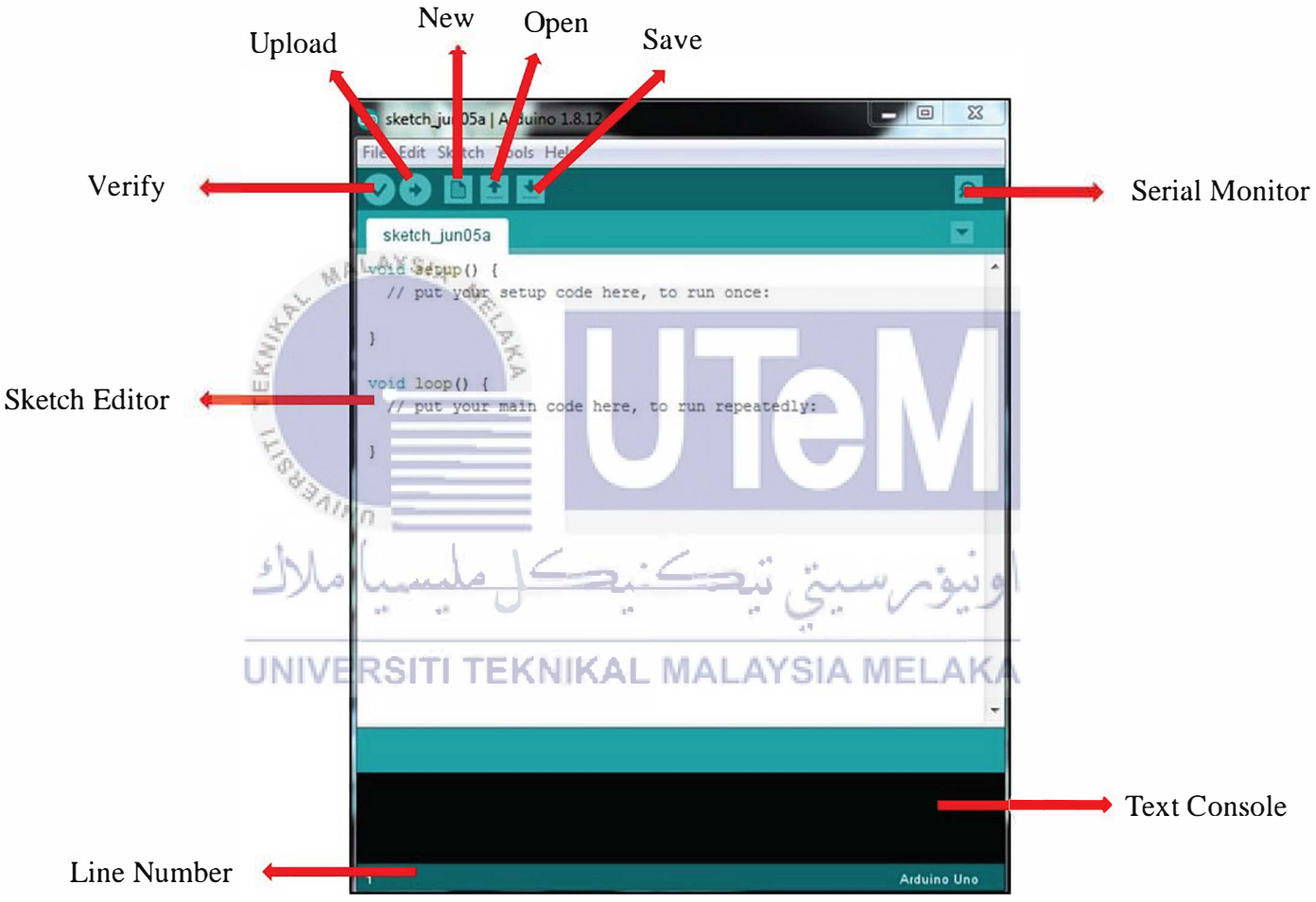


Figure 3.1: Parts of Arduino IDE

The figure 3.1 shows the part of Adruino IDE which contains of verify tab, new tab, open tab, save tab, upload tab, serial monitor, sketch editor, text console and line number. Verify tab is used for check the program that has been built in the Arduino IDE. This tab is very useful for checking either the coding is correct or incorrect. This process

is called compiling before the coding is transfer into the physical board. Next is New tab, the function is to open a new window to create a new coding. Save tab is to save any changes or save the coding that is needed to be working on. Upload tab is to transmit the coding into the physical board by connecting the USB cable to the board. Furthermore, the Serial Monitor is a separate pop-up window that act as a separate terminal that communicates by receiving and sending a Serial Data. The usage of Serial Monitor to debug an Arduino Software Coding or to view the data that are sent by a working sketch. Sketch Editor where the users can write or edit the coding.

Besides that, Text Console will shows the process of Arduino IDE and also display the error messages if there is any mistake or syntax error in the coding. For the last part that is Line Number will shows where the cursor line number is. It is very useful to keep track on the coding and user able to find their mistake on which line number.

Moreover, in this chapter also will be discussing about on how the program is started by using Arduino IDE software. The first thing is to connect the physical board with AB USB cable type or it is known as USB printer cable. The connection between the USB and laptop is required to program the board and to power it up. Figure 3.2 shows the connection the board onto the laptop by using USB cable and the blue LED with the labelled PWR will be light up or ON.

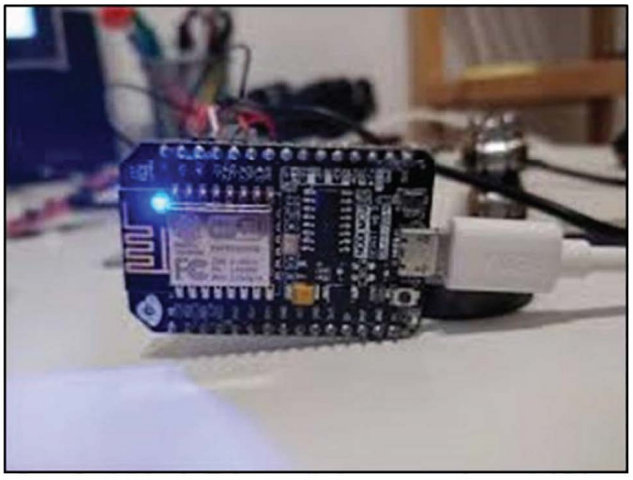


Figure 3.2: Connect the board to COM Port.

After that choose the board type and board. The steps as follows, first select the Tools tab > Board menu > Select the board that want to be use. The processor for this project is NodeMCU V3 ESP8266 so the selection on board menu should be ESP8266. Before select the board every user need to take note that ESP8266 need to be downloaded in board manager. Select the serial device on the board from Tool > Serial Port menu as shown in Figure 3.3. The port is depends on what port the board is connected.

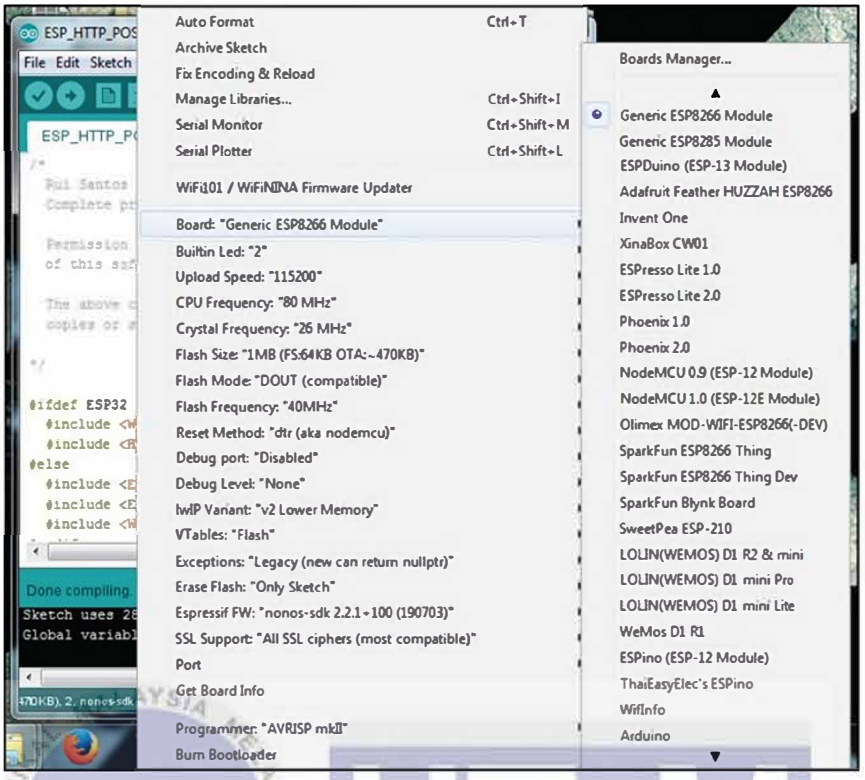


Figure 3.3: Selecting board type

The next paragraph will be discussed about on how to upload a coding to the physical board. After the coding that users have already finish working on and save it, it is time to upload the coding into their preference board. Before uploading the coding, user need to check the coding first by clicking the Verify tab. Verify tab is to ensure that the coding is correct and if there is an error, users can fix their coding as shown in Figure 3.5.

