



Faculty of Electrical and Electronic Engineering Technology



**i-SAJADAH WITH AUTOMATIC LOCATION TRACKER USING
GPS**

NUR FATIN SHAZWANI BINTI NOR RAZMAN

**Bachelor of Electrical Engineering Technology (Industrial Automation & Robotics)
with Honours**

2021

i-SAJDAH WITH AUTOMATIC LOCATION TRACKER USING GPS

NUR FATIN SHAZWANI BINTI NOR RAZMAN

**A project report submitted
in partial fulfillment of the requirements for the degree of
Bachelor of Electrical Engineering Technology (Industrial Automation & Robotics)
with Honours**



Faculty of Electrical and Electronic Engineering Technology

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

2021

**BORANG PENGESAHAN STATUS LAPORAN
PROJEK SARJANA MUDA II**

Tajuk Projek : Nur Fatin Shazwani Binti Nor Razman

Sesi Pengajian : 2020/2021

Saya **Nur Fatin Shazwani Binti Nor Razman** mengaku membenarkan laporan Projek Sarjana Muda ini disimpan di Perpustakaan dengan syarat-syarat kegunaan seperti berikut:

1. Laporan adalah hakmilik Universiti Teknikal Malaysia Melaka.
2. Perpustakaan dibenarkan membuat salinan untuk tujuan pengajian sahaja.
3. Perpustakaan dibenarkan membuat salinan laporan ini sebagai bahan pertukaran antara institusi pengajian tinggi.
4. Sila tandakan (✓):

SULIT*

(Mengandungi maklumat yang berdarjah keselamatan atau kepentingan Malaysia seperti yang termaktub di dalam AKTA RAHSIA RASMI 1972)

TERHAD*

(Mengandungi maklumat terhad yang telah ditentukan oleh organisasi/badan di mana penyelidikan dijalankan)

TIDAK TERHAD



Disahkan oleh:

Ahmad Idil

(TANDATANGAN PENULIS)

Alamat Tetap: No 10, Jalan Lampam 25
Taman Tanjung Puteri Resort, 81700 Pasir
Gudang, Johor.

(COP DAN TANDATANGAN PENYELIA)

AHMAD IDIL BIN ABDUL RAHMAN
Pensyarah Kanan
Jabatan Teknologi Kejuruteraan Elektrik
Fakulti Teknologi Kejuruteraan Elektrik Dan Elektronik
Universiti Teknikal Malaysia Melaka

Tarikh: 11/1/2021

Tarikh: 11/1/2022

DECLARATION

I declare that this project report entitled “i-Sajadah with Automatic Location Tracker Using GPS” 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 FATIN SHAZWANI BINTI NOR RAZMAN

Date :

11 JANUARY 2022

اونيورسيتي تيكنيكل مليسيا ملاك

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

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 (Industrial Automation & Robotics) with Honours.

Signature :

Ahmad Idil

Supervisor Name : TS. AHMAD IDIL BIN ABD RAHMAN

Date : 11/1/2022

Signature :

اوينور سيتي تيم جوهار

Co-Supervisor :

Name (if any)

TS. JOHAR AKBAR BIN MOHAMAT GANI

Date :

13/01/2022

DEDICATION

*Special dedicated to my beloved parents, friends and the most supported person,
Fahmi Asyraf*



ABSTRACT

Development of this i-sajadah with automatic location tracker by using GPS real-time location which is an automated system that can be used by all levels of society. This project is to develop the i-sajadah rakaah notification and smart monitoring with automatic location tracker while the system can display time for solah automatically by using GPS. The basic idea of this project by using GPS are real-time information. Many modern development systems calculate prayer times based on manual longitude rather than automatic load such as GPS. It means that people must know their longitude wherever they go in order to know when to perform their solah. By applying the automatic location tracker, it can be easier for users to figure out a dependable means to identify them, particularly for Muslims, in order to guide them to the prayer hour. Therefore, the continuation of the i-sajadah with Automatic Location Tracker using GPS will provide the efficient usage for every Muslim out there. The GPS will function to tell us the exact prayer time according to the current places. The improvement of this project is to propose a more user-friendly and efficient usage of the current system. This device consists of GPS module that help user trace their current location and the prayer time based on their location. In this project of i-sajadah with automatic location tracker using GPS will automatically display the time of prayer on LCD screen. This device consists of the Arduino software, Wi- Fi application, sensory component and GPS module. In a nutshell, the innovation of the i- sajadah with Automatic Location Tracker using GPS provides more efficient system in tracking our location for our daily prayer routines.

