

GPSajadah

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BORANG PENGESAHAN STATUS LAPORAN
PROJEK SARJANA MUDA II

Tajuk Projek: GPSajadah

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This thesis is dedicated to

Special dedication to my lovely parents, Shikh Maidin Bin Abd Kadir and Masharom bt Yusuf, my siblings, my kind hearted supervisor Dr. Mohd Sa'ari bin Mohamad Isa , all beloved lectures in Faculty of Electronic and Computer Engineering and to my dearest friend.

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ABSTRACT

To perform Solat, every Muslim must face Qibla. It is a direction that should be faced when a Muslim prays during Solat. The direction of Qibla is fixed towards the Kaaba. Because of that reason, Muslims must use proper technique or tools to ensure the right direction of Qibla. As Mecca is about 6950 kilometers away from Malaysia, one degree of Qibla direction can make the direction deviated about 120 kilometers away from Kaaba. Sometimes it was hard to find the exact direction, especially for blind people because a lack of information and cannot see the direction to find it. Hence, this GPSajadah is one of the best solutions to solve this problem. By using GPS module, digital compass, microcontroller and Qibla indicator, GPSajadah will be developed to ensure the consistent Qibla direction at any location in the world. This project will make life easier for whole Islam community because it well helps them to find exact direction towards Kaaba in a split second.

ABSTRAK

Untuk menunaikan solat, setiap Muslim perlu menghadap kiblat. Arah kiblat adalah tetap ke arah Kaabah. Disebabkan hal itu, seorang Muslim perlu untuk menggunakan teknik yang betul atau alat untuk memastikan arah Kiblat yang tepat. Jarak Mekah adalah sebanyak 6950 kilometers dari Malaysia. Satu darjah arah Kiblat akan menyebabkan arah itu menyimpang sebanyak 120 kilometer tersasar dari Kaabah. Kadang-kala ianya adalah susah untuk mencari arah Kiblat yang tepat terutamanya untuk orang buta, kerana kurangnya informasi dan mereka tidak dapat melihat arah yang mereka cari. Lantaran itu, GPSajadah ini merupakan jalan penyelesaian yang terbaik. Dengan menggunakan modul GPS, kompas digital, mikropengawal dan penunjuk Kiblat, GPSajadah akan dihasilkan untuk memastikan arah Kiblat yang konsisten walaupun dimana-mana di dunia ini. Projek ini akan memastikan kehidupan komuniti Muslim lebih menyenangkan dan akan membantu mereka untuk mencari arah Kiblat yang tepat dalam sekelip mata .

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LIST OF ABBREVIATIONS

Qibla	Kaabah in Makkah Saudi Arabia
Solat	Muslims prayers
Jakim	Jabatan Kemajuan Islam Malaysia
Sajadah	Prayer rug
GPS	Global Positioning System
LED	Light emitting diode
GNSS	Global Navigation Satellite System
ROM	Read-only memory
RAM	Random access memory
EPROM	Erasable programmable read-only memory
EEPROM	Electrically erasable programmable read-only memory
LCD	Liquid crystal display
IoT	Internet of Things
CPU	Central processing unit
USB	Universal Serial Bus

CHAPTER I

INTRODUCTION

This project is focussing on how to Design and invent GPSajadah with accurate Qibla direction for Muslim with additional indicator to help blind people to determine the right direction of Qibla anywhere in this world with affordable cost, that is below RM200. This chapter will discuss about the project background, objectives, work scope, problem statement and methodology of the project.

Project Background

Prayer is the central elements of Islamic practice and it is the second of the Five Pillars of Islam. Along with the testimony of faith, the pilgrimage to Mecca, fasting in the month of Ramadan and paying the poor tax, forms the essential framework of beautiful religious life for Muslims. Furthermore, the observance of the ritual prayer forms the framework of each Muslim's day, from morning to the night prayer that precedes sleep

Prayer, in the ritual sense is an obligation of the faith, and it need to be performed five times a day. According to Islamic law, prayers have a variety of obligations and conditions need to be care. These prayers are a must on every Muslim who has reached the age of puberty, except for those who are mentally ill, too physically ill for it to be possible, menstruating, and etc. Those who are ill or otherwise physically unable to offer their prayers in the traditional form still can perform Solat while sitting or lying, as they are able. [1]