Figure 3.4: Verify to check the coding

If the verify process is completed, a message of 'Done Compiling' will appear in the Text Console and there will be no error shown. Figure 3.6 shows the process of verifying.

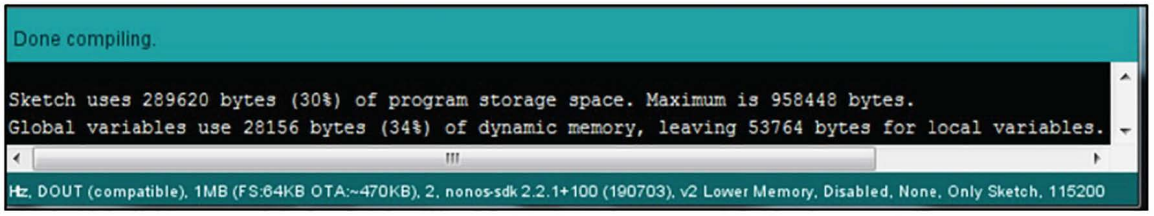


Figure 3.5: Successful verify

After done the verifying process, in the Text Console will give the verification status. It should be success if there is no error in the coding. Then, user can upload the coding into the board through the AB USB cable.

Once the users have already click the Upload tab, the Arduino IDE software will show a status bar that indicates how much is the progression. Figure 3.8 shows the progress bar for uploading.

Figure 3.6: Progress bar

Finally after the coding is done to be uploaded, a message of 'Done Compiling' will be shown in the Text Console.

It will shows that the coding condition after users have successful uploading. There will be a blinking of LED showing that the coding has been inserted in the board. If there is no blinking of LED, users might need to check the condition of the board.

3.2.2 MySQL Database

MySQL the database platform that is chosen for this project that known as an open source platform. It has a high data protection state where it will protect any organizations most valuable asset with advanced security including Encryption, Firewall, Auditing and etc. It is very easy to use since the language for this platform is Structured Query Language (SQL). Next, this database is free to download since it's an open software. Besides that, MySQL is compatible with any kind of operating systems that makes it as people preferences or choices.

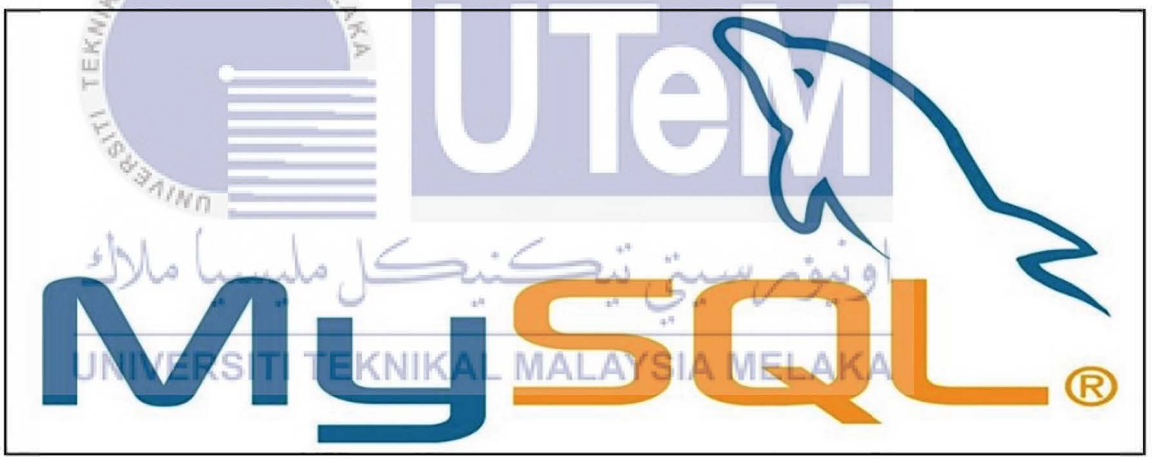


Figure 3.7: MySQL Database (www.iserverssupport.com)

3.3 Hardware

In this section, the specifications of the hardware component will be discussed that is used to implement this project.

3.3.1 NodeMCU V3 ESP8266

For this project, the microcontroller that will be used is NodeMCU V3 ESP8266 that connect with supply of AC to DC adapter or battery even with a direct connection to the computer by using USB cable. Figure 3.8 shows NodeMCU V3 ESP8266 is used in this project as microcontroller due to the compatible with Ublox NEO-6m GPS module and build in Wi-Fi module to send the information for MySQL database.

To check the board is functioning or not functioning, users need to upload a simple coding in the board and test it either it is working or not. The software that is used to coding this board is Arduino IDE.Besides that, NodeMCU V3 ESP8266 can operate on external supply between 6V-12V. If users using more than 12V, the voltage regulator could be overheat and damage the device. The recommended supply is between 7V-12V.

This device is designed and manufactured by Espressif Systems, it contains main elements from a computer such as CPU, RAM, networking (Wi-Fi), modern operating system and SDK. This device makes it as a famous choices for researchers to do projects that involved IoT platform. Figure 3.8 shows an overview of NodeMCU V3 ESP8266.

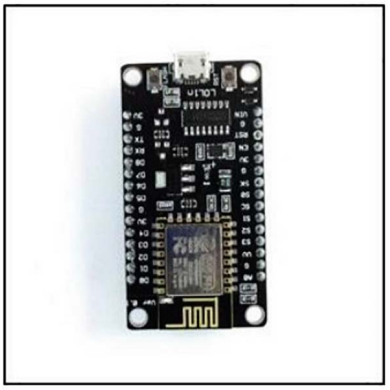


Figure 3.8: Overview of NodeMCU V3 ESP8266 (www.cytron.com)

3.3.2 Ublox NEO-6m GPS

Ublox NEO-6m GPS is a standalone GPS receiver with a high performance of positioning system. These compact and cost-effective receivers offer various networking options in a 16 x 12.2 x 2.4 mm miniature box. Its compact architecture and power and memory options make NEO-6 modules suitable for mobile devices powered by batteries with very strict cost and room.

The positioning engine for the 50-channel u-blox 6 has a Time-To-First-Fix (TTFF) of less than 1 second. With 2 million correlators, the dedicated discovery engine is capable of vast parallel time / frequency searches of space, enabling it to locate satellites instantly. Innovative architecture and development do away with sources of jamming and mitigates multi-track impacts, offering excellent navigation efficiency for NEO-6m GPS receivers even in the toughest conditions. Figure 3.9 shows and overview of Ublox NEO-6m GPS module.

The connection between NodeMCU V3 ESP8266 and Ublox NEO-6m GPS module. Attach the Ublox Neo 6 m GPS module directly to the NodeMCU board by attaching GND neo 6 m pin to NodeMCU GND pin and VCC pin with 3v3 pin. Link RXD to D1 and D2 to TXD, too.