ABSTRAK

Pembangunan i-sajadah ini dengan pengesanan lokasi automatik dengan menggunakan lokasi masa nyata GPS yang merupakan sistem automatik yang boleh digunakan oleh semua lapisan masyarakat. Projek ini adalah untuk membangunkan pemberitahuan i-sajadah rakaah dan pemantauan pintar dengan pengesanan lokasi automatik manakala sistem boleh memaparkan masa solat secara automatik menggunakan GPS. Idea asas projek ini dengan menggunakan GPS ialah maklumat masa nyata. Banyak sistem pembangunan moden mengira waktu solat berdasarkan longitud manual dan bukannya beban automatik seperti GPS. Maksudnya, orang ramai mesti mengetahui garis bujur mereka ke mana sahaja mereka pergi untuk mengetahui masa untuk menunaikan solat. Dengan menggunakan penjejak lokasi automatik, lebih mudah bagi pengguna untuk memikirkan cara yang boleh dipercayai untuk mengenal pasti mereka, terutamanya bagi orang Islam, untuk membimbing mereka ke waktu solat. Justeru, kesinambungan i-sajadah dengan Automatic Location Tracker menggunakan GPS akan memberikan penggunaan yang cekap kepada setiap umat Islam di luar sana. GPS akan berfungsi untuk memberitahu kami waktu solat yang tepat mengikut tempat semasa. Penambahbaikan projek ini adalah untuk mencadangkan penggunaan sistem semasa yang lebih mesra pengguna dan cekap. Peranti ini terdiri daripada modul GPS yang membantu pengguna mengesan lokasi semasa mereka dan waktu solat berdasarkan lokasi mereka. Dalam projek i-sajadah dengan penjejak lokasi automatik menggunakan GPS ini secara automatik akan memaparkan waktu solat pada skrin LCD. Peranti ini terdiri daripada perisian Arduino, aplikasi Wi-Fi, komponen deria dan modul GPS. Secara ringkasnya, inovasi i-sajadah dengan Penjejak Lokasi Automatik menggunakan GPS menyediakan sistem yang lebih cekap dalam menjejak lokasi kita untuk rutin solat harian kita.

ACKNOWLEDGEMENTS

First of all, I would like to thank Allah SWT, The Almighty, a place where I pray and surrender, who has given me strength and ability to complete the project on time. The success and outcome of this project required a lot of guidance and assistance from many people, and I am incredibly fortunate to have got this all along with the completion of this project.

However, I would like to express my gratitude to my supervisor, Mr. Ahmad Idil Bin Abdul Rahman and my co-supervisor, Encik Johar Akbar bin Mohamat Gani for his precious guidance, words of wisdom and patient throughout this project. He also guiding me through this project, despite being extraordinarily busy with his duties, and keeping me on the correct path.

Bearing in mind previously, I am using this opportunity to express my deepest gratitude and special thanks to all the lecturers who taught in the past four years and the significant contribution that qualifies me to do my final year project.

I want to extend this to my parents Khairulanwar Bin Othman and Suhaily Binti Mustapha, for their kind cooperation and encouragement, which will help complete this project. Their advice has been my strength in moving forward and helping me focus on what I'm doing. They are my backbone and my motivator.

Also, I thank all my friends, whether senior or middle-aged, for helping with software on computers. regardless of the contribution made either in terms of finances or energy, without which my project would not have ended.

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

TABLE OF CONTENTS

	PAGE
DECLARATION	
APPROVAL	
DEDICATIONS	
ABSTRACT	i
ABSTRAK	ii
ACKNOWLEDGEMENTS	iii
TABLE OF CONTENTS	i
LIST OF TABLES	iv
LIST OF FIGURES	v
LIST OF SYMBOLS	viii
LIST OF ABBREVIATIONS	ix
LIST OF APPENDICES	x
CHAPTER 1 INTRODUCTION	1
1.1 Background	1
1.2 Problem Statement	2
1.3 Project Objective	4
1.4 Scope of Project	4
CHAPTER 2 LITERATURE REVIEW	6
2.1 Introduction	6
2.2.1 Prayer Time System	7
2.2 Global Positioning System (GPS)	9
2.3 How GPS Works	10
2.4 GPS Module	12
2.4.1 GPS Module Interfacing with Arduini UNO	12
2.5 Hardware of NEO-6M GPS Module	13
2.5.1 Overview of The Hardware of GPS Module (NEO-6M GPS)	14
2.5.2 Comparisom with Existing System or Application	15
2.5.3 Advantage of i-sajadah with Automatic Location	21
2.6 GPS Navigation and Tracking Device	22
2.6.1 GPS Navigation Device	23
2.6.2 Software that support GPS receiver	23
2.6.3 GPS Tracking Device	25
2.7 Real-Time Satellite Mosque Tracking System	26