The Qibla is the direction that Muslim must face while performing Solat. The direction is fixed towarded of the Kaaba in Mecca. The reasons why Muslims all praying towards the same point, is because it is traditionally considered to symbolize the unity of the Ummah, or all Muslims worldwide, under Sharia (Law of God). They do not worship the Kaaba, Muslims worship and bow to none but Allah. It is mentioned in Al-Quran:

We see the turning of thy face (for guidance) to the heavens: now shall we turn thee to a Qiblat that shall please thee. Turn then thy face in the direction of the Sacred Mosque: wherever you are, turn your faces in that direction. (Al-Baqarah: 144)

The significance of Muslims face Kaaba while praying are as a test of our ability to obey the commands of God. Muslims, as servants of God, are required to submit to Him. Another reason is because that the Qibla is a sign of the spiritual unity of Muslims around the world. At the time of prayer, every Muslims all who are lined in circles big and small facing one direction towards Kaaba and feeling belonging to

this centre and belonging to each other. This act creates some kind of spiritual unity amongst all Muslims worldwide and leaves them with a sense of belonging to each other and grateful.

The direction of Qibla can determine by using a compass, through latitude and longitude. The Qibla direction is important while perform solat and plays a part in various ceremonies. Hence, finding the Qibla accuracy for Muslims to face the correct direction to fulfil their worship of Allah is an important aspect in legislation and it is a legal requirement between either pray the obligatory prayers and circumcision prayers.

Chief Assistant Director of the Astronomy Branch, Division of Research Jakim, Che Alias Che Ismail, said the exact determination of the direction is particularly important in the construction of mosques to ensure they do not miss. He stressed, accuracy Qibla not something to be taken lightly, because even if it is only one degree of deviation, it is equivalent to approximately 125 kilometres strayed from the direction of the Kaaba. [2]

When Muslim are travel around the world, they might have a problem to perform Solat five times a day with the accurate Qibla direction wherever they are. They might need to bring any portable Qibla finder to find exact direction of the Kaaba. The accuracy of Qibla determination is very important and critical because slightly inaccuracies of Qibla direction will consequences a significant deviation to the user. Based on the statistics, there are 1.6 billion Muslim worldwide, representing 23% of global population. [3] In Malaysia itself, population of Muslim is around 19.5 million people that is 61.3% of population in Malaysia. [4]

Thus, each Muslim should be responsible to make sure their can found the right direction of Qibla to prove the actual effort and level of sincerity displayed in trying to figure out the right direction of Qibla. It is a must for a Muslim to face the Qiblah when praying as stated in the Holy al-Quran in chapter two:

So from wherever you go out (for prayer, O Muhammad) turn your face toward al-Masjid al-Haram, and indeed, it is the truth from your Lord. And Allah is not unaware of what you do. Muslims need to sincerely make an attempt to find the correct direction of Qiblah. (Surah al-Baqarah: 149)

There is a lot of electronic sajadah has been produce out there, but after go through research and review there is none of the sajadah is produce for the blind people. This is the main reason why GPSajadah is designed. It is because it was the first Sajadah that will help blind people to find the right direction of qibla. This product will help them and make life easier for those blind people and it will be useful for blind people. Besides that, this product also will help normal people because it has multi-function on how to find the right direction of Qibla with the affordable price that is below RM200 only.

There are few similar product available on market. One of them is called Ell Sajjadah which manufactured and available in Pakistan. It has beautiful art pattern on the mat that when the user turn the sajadah facing towards the Qibla direction, it will glow. Although it is beautiful and practical device, the price of each Ell Sajjadah is around \$625 that is RM 2750. This is expensive for an average person to have a sajadah that has Qibla indicator and people may not consider buying one. The other products on market have the same characteristic as Ell Sajjadah which is high in price.

For this project, GPSajadah is designed to have angle deviation below than 2.5 degree from the exact direction of Kaaba. The GPS module on GPSajadah will collect user longitude and latitude that will show user current position. It will transfer the collected data to the microcontroller. Then, digital compass will detect the current azimuth of user location and based on the algorithm in the code it will calculate the azimuth of the Qibla. Next, the azimuth of the Qibla will compared with user current azimuth and finally, the output indicator of GPSajadah that is LED light bulbs and buzzer will responded.