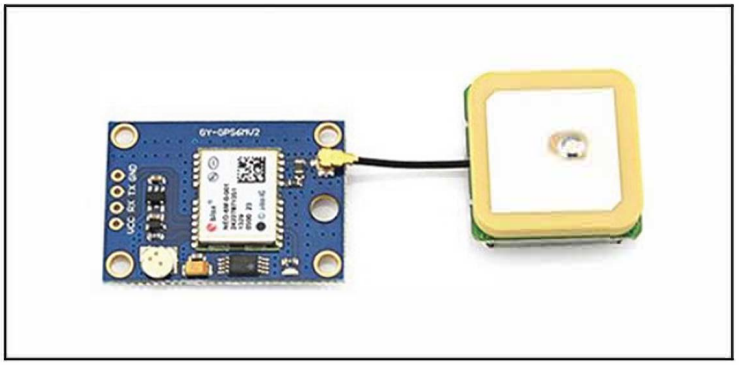


Figure 3.9: Overview of Ublox NEO-6m GPS module (www.components101.com)

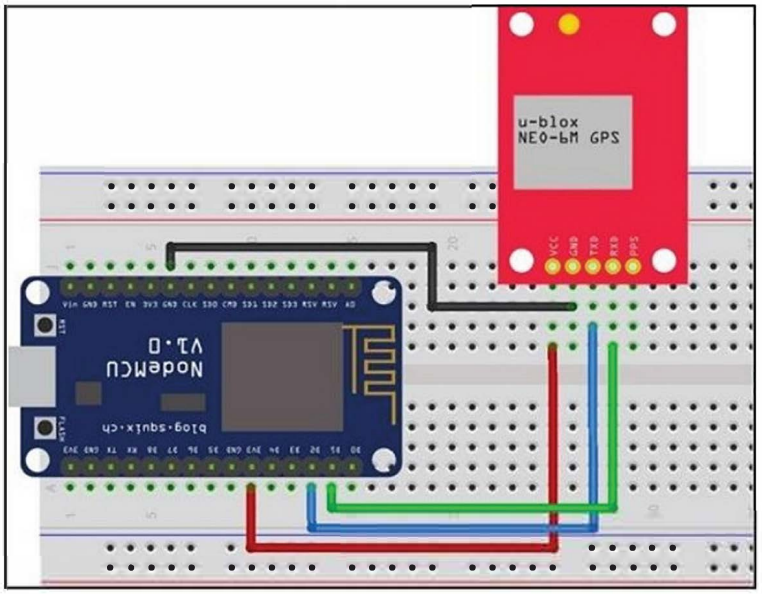


Figure 3.10: The connection between NodeMCU ESP8266 and Ublox NEO-6m GPS module

3.4 Methodology Flowchart

The figure 3.11 shows the flowchart of bachelor degree project. This flowchart will explained the process from the starting till the end. First step before doing this Bachelor Degree Project, students need to find a supervisor that will guide them doing this project. After students have found their supervisor, they need to come up with a project title with the liaising of supervisor.

After that, students need to identify the main objectives and the reasons why this project need to be developed. Next, students need to find out the scope of the project that can determine the limitations of the project. In literature review, students need to study the past project of researchers that have common hardware, software and method that they will need to use in the project. Moreover, by doing a research on the past researchers project will help students to understand more about the project that they wanted to develop.

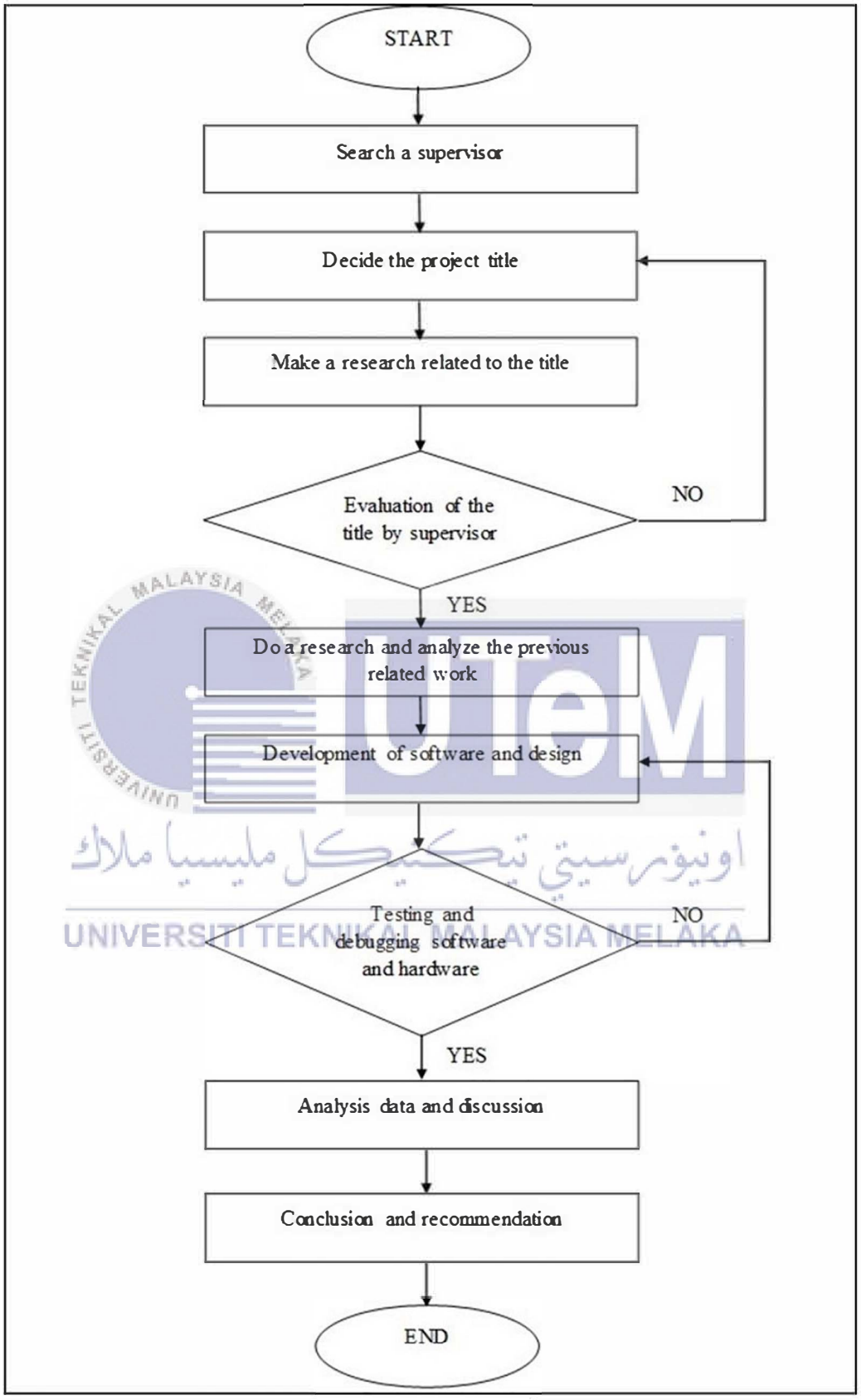


Figure 3.11: Flowchart of the project

3.4.1 General Flowchart for Emergency Vehicle Location Tracking System by Using MySQL

The Figure 3.12 shows the general flowchart on how the process of NodeMCU V3 ESP8266 and NEO-6m GPS module are working from the beginning until the end. Firstly, switch on the Wi-Fi in any device such as router or mobile hotspot. After that switch on NodeMCU and NEO-6m GPS module will automatically turn on together with the microcontroller. Then, connect the Wi-Fi to the NodeMCU V3 ESP8266. If there is no connection of Wi-Fi, check the board or the Wi-Fi status and do some troubleshoot. If the connection is successful, NEO-6m GPS module will give the data of latitude and longitude and will display in Arduino IDE. The data will also send by NodeMCU to MySQL database. MySQL database will display data on the web that has been set.