2.8	The Algorithm for Optimization of GPS tracking on a mobile platforms	26
2.9	GPS Prayer Time On Airplanes	27
2.10	GSM-Based Tracking on A Real Time Bus Location	28
2.11	Summary	29
CHAPTER 3 METHODOLOGY		30
3.1	Introduction	30
3.2	Project Development	30
3.2.1	Project Planning	30
3.2.1.1	Project Analysis	33
3.2.1.2	Design	33
3.2.1.3	Implementation	33
3.2.1.4	Testing	34
3.2.1.5	Process Flow	34
3.2.1.6	Project Requirement	36
3.3	Software and Hardware Design	36
3.3.1	Software	36
3.3.1.1	Arduino IDE	36
3.3.1.2	Blynk Application	39
3.3.2	Hardware Development	40
3.3.2.1	ESP32 Arduino	40
3.3.2.2	GPS Module	42
3.3.2.3	LCD Screen	43
3.4	Project Design	45
3.4.1	Problem Statement	45
3.4.2	Research Study	48
3.5	Component Selection	49
3.6	Project Implementation	50
3.6.1	Programming Testing using Arduino Software and Hardware	50
3.7	Project Integration	67
3.8	Summary	69
CHAPTER 4 RESULTS AND DISCUSSIONS		70
4.1	Introduction	70
4.2	Project Result	71
4.2.1	Overall system working	71
4.3	Data analysis on user using i-sajadah with automatic location tracker	75
4.3.1	Data analysis on GPS at Zone 1	76
4.3.2	Data analysis on GPS at Zone 2	77
4.3.3	Signal detection of the GPS analysis	78
4.3.4	Signal accuracy of the GPS analysis	78
4.4	Commercialization Relevancy	80

CHAPTER 5	CONCLUSION AND RECOMMENDATIONS	83
5.1	Introduction	83
5.2	Conclusion	83
5.3	Recommendation	84
REFERENCES		85
APPENDICES		87



LIST OF TABLES

TABLE	TITLE	PAGE
Table 2.1	Prayer Time	8
Table 2.2	Comparison between previous design	15
Table 3.1	Pin connection between esp32 and OLED Display	53
Table 3.2	Pin connection between esp32 and GPS Module	60
Table 3.3	Prayer time for Tg Puteri (region 1)	68
Table 3.4	Assumption prayer time for Pasir Putih (region 2)	69
Table 4.1	Range of actual latitude and longitude for Zone 1	76
Table 4.2	Range of measure latitude and longitude for Zone 1	76
Table 4.3	Range of actual latitude and longitude for Zone 2	77
Table 4.4	Range of measure latitude and longitude for Zone 2	77
Table 4.5	Basic costing of component used in package A	80
Table 4.6	Basic costing of component used in package B	81
Table 4.7	Basic costing of component used in package C	82

LIST OF FIGURES

FIGURE	TITLE	PAGE
Figure 2.1	Time of prayer	8
Figure 2.2	Twilight	9
Figure 2.3	General Works Of GPS (Modified from [4])	11
Figure 2.4	NEO-6M GPS Receiver Module	12
Figure 2.5	u-blox NEO-6M GPS Module	13
Figure 2.6	Circuit Diagram of The Module	14
Figure 2.7	Design Block Diagram of GPS Satellites	22
Figure 2.8	BSGPS program interface (Navigation device)	23
Figure 2.9	Sirf DEMO program interface (Navigation device)	24
Figure 2.10	Message received by the observer containing the position of	25
Figure 2.11	The Three Part of GPS	27
Figure 3.1	Project planning flowchart	32
Figure 3.2	Flowchart of GPS module Operation as automatic location tracker	35
Figure 3.3	Block Diagram For Hardware	35
Figure 3.4	Introduction to Arduino IDE environment	37
Figure 3.5	Six button appeared in Menu tab of Arduino Software	37
Figure 3.6	System of Blynk Application	39
Figure 3.7	Arduino Uno pinout	40
Figure 3.8	The Differences between ESP32 and ESP8266[9]	41
Figure 3.9	Pin GPS to Arduino	42
Figure 3.10	GPS NEO-6M Module	43
Figure 3.11	LCD 16x2 Lines	43
Figure 3.12	Pin Connection from Arduino UNO to LCD	44