Project Objectives

This Project is carried out on the following objectives:

- I. Design and invent GPSajadah with accurate Qibla direction for Muslim to determine the right direction of Qibla anywhere in this world.
- II. Design and invent GPSajadah with additional indicator to help blind people to identify the right direction of Qibla.
- III. GPSajadah will be produced with an affordable cost.(less RM200)

Project Scope

This project concentrates on determining the right direction of the Qibla by invented GPSajadah as a tool to be used to find the right direction of the Kaaba. In this project, there will be four main scope that must be completed to make sure objectives is successfully achieved. First is to study on literature review. Second, designing on how to produce GPSajadah. Next, GPSajadah will be invented based on the process assigned and finally is to validate the invented GPSajadah with the available Qibla finder.

Firstly, is a literature review part, a lot of research and studies need to be done on how to calculate Qibla direction, how GPS module, digital compass and microcontroller is work for the need to find the Qibla direction. Next, is design the GPSajadah, in this part the GPSajadah need to be designed with below than 2.5 degree of deviation angle. Thirdly, GPSajadah need to be invented by using 3 main component that is Digital Compass, Global Positioning System (GPS) module and Microcontroller as a brain of this project. An output indicator of LED light bulb and buzzer also need in this project. Final scope work in this project will be, validating GPSajadah with other available Qibla finder such as compare it with magnetic compass and test the accuracy with the Qibla direction in the mosque.

Problem Statements

This project consists of three problem statement, that is:

- I. Normal people might face some problem to determine the correct Qibla direction while travelling because each place in this world has different direction of Qibla. This mainly due to their geographical location.
- II. Blind people might face bigger problem to identify the Qibla direction even at their hometown.
- III. Existing electronic Sajadah are expensive

System Operation

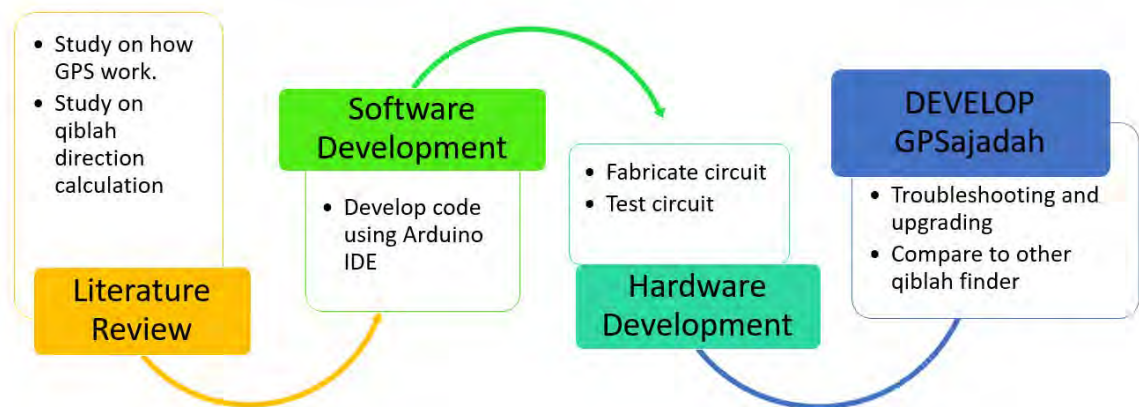


Figure 1.1: Overall block diagram of GPSajadah

The overall block diagram on how to invent GPSajadah is shown in Figure 1.1. Study about Global Positioning System (GPS) is part of the literature review in order to determine the accurate direction of Qibla by using latitude and longitude of user location. This information overall are obtained mainly from previous research paper which is journals, others are from reference books, e-Books, the internet and etc. The information obtained will be based on methods to determine Qibla direction, instruments used, construction of the device, advantages, disadvantages, and also cost to make it. When all the information is fully recovered, then the process of software development is begins. In this part, program code is written by using Arduino IDE software. The program code generally consist of instructions set for the GPS module that will collect data of user latitude and longitude, and it will sent to the microcontroller. Digital compass then will identify the current azimuth of the user and will be comparable with the Qibla azimuth that already been calculated in the code. The LED and buzzer will be as indicator to show the right direction of Qibla as instruct in the code.