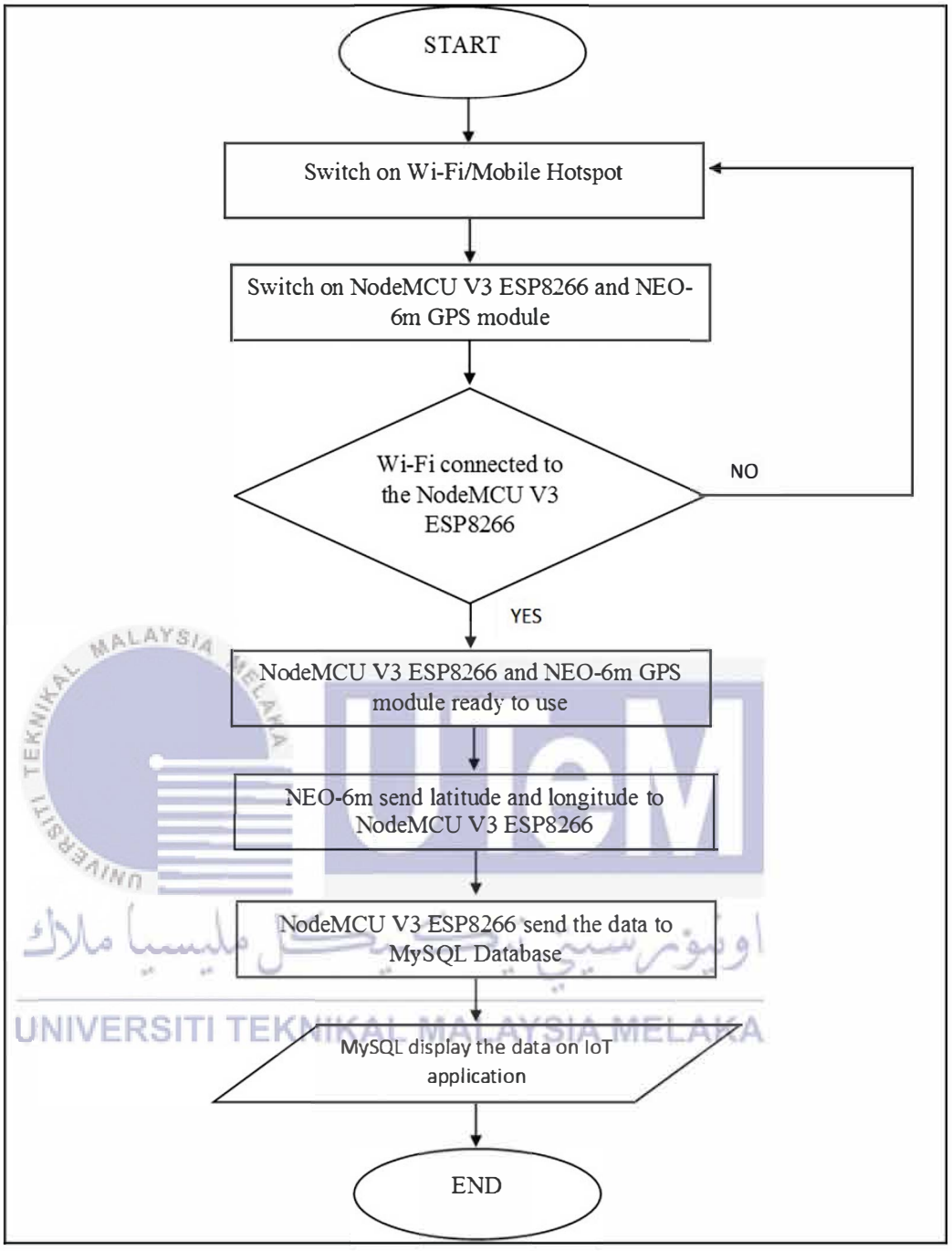


Figure 3.12: General flowchart for Development Emergency Vehicle Location Tracking System by Using MySQL

3.5 Hardware Configuration

In this section will be discussed about the initial result of Emergency Vehicle Location Tracking System by Using MySQL. The result has been taken by connecting the NodeMCU V3 ESP8266 and Ublox NEO-6m GPS Module with Blynk application. The concept of Blynk application has the same concept for this project. Therefore, for the initial result is stated below in the following figures.

Figure 3.13 below shows the connection of NodeMCU V3 ESP8266 with NEO-6m GPS Module. Table 3.1 shows the connection of the pin for both component.

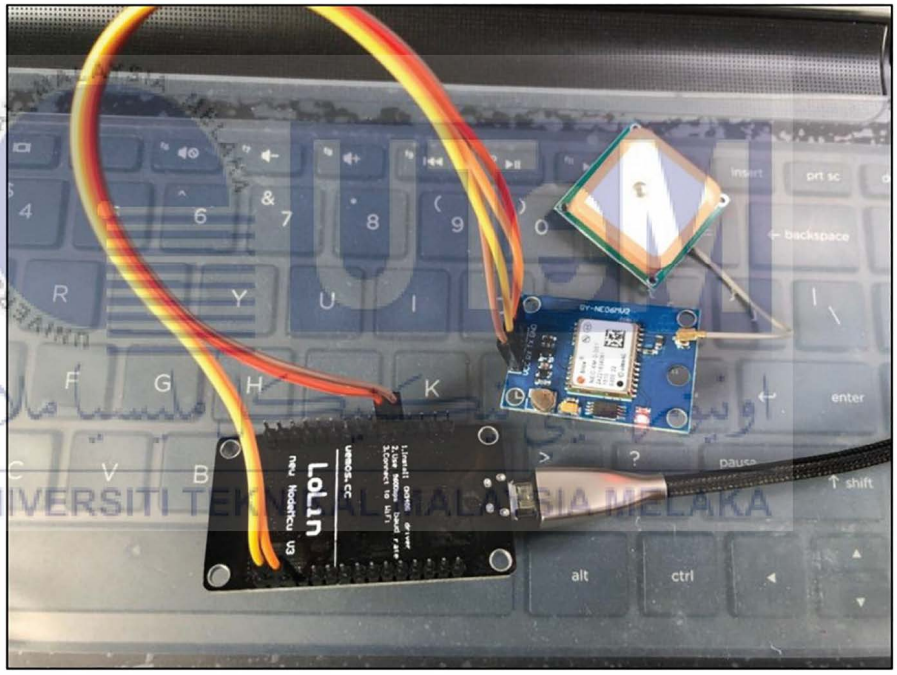


Figure 3.13: Connection of NodeMCU and NEO-6m

Table 3.1: Connection of the pin for both component

NodeMCU V3 ESP8266	Ublox NEO-6m GPS Module
3.3V	VCC
D1	RX

D2	TX
GND	GND

Figure 3.14 below shows the detection of user location by using Blynk application.

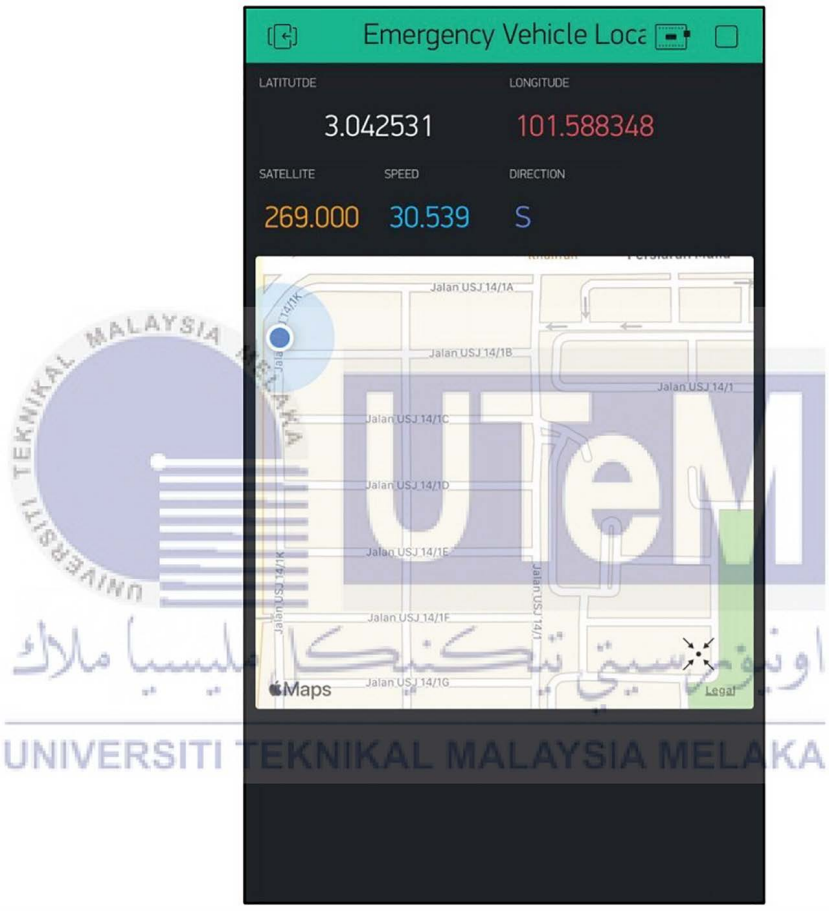


Figure 3.14: Detection of user location by using Blynk Application

3.6 Summary

As a conclusion, in this chapter had been discussed about the observation of the project hardware and software. There steps on how to use Arduino IDE software and the connection of the hardware between NodeMCU V3 ESP8266 and NEO-6m GPS module had been discussed in this chapter. Besides that, the specifications and limitations of each hardware had been discussed for further precaution.

Furthermore, there are two types of different flowchart which are the project general flowchart and the general flowchart for Emergency Vehicle Location Tracking System by Using MySQL. There are also overview about the initial results of this project. Hence for the next chapter, the result analysis will be discussed in details.