Figure 3.13	LCD 16x2	44
Figure 3.14	Configuration Number of Pin	44
Figure 3.15	Flowchart of i-sajadah	47
Figure 3.16	Block diagram of the project implementation	50
Figure 3.17	Flowchart diagram for libraries of OLED Display	51
Figure 3.18	Flowchart diagram of setup OLED display in system	52
Figure 3.19	Connection diagram between esp32 and OLED	53
Figure 3.20	The output display on OLED	54
Figure 3.21	Flowchart diagram of setup pushbutton function in system	55
Figure 3.22	Diagram between esp32 and pushbutton	56
Figure 3.23	Flowchart diagram for the example testing pushbutton function	57
Figure 3.24	The output of the testing between pushbutton and LED	57
Figure 3.25	Flowchart diagram of the code for pin connection	59
Figure 3.26	Connection diagram between esp32 and GPS Module	60
Figure 3.27	NMEA sentence string	61
Figure 3.28	Location diagram based on NMEA sentence code	61
Figure 3.29	Flowchart diagram of the the real time clock in GPS Module	62
Figure 3.30	Connection diagram between esp32 and piezoelectric sensor	63
Figure 3.31	Flowchart diagram for piezoelectric sensor testing	64
Figure 3.32	Testing result of piezoelectric sensor on serial monitor	64
Figure 3.33	Flowchart of Blynk Application library for ESP32	65
Figure 3.34	Example coding for auth,ssid and pass of this system	66
Figure 3.35	Circuit simulation using fritzing software	67
Figure 4.1	Initial display after ON the system	71
Figure 4.2	Wi-Fi being connected with system display on OLED	71

Figure 4.3	Title of project on OLED display	72
Figure 4.4	latitude, longitude, location, date and current time on the OLED	72
Figure 4.5	OLED display time and type of prayer then user need to press push button to start solah	73
Figure 4.6	Prayer type on OLED display	74
Figure 4.7	Isyak prayer raka'ah counting when user's forehead detected by sensor	74
Figure 4.8	Notification of completing Isyak prayer on smartphone via Blynk Application	75
Figure 4.9	Region for Zone 1	76
Figure 4.10	Region for Zone 2	77
Figure 4.11	Formula for percentage of error	78



LIST OF SYMBOLS

D, d	-	Voltage angle
F	-	Force
g	-	Gravity = 9.81 m/s
I	-	Moment of inertia
l	-	Length
m	-	Mass
N	-	Rotational velocity
P	-	Pressure
Q	-	Volumetric flow-rate
r	-	Radius
T	-	Torque
Re	-	Reynold number
V	-	Velocity
w	-	Angular velocity
x	-	Displacement
z	-	Height
q	-	Angle

LIST OF ABBREVIATIONS

RTC	-	Real Time Clock
UART	-	Universal Asynchronous Receiver-Transmitter
OLED	-	Organic Light Emitting Diode
GPS	-	Global Positioning System



LIST OF APPENDICES

APPENDIX	TITLE	PAGE
Appendix 1	Gantt Chart BDP I	63
Appendix 2	Gantt Chart BDP II	64



CHAPTER 1

INTRODUCTION

1.1 Background

Nowadays, it's thought-about a standard state of affairs for the industries to use technology to the extent of a much better or lesser degree. In several cases, the nice functioning of the instrumentality, overall system and swish networks are the most key of the corporate to unendingly in operation with success. In straightforward words, the buyer or client are the neutral directly offered with the new technology service. albeit the organization has the mandatory technology for his or her operational tasks, this doesn't imply that it's effective or helpful. At any purpose, the extent of the fault incidence could increase to bound difficult settings or eventualities. because of that reason, it's essential to possess associate degree organized laptop design to manage its functioning, as a result of any errors that occur won't influence the service provided to the customers within the finish.

Since prehistoric times, humans are making an attempt to plot a reliable technique of determinant wherever they are, notably for Muslims, so as to help them in determinant the prayer time. The sun, moon, and stars area unit utilized by cavemen to work out their location. The previous position is crammed by succeeding person. compass and sextants area unit succeeding advancements within the good procedure. The needle of a compass perpetually purposes to the north point, whereas a sextant uses associate degree adjustable mirror to live the angle of the sun, stars, and moon. However, all of them simply show the latitude and not the great circle.