After that, the circuit will be fabricate on the breadboard to be tested. The circuit need to be test to make sure digital compass is successfully identify the right direction of the Qibla according to the instruction of the code. Finally, GPSajadah will be invented and if there is any problem in finding the Qibla, there will be troubleshoot until there are operate successfully.

CHAPTER II

LITERATURE REVIEW

A literature review is a text of a scholarly paper that includes the current knowledge, including substantive findings, theoretical, methodological contributions of the project. This chapter will discuss published information in a particular subject area, and sometimes information in a particular subject area within a certain time of period. A literature review can be just a simple summary of the sources. Usually in literature review it is an organizational pattern and combines both summary and synthesis. This chapter reviews of an articles, books and journals to understand about the concept that needs to know by the researcher in order to make sure their project is complete. In this chapter, will be discussed on how to determining the Qibla direction, how Global Positioning System (GPS) are work, how digital compass operate and etc.

Qibla Direction

The word of Qibla is origins from Arabic language that means the direction that faced towards Kaaba that is building located in Makkah, Saudi Arabia. Qibla direction is used by the Muslims all over the world to perform prayer. Besides that, as other religious obligations such as an animal slaughtering procedure which is the head of an animal should be aligned to the Qibla direction and furthermore, Muslims are buried with their heads are turned right towards Qibla direction. In Islam, it is compulsory for them to face the Qibla during while performing Solat.

At first, the Qibla originally faced the Noble Sanctuary in Jerusalem. This Qibla direction was used for over 13 years, from 610 CE until 623 CE. Seventeen months after the Islamic prophet Muhammad's 622 CE arrival in Medina – the date is given as 11 February 624 – the Qibla became oriented towards the Kaaba in Mecca Saudi Arabia. [5]

Nowadays, Qibla determination methods have evolved and being simplified. To find the Qibla direction is not hard anymore like in the early days due to many instruments have been invented and developed. There are a lot of mobile phone applications like 'alQibla', 'MySolat' and 'Qibla Compass' and many others that can be a tools or technique to find the direction of Qibla. Besides that, non-mobile web-based application like e.qibla.com and Qibla direction also can be used to find the Qibla direction. This mobile applications are usually equipped with Location-Based Services (LBS) and Geographical Information System (GIS) technology. By using this technology, it can help the Muslims around the world to locate the Qibla direction conveniently especially during travelling and when the mosque is not accessible.[6]

History of Geometric Calculation of Qibla Direction

The determination of the Qibla has in the past exercised the minds of the greatest astronomers, geographers and mathematicians of the Islamic world. In the late 8th century, sophisticated mathematical solutions were developed based on spherical trigonometry and the geographical knowledge of that period of time. The most commonly adopted algorithm was based on the great-circle path (or shortest-distance path) connecting the observer with the Kaaba building in Mecca and determining its angle with the direction to North. [8]

Geometric calculation of Qibla direction was concerned by the Muslim astronomers from the eight century onwards. By using mathematical procedure Qibla direction can be determining as expected. Muslim scientists like Al-Khwarizmi and Al-Battani, Ibn Yunus, al-Nayrizi, and al-Biruni back then had discuss about how to find the direction of Qibla earliest centuries ago. This Muslim scientists encounter the solution of spherical trigonometry or reducing the three-dimensional situation to two dimensions which solved by using geometry or plane trigonometry.

The one who work on determining the Qibla direction in the past is by Muslim scientists. Firstly, approximate methods were given by Al-Khwarizmi and Al-Battani, then due to the simplicity of its geometric construction, Al-Battani's method remained in wide use even after more accurate methods became available. Five Exact methods based on graphical constructions were given by Habash al-Hasib and Ibn al Haitham, and those based on such constructions and spherical trigonometric computations were given by Ibn Yunus, al-Nayrizi, and al-Biruni. Ibn Yunus and al-Kalili then compiled a tables containing the Qibla angle as a function of longitude difference from Mecca and latitude. Furthermore, practical methods involving astronomical instruments such as astrolabes and various types of quadrants were devised by many researchers in the past, many of them unidentified. The Qibla direction could also be determined by solar observations directly at certain times, and can be derived from observations using spherical trigonometric calculations at other times. The versatile astrolabe served well