CHAPTER 4

RESULT AND DISCUSSION

4.1 Introduction

This chapter will explained about the hardware circuit diagram, latitude, longitude and speed that obtained from this project. This project will be monitored by an IoT website from the data obtained and activities progress. Data from Neo-6m GPS Module will be transferred to NodeMCU ESP8266 then will be kept in MySQL database and displayed on the IoT website.

4.2 Initial Result

In this section will be discussed about the initial result of Emergency Vehicle Location Tracking System by Using MySQL. The result has been taken by connecting the NodeMCU V3 ESP8266 and Ublox NEO-6m GPS Module with Blynk application. The concept of Blynk application has the same concept for this project. Therefore, for the initial result is stated below in the following figures.

Figure 4.1 below shows the connection of NodeMCU V3 ESP8266 with NEO-6m GPS Module. Table 4.1 shows the connection of the pin for both component.

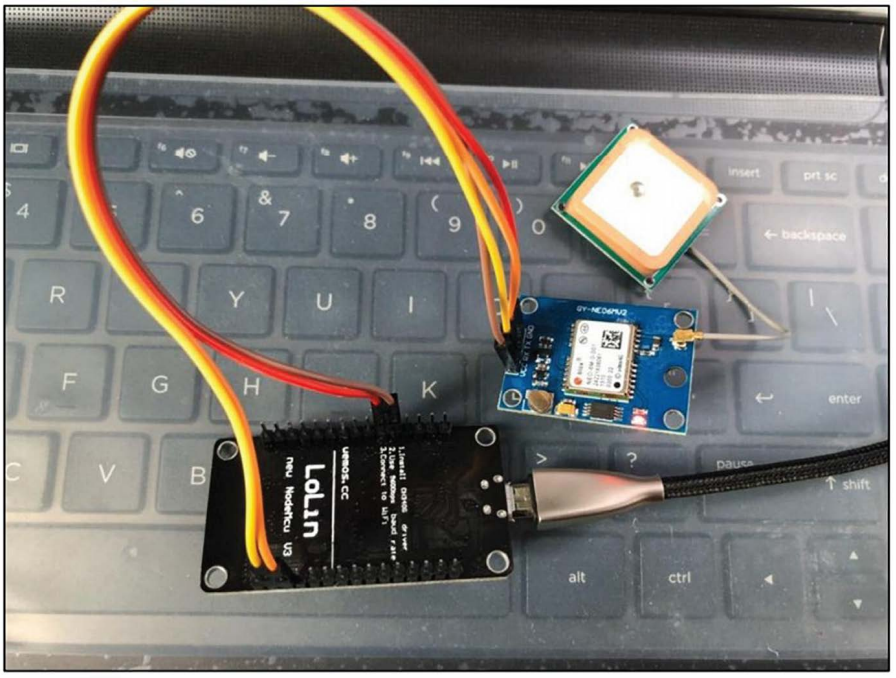


Figure 4.1: Connection of NodeMCU and NEO-6m

Table 4.1: Connection of the pin for both component

NodeMCU V3 ESP8266	Ublox NEO-6m GPS Module
3.3V	VCC
D1	RX
D2	TX
GND	GND

Figure 4.2 below shows the detection of user location by using Blynk application.

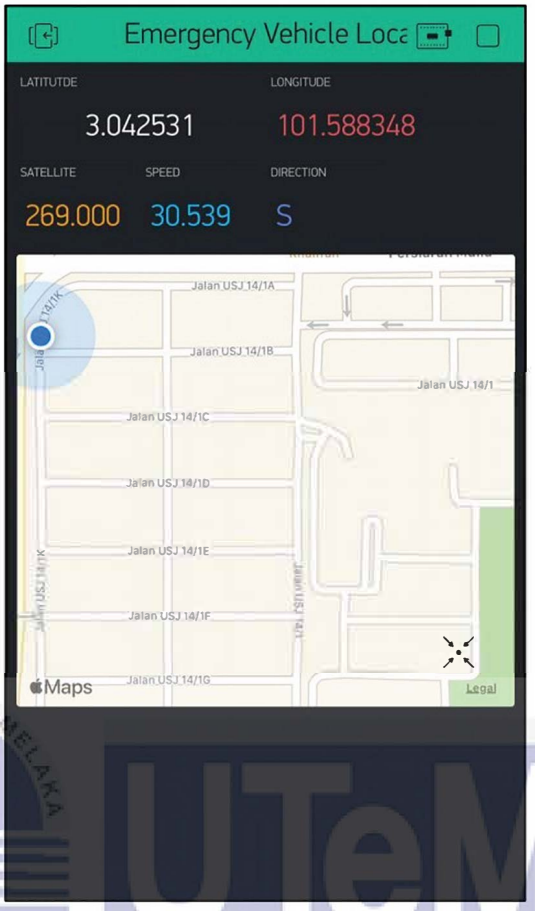


Figure 4.2: Detection of user location by using Blynk Application

4.3 Results

For figure 4.3 will be shown the circuit diagram of this project and the connection between NodeMCU ESP8266 and Neo-6m GPS Module. The 3.3V from NodeMCU ESP8266 will be connected with VCC from the Neo-6m GPS Module. Next, pin 4 (D1) will be connected to RX. Pin 5 (D2) will be connected to TX and the GND will be connected to GND.

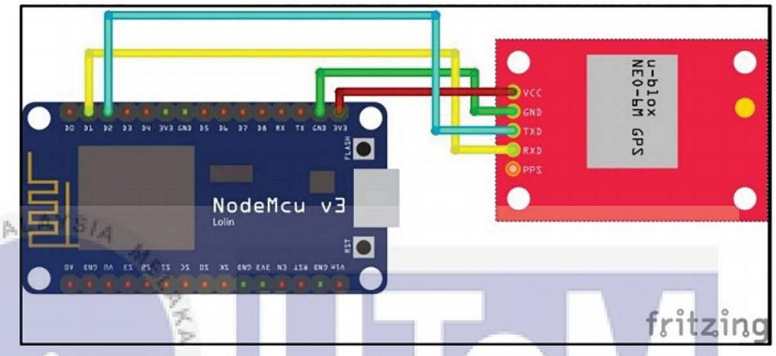


Figure 4.3: Circuit diagram and connection NodeMCU ESP8266 & Neo-6m GPS Module

The sketch of the program needed to be upload in the NodeMCU ESP8266 by using Arduino IDE software. The port COM needed to choose precisely to burn the sketch inside the microcontroller. Figure 4.4 will be shown the sketch being uploaded inside the NodeMCU ESP8266. Then uploading status will be shown and compiling status will be done. The latitude, longitude and speed every 30 seconds to determine the location of the user.