Radio-based navigation systems were developed within the early twentieth century. that were of times used throughout warfare II, there have been 2 choices that is use an occasional frequency radio radiation that might cowl an oversized space however was inaccurate, or use a high frequency radio radiation that might cowl an oversized space however was inaccurate. At the instant, the sole system capable of displaying an exact position on the world at anytime, anyplace, and all told weather is that the international Positioning System (GPS). it's normally used as a method for gathering spacial information. Existing digital files, maps which will be digitized, and, a lot of recently, GPS area unit key sources of special information. It may be wont to confirm the situation of one thing within the globe by providing great circle, latitude, and altitude information.

The i-sajadah with Automatic Location Tracker Using GPS has been designed to improve the previous project development which is the i-sajadah with Smart Monitoring System. This system is improved in its design by adding the beneficial automatic location tracker feature which is using GPS module. In addition, improving the previous project by adding the GPS module as automatic location tracker, it will ease user to perform their solah wherever they are. By improving the new features, a possible problem to perform solah when doing work outside of current places or being at nowhere can be solve.

1.2 Problem Statement

For Muslims, prayer is an important moment to express their gratitude to The Almighty. As a result, they are attempting to devise the simplest method of calculating the time of prayer based on the location of the sun. The advanced technology on GPS has contributed many new discoveries and made many things easier for the end-user, particularly in the area of position monitoring, and its accuracy is also used to navigate a course of directions to a destination. The capacity of GPS to precisely track location coordinates can

also be used to help a Moslem traveller who is going on a trip to a new location find the nearest mosque to do prayer. However, few solutions for a Moslem traveller for Mosque tracking systems have been offered, and how to handle the geometrics dilution of accuracy problem on signal retrieving while tracking mosques remains a difficulty[1]. Some of them produce software for mobile phones, software for PCs, and prayer azan clocks to meet the demand of easily knowing the prayer time, as mentioned in the literature review in the following chapter.

The basic ideas of the i-sajadah with prayer time system using GPS are real-time information. Many modern development systems calculate prayer times based on manual longitude rather than automatic loads such as GPS. It means that people must know their longitude wherever they go in order to know when to pray. Nonetheless, the issue persists. They are prone to human errors (both intentional and inadvertent), have higher costs, and lack real-time monitoring and regulation. Many challenges can be overcome by creating this project. It has the potential to provide precise position without having to worry about where you are and the weather. People can take it with them wherever they go because it is small in size. It provides an advantage to Muslims who wish to migrate from one country to another. There is no need for them to be concerned about the difficulties of determining prayer time because the technology automatically loads and calculates prayer time. They can get prayer time information from the LCD display. As a result, we will undoubtedly know the prayer time precisely, and it will be possible to improve the system that was previously researched and developed. Hence, the problem statement that produce the reason for the outcome idea which is the improvement that helps user to track prayer time according to their locations or coordinate such as Global Positioning System (GPS). User can bring the prayer mat anywhere without need to change the coding of prayer time due to changes of

location. The weakness of the previous project is one of the problem statement which is the previous *i-sajadah* is moveable but the monitoring system is fixed. Then the prayer time is fix based on one location that's mean the *sajadah* is not valid to use at another places.

1.3 Project Objective

The main aim of this project is to propose a systematic and effective methodology to estimate system *i-sajadah* with automatic location tracker using GPS with reasonable accuracy. Specifically, the objectives are as follows:

- a) To develop *i-sajadah* rakaah notification and smart monitoring with automatic location tracker.
- b) To develop a system that can display time for *solah* automatically by using GPS module
- c) To perform an analysis performance on the *i-sajadah* in term of its functionality and precision on detecting location and displaying *solah* time correctly.

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

1.4 Scope of Project

Muslims all across the world conduct extensive research into location trackers that use GPS modules. Several techniques have been discovered. To reduce the scope of the research, the project has been confined to a specific area, *i-sajadah* using an automatic location tracker system based on a GPS module. The goal of this project is to display the prayer time on an LCD panel that is determined automatically. The GPS Module determines the user's location. The receiver's longitude and latitude data are utilized to calculate the prayer time, which happens automatically. The propose system will be integrated with two

previous project which is Ingenious Prayer Mat with smart *rakaah* notification device and the another one is *i-sajadah* with smart monitoring system. There is two targeted zone area which Ayer Keroh, the place where I am study and the second are is Johor Bahru which is my hometown for setting up this project. In this project, the limit region function is to make this project more easy to analyze the performance. The limit region also is to create one zone for the testing to the system.