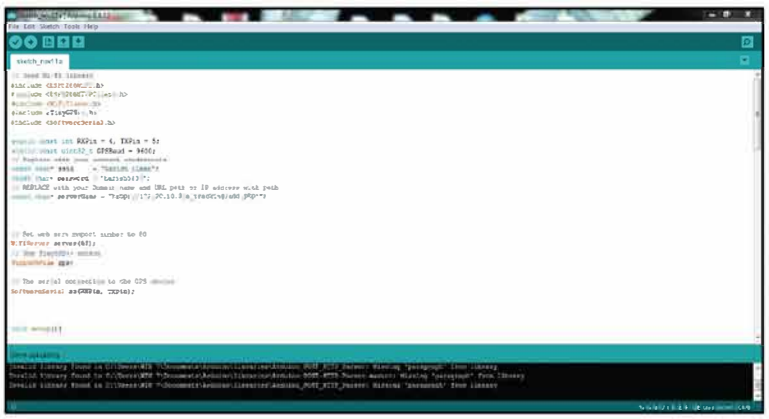
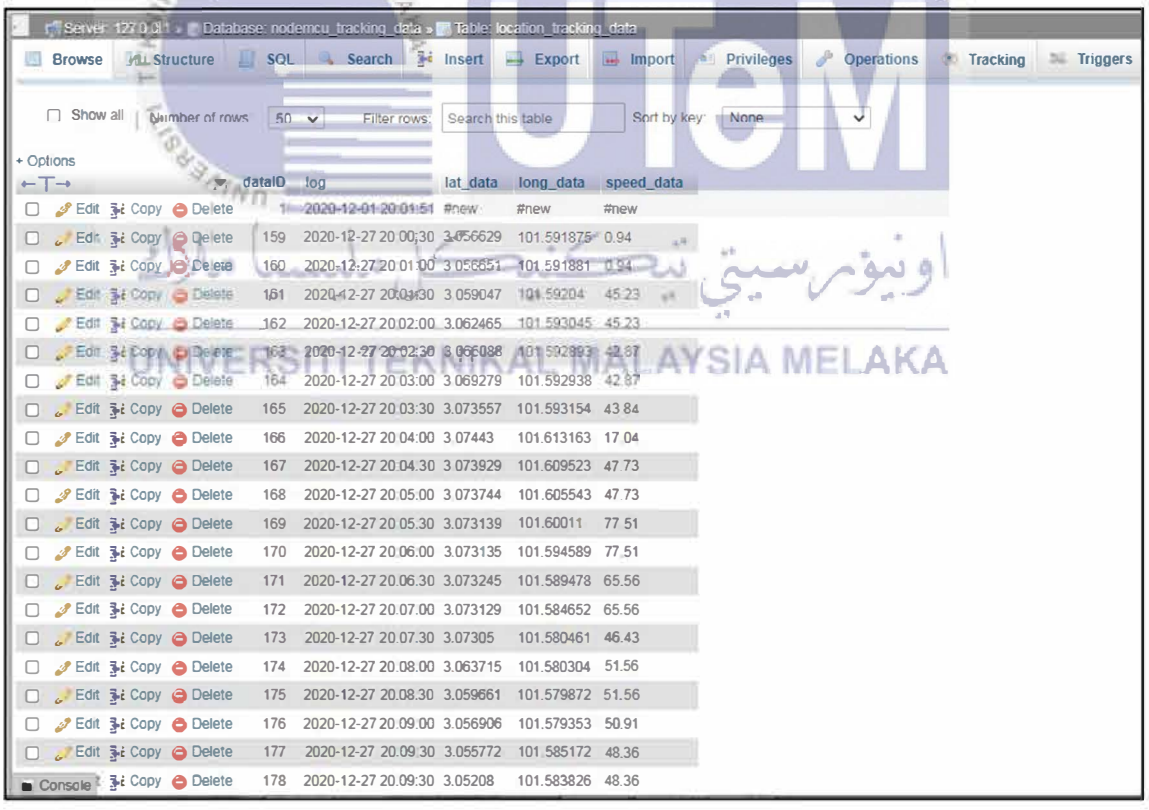


Figure 4.4: The sketch of Emergency Vehicle Location Tracking System

The Figure 4.5 shows the output data on the MySQL database from the GPS. Next, the data will be post to the IoT website for monitoring purposes in Figure 4.6. The data are consists of latitude, longitude and speed of the user.



Server: 127.0.0.1 » Database: nodemcu_tracking_data » Table: location_tracking_data

Browse | Structure | SQL | Search | Insert | Export | Import | Privileges | Operations | Tracking | Triggers

Show all | Number of rows: 50 | Filter rows: Search this table | Sort by key: None

+ Options

	dataID	log	lat_data	long_data	speed_data
Edit Copy Delete	1	2020-12-01 20:01:51	#new	#new	#new
Edit Copy Delete	159	2020-12-27 20:00:30	3.056629	101.591875	0.94
Edit Copy Delete	160	2020-12-27 20:01:00	3.056651	101.591881	0.94
Edit Copy Delete	161	2020-12-27 20:01:30	3.059047	101.59204	45.23
Edit Copy Delete	162	2020-12-27 20:02:00	3.062465	101.593045	45.23
Edit Copy Delete	163	2020-12-27 20:02:30	3.066088	101.592893	42.87
Edit Copy Delete	164	2020-12-27 20:03:00	3.069279	101.592938	42.87
Edit Copy Delete	165	2020-12-27 20:03:30	3.073557	101.593154	43.84
Edit Copy Delete	166	2020-12-27 20:04:00	3.07443	101.613163	17.04
Edit Copy Delete	167	2020-12-27 20:04:30	3.073929	101.609523	47.73
Edit Copy Delete	168	2020-12-27 20:05:00	3.073744	101.605543	47.73
Edit Copy Delete	169	2020-12-27 20:05:30	3.073139	101.60011	77.51
Edit Copy Delete	170	2020-12-27 20:06:00	3.073135	101.594589	77.51
Edit Copy Delete	171	2020-12-27 20:06:30	3.073245	101.589478	65.56
Edit Copy Delete	172	2020-12-27 20:07:00	3.073129	101.584652	65.56
Edit Copy Delete	173	2020-12-27 20:07:30	3.07305	101.580461	46.43
Edit Copy Delete	174	2020-12-27 20:08:00	3.063715	101.580304	51.56
Edit Copy Delete	175	2020-12-27 20:08:30	3.059661	101.579872	51.56
Edit Copy Delete	176	2020-12-27 20:09:00	3.056906	101.579353	50.91
Edit Copy Delete	177	2020-12-27 20:09:30	3.055772	101.585172	48.36
Edit Copy Delete	178	2020-12-27 20:09:30	3.05208	101.583826	48.36

Console

Figure 4.5: Output Data from MySQL Database

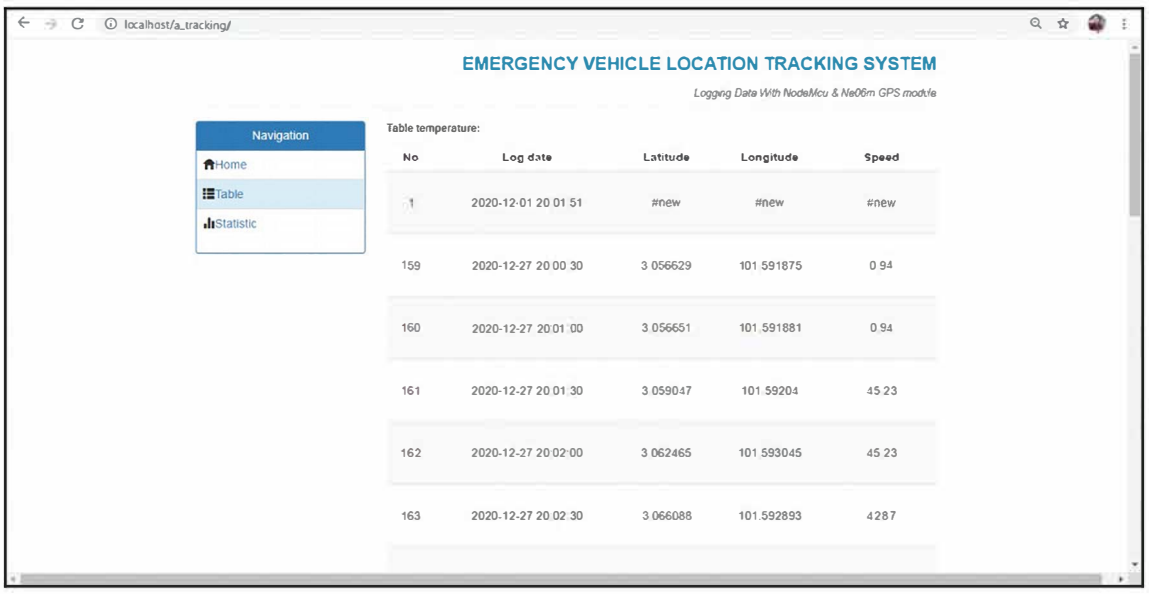


Figure 4.6: Output Data from IoT Wesbite

4.4 Hardware Configuration

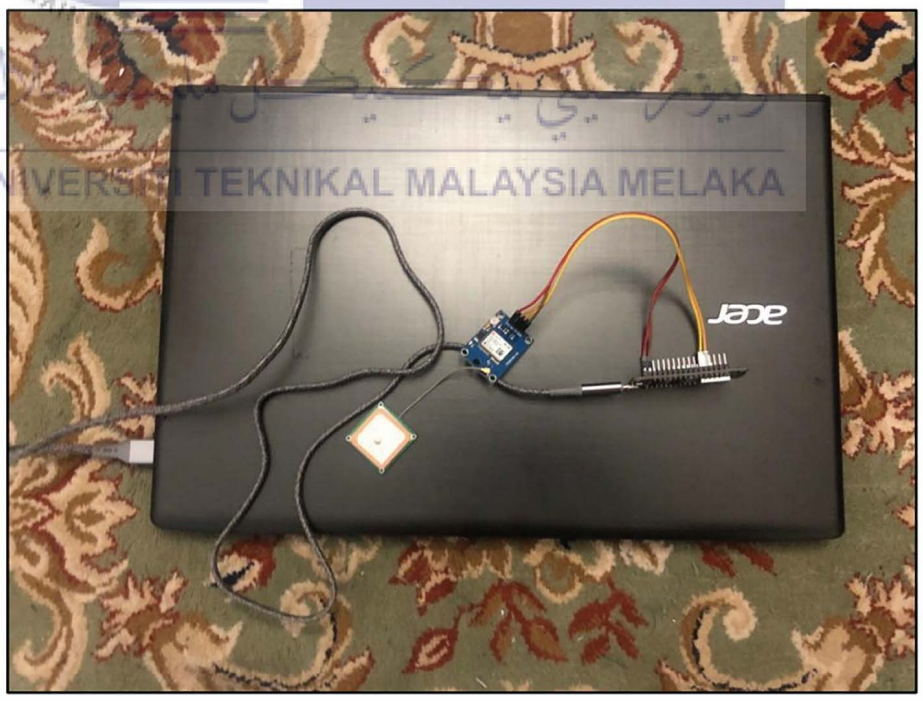


Figure 4.7: Hardware Configuration for Development Emergency Vehicle Location Tracking System

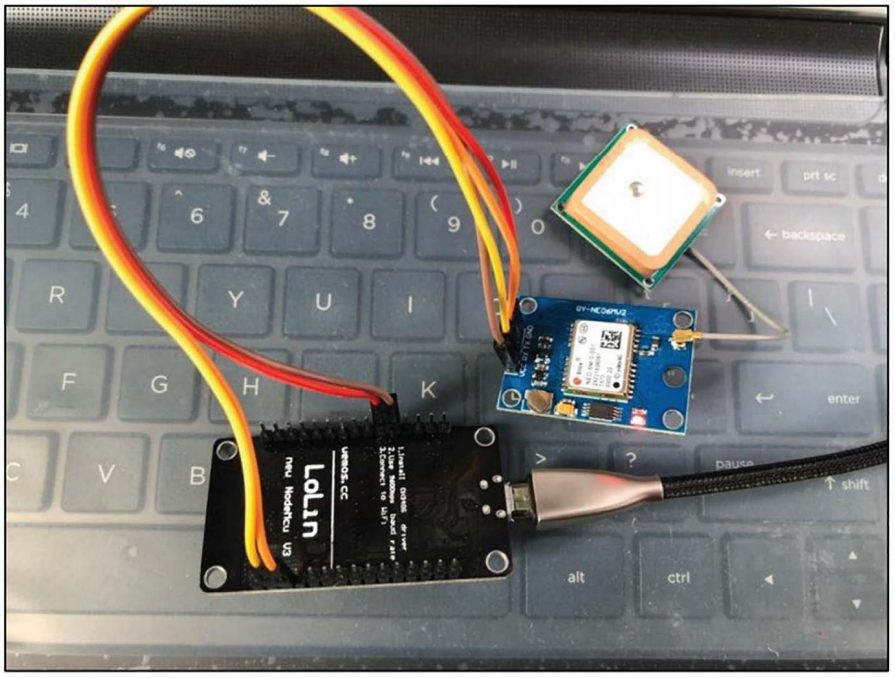


Figure 4.8: Complete Circuit of Development Emergency Vehicle Location Tracking System

Figure 4.7 shows the hardware configuration for this project and Figure 4.8 shows the completed circuit of this project. The Neo-6m GPS Module will act as receiver to locate the user location. Meanwhile for the NodeMCU ESP8266 will act as transmitter that transmit the data to MySQL database. From the database it will appear at the IoT website for monitoring purposes. A location is detected when the Neo-6m GPS module started to blinking. It will search for the nearest satellite to locate the user. Once the data has been obtained, it will send to NodeMCU ESP8266. Then, it will be send by NodeMCU ESP8266 to the MySQL database as a medium to keep the data. Finally, from the database it will send to the IoT website for monitoring purposes.

4.5 Analysis

In this chapter, the project was tested on the road to examine the effectiveness of locating system by a GPS from the satellite. . There will be a table of data that will be created in this chapter. The table will show the location of user, time taken and speed to ensure this project is a real-time location tacking system. The data has been taken for 11 minutes to determine the strength of satellite signal and the response between Neo-6m GPS module and NodeMCU ESP8266. Table 4.2 will show the result of this analysis for Development Emergency Vehicle Location Tracking System.

This chapter will be explained about the observation that has been get from this project and will be discussed the findings.

4.5.1 Analysis of Development Emergency Location Tracking System

Table 4.2: Result of Analysis for Development Emergency Vehicle Location Tracking System

Time/sec	Latitude	Longitude	Speed
20:00:30	3.056629	101.5919	0.94
20:01:00	3.056651	101.5919	0.94
20:01:30	3.059047	101.592	45.23
20:02:00	3.062465	101.593	45.23
20:02:30	3.066088	101.5929	42.87
20:03:00	3.069279	101.5929	42.87
20:03:30	3.073557	101.5932	43.84
20:04:00	3.07443	101.6132	17.04
20:04:30	3.073929	101.6095	47.73
20:05:00	3.073744	101.6055	47.73
20:05:30	3.073139	101.6001	77.51
20:06:00	3.073135	101.5946	77.51
20:06:30	3.073245	101.5895	65.56
20:07:00	3.073129	101.5847	65.56
20:07:30	3.07305	101.5805	46.43

20:08:00	3.063715	101.5803	51.56
20:08:30	3.059661	101.5799	51.56
20:09:00	3.056906	101.5794	50.91
20:09:30	3.055772	101.5852	48.36
20:10:00	3.05208	101.5838	48.36
20:10:30	3.05041	101.5846	54.28
20:11:00	3.048399	101.5872	54.28

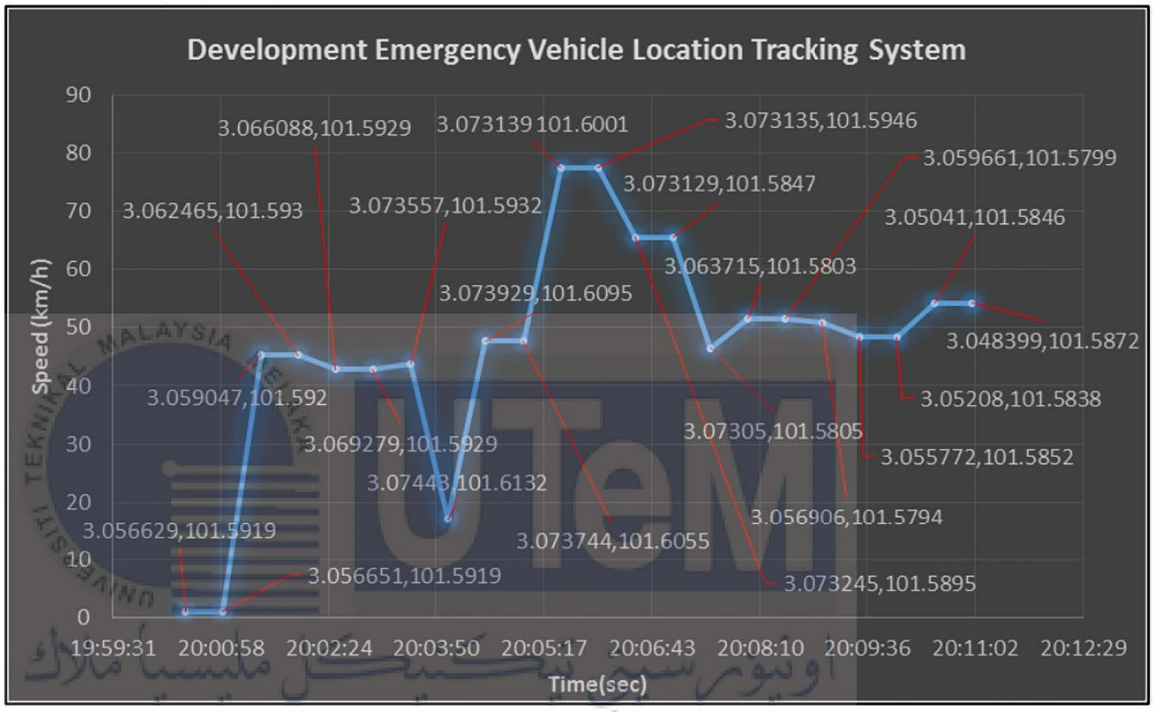


Figure 4.9: Graph for Speed (km/h) vs. Time (sec)

Figure 4.9 above shows the graph from the data that has been taken from this project. The data were taken with a real-time location tracking system, the data consists of speed, time, latitude and longitude of the user. Next, the speed is measured in km/h for the user driving speed. Meanwhile, the time taken is the data that has been obtain for every 30 seconds. Furthermore, latitude and longitude was taken to determine the location of user for every 30 seconds. Moreover, the speed will become 0 km/h due to the user stopped at traffic light or there is an accident occurred that makes the emergency vehicle

slow down. This data also has been updated in the MySQL database and on the IoT website for monitoring purposes.

CHAPTER 5

CONCLUSION AND FUTURE WORK

5.1 Introduction

The wireless communication, networking of the system management and the researched is required to design development emergency vehicle location tracking system based on IoT system by using NodeMCU ESP8266 and Neo-6m GPS Module. The microcontroller and GPS module are very easy to use and very compatible with Arduino IDE software. The process come with learning, researching and deep understanding about MySQL database, location tracking and IoT system, this project will be functioning properly. As it has been mentioned for the objective of this project, the objectives are to develop emergency vehicle location tracking system and to analyses it for the future usage. This is due to effectiveness and efficiency of an emergency vehicle can be improved. Furthermore, the society with emergency vehicle does not have to worry about the time taken and wait for the driver feedback to headquarter. The route can be adjust according to the least time taken for emergency vehicle arrived at the location. Moreover, Wi-Fi and database could accomplish a data transfer in a restricted distances applications but by using Wi-Fi system, the data could be allocation in more protected ways rather than use other wireless communication such as Bluetooth and others. Wi-Fi could be applied in any electrical and electronic devices that using wireless systems such as smartphones with location tracking systems as it could be get in a several size and Wi-Fi become trending nowadays.

As conclusion, the objectives of this project has been achieved. There are important steps must be followed in order to reach the objective of this project which is to develop Emergency Vehicle Location Tracking System that based on wireless communication types such as Wi-Fi, database and IoT platform. Moreover, this project is important due to the effectiveness and efficiency it could bring to the society that handle with emergency vehicle. It is also could cut the cost for a long term due the component that easily to maintain. Lastly, overwhelmed the problem for this system for the future work, it is must be focused on the programming, application, analysis and evaluating the system design.

5.2 Recommendation

Currently at the moment, this system does not include a Google map. So for the future work a Google map can be applied inside this system for easy detection of user.

REFERENCES

Abzalov, M. (2016) 'Database', in *Modern Approaches in Solid Earth Sciences*. doi: 10.1007/978-3-319-39264-6_12.

Dahoud, A. Al and Fezari, M. (2018) 'NodeMCU V3 For Fast IoT Application Development', *Notes*.

Ge, M. J. *et al.* (2014) 'Design of communication module based on GPS/GPRS', in *Applied Mechanics and Materials*. doi: 10.4028/www.scientific.net/AMM.536-537.711.

Gregorio, F. *et al.* (2020) 'Internet of Things', in *Signals and Communication Technology*. doi: 10.1007/978-3-030-32437-7_9.

Hegarty, C. J. (2017) 'The Global Positioning System (GPS)', in *Springer Handbooks*. doi: 10.1007/978-3-319-42928-1_7.

Kofler, M. and Kofler, M. (2001) 'What Is MySQL?', in *MySQL*. doi: 10.1007/978-1-4302-0853-2_1.

Koley, S. and Ghosal, P. (2017) 'An IoT Enabled Real-Time Communication and Location Tracking System for Vehicular Emergency', *Proceedings of IEEE Computer Society Annual Symposium on VLSI, ISVLSI*. doi: 10.1109/ISVLSI.2017.122.

Kumar, B Hari and Tehseen, Syeda Faathima and Thanveer, S and Krishna, Guntha Vamshi and Akram, S. M. (2016) 'Vehicle Monitoring and Tracking System using GPS and GSM Technologies', *International Research Journal of Engineering and Technology (IRJET)*.

Navani, D., Jain, S. and Nehra, M. S. (2018) 'The internet of things (IoT): A study of architectural elements', in *Proceedings - 13th International Conference on Signal-Image Technology and Internet-Based Systems, SITIS 2017*. doi:

10.1109/SITIS.2017.83.

Nugraha, A., Subianto, M. and Swastika, W. (2019) 'Rancang Bangun Sistem Monitoring dan Pembatasan Zona Operasional Kendaraan Bermotor Roda Dua berbasis Website dan Arduino', *Jurnal Teknik Informatika dan Sistem Informasi*. doi: 10.28932/jutisi.v5i2.1602.

Rahman, M. M. *et al.* (2017) 'Real time Google map & Arduino based vehicle tracking system', in *ICECTE 2016 - 2nd International Conference on Electrical, Computer and Telecommunication Engineering*. doi: 10.1109/ICECTE.2016.7879577.

Ranjini, T. and Yamuna, R. (2011) 'Wireless technology', in *Proceedings of National Conference on Innovations in Emerging Technology, NCOIET'11*. doi: 10.1109/NCOIET.2011.5738824.

Ren, Z. *et al.* (2017) 'Security and privacy on internet of things', in *Proceedings of 2017 IEEE 7th International Conference on Electronics Information and Emergency Communication, ICEIEC 2017*. doi: 10.1109/ICEIEC.2017.8076530.

Sinha, S. *et al.* (2017) 'Real Time College Bus Tracking Application for Android Smartphone', *International Journal Of Engineering And Computer Science*. doi: 10.18535/ijecs/v6i2.22.

APPENDIX

Appendix 1 Coding for Development of Emergency Vehicle Location Tracking System by Using MySQL

```
// Load Wi-Fi library
#include <ESP8266WiFi.h>
#include <ESP8266HTTPClient.h>
#include <WiFiClient.h>
#include <TinyGPS++.h>
#include <SoftwareSerial.h>

static const int RXPin = 4, TXPin = 5;
static const uint32_t GPSBaud = 9600;
// Replace with your network credentials
const char* ssid     = "Harish ilman";
const char* password = "harish5407";
// REPLACE with your Domain name and URL path or IP address with path
const char* serverName = "http://172.20.10.3/a_tracking/add.php?";


// Set web server port number to 80
WiFiServer server(80);
// The TinyGPS++ object
TinyGPSPlus gps;

// The serial connection to the GPS device
SoftwareSerial ss(RXPin, TXPin);



void setup(){
```

```
  Serial.begin(9600);
  ss.begin(GPSBaud);
  WiFi.begin(ssid, password);
  Serial.println("Connecting");
  while(WiFi.status() != WL_CONNECTED) {
    delay(500);
    Serial.print(".");
  }
  Serial.println("");
  Serial.print("Connected to WiFi network with IP Address: ");
  Serial.println(WiFi.localIP());
}
//void checkGPS(){
 // if (gps.charsProcessed() < 10)
  //{
    //Serial.println(F("No GPS detected: check wiring."));
  //}
//}
void loop(){

    {

    //Check WiFi connection status
    if(WiFi.status()== WL_CONNECTED){
      HTTPClient http;

      // Your Domain name with URL path or IP address with path
      http.begin(serverName);
```



```
// Specify content-type header
http.addHeader("Content-Type", "application/x-www-form-urlencoded");
// Prepare your HTTP POST request data
String httpRequestData = "latitude=" + String(gps.location.lat(), 6) + "&longitude=" + String(gps.location.lng(), 6) + "&speed=" + String(gps.speed.kmph()) + "";


Serial.print("httpRequestData: ");
Serial.println(httpRequestData);


// You can comment the httpRequestData variable above
// then, use the httpRequestData variable below (for testing purposes without the BME280 sensor)
//String httpRequestData = "api_key=tPmAT5Ab3j7F9&sensor=BME280&location=Office&value1=24.75&value2=49.54&value3=1005.14";

// Send HTTP POST request
int httpResponseCode = http.POST(httpRequestData);

// If you need an HTTP request with a content type: text/plain
//http.addHeader("Content-Type", "text/plain");
//int httpResponseCode = http.POST("Hello, World!");

// If you need an HTTP request with a content type: application/json, use the following:
//http.addHeader("Content-Type", "application/json");
//int httpResponseCode = http.POST("{\"value1\":\"19\",\"value2\":\"67\",\"value3\":\"78\"}");

if (httpResponseCode>0) {
  Serial.print("HTTP Response code: ");
  Serial.println(httpResponseCode);
```

```
      }
      else {
        Serial.print("Error code: ");
        Serial.println(httpResponseCode);
      }
      // Free resources
      http.end();
    }
    else {
      Serial.println("WiFi Disconnected");
    }
//Send an HTTP POST request every 30 seconds
  delay(30000);
  }

}
```