UNIVERSITI TEKNIKAL MALAYSIA MELAKA

DEVELOPMENT OF TRACKING SYSTEM FOR HIKING AND MOUNTAIN CLIMBING

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

By

MUHAMMAD ANAS BIN ZULKAFLIE

B071510794

940921-10-5449

FACULTY OF ELECTRICAL AND ELECTRONIC ENGINEERING TECHNOLOGY

2018

© Universiti Teknikal Malaysia Melaka

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

BORANG PENGESAHAN STATUS LAPORAN PROJEK SARJANA MUDA

Tajuk: Development of Tracking System for Hiking and Mountain Climbing

Sesi Pengajian: 2018/2019

Saya **MUHAMMAD ANAS BIN ZULKAFLIE** mengaku membenarkan Laporan PSM ini disimpan di Perpustakaan Universiti Teknikal Malaysia Melaka (UTeM) dengan syarat-syarat kegunaan seperti berikut:

1. Laporan PSM adalah hak milik Universiti Teknikal Malaysia Melaka dan penulis.
2. Perpustakaan Universiti Teknikal Malaysia Melaka dibenarkan membuat salinan untuk tujuan pengajian sahaja dengan izin penulis.
3. Perpustakaan dibenarkan membuat salinan laporan PSM ini sebagai bahan pertukaran antara institusi pengajian tinggi.
4. **Sila tandakan (X)

☐	SULIT*	Mengandungi maklumat yang berdarjah keselamatan atau kepentingan Malaysia sebagaimana yang termaktub dalam AKTA RAHSIA RASMI 1972.
☐	TERHAD*	Mengandungi maklumat TERHAD yang telah ditentukan oleh organisasi/badan di mana penyelidikan dijalankan.
☒	TIDAK TERHAD	

Yang benar,

.....

MUHAMMAD ANAS BIN ZULKAFLIE

Alamat Tetap:
No 29 Jalan 2B/6,
Taman Setapak Indah,
53300 Setapak,
Kuala Lumpur

Tarikh: 8/1/2019

Disahkan oleh penyelia:

.....

Nurliyana binti Abd Mutalib

Cop Rasmi Penyelia

NURLIYANA BINTI ABD MUTALIB
Pensyarah
Jabatan Teknologi Kejuruteraan Elektronik & Komputer
Fakulti Teknologi Kejuruteraan Elektrik dan Elektronik
Universiti Teknikal Malaysia Melaka

Tarikh: 8/1/2019

© Universiti Teknikal Malaysia Melaka

DECLARATION

I hereby, declared this report entitled Development of Tracking System for Hiking and Mountain Climbing is the results of my own research except as cited in references.

Signature: .....

Author : MUHAMMAD ANAS BIN ZULKAFLIE

Date: 8/1/2019

© Universiti Teknikal Malaysia Melaka

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 Engineering Technology (Industrial Electronic) with Honours. The member of the supervisory is as follow:

Signature: .....

Supervisor : Nurliyana binti Abd Mutalib

© Universiti Teknikal Malaysia Melaka

ABSTRAK

Penggemar aktiviti lasak seperti mendaki gunung dan memanjat batu kerap menghadapi situasi dimana sukar mengenal pasti lokasi dimana mereka berada serta mengalami kesukaran ketika sesat di sekitar kawasan aktiviti berkenaan. Hal ini demikian kerana tiada sistem yang dapat mengesan dan memberitahu kedudukan mereka ketika berdepan situasi sedemikian. Malah, ianya boleh mengakibatkan seseorang itu mengalami kecederaan yang agak serius sehingga sukar untuk pasukan mencari dan menyelamat berada di lokasi berkenaan untuk membantu. Oleh itu, satu sistem telah direka untuk mengesan seseorang ketika melakukan aktiviti mendaki gunung dan memanjat batu bagi memudahkan pasukan mencari dan menyelamat mendapatkan informasi melalui lokasi, latitude dan longitude pengguna di dalam kawasan yang telah dijadikan pusat pemeriksaan. Projek ini mempunyai paparan OLED yang memaparkan tarikh dan waktu kepada pengguna bagi memudahkan pengguna untuk mengikut jadual yang ditetapkan mereka ketika sedang melakukan aktiviti berkenaan. Ianya juga dilengkapi dengan modul GPS untuk mengesan dan menghantar informasi berkenaan lokasi pengguna melalui hubungan internet.

© Universiti Teknikal Malaysia Melaka

ABSTRACT

People who enjoy outdoor activities such as hiking will most likely face problems such as getting lost in unfamiliar places or losing their directions during their hike. It is hard for them to know their exact locations if they are lost. It will become bigger problems if any emergency cases happened while doing these types of activities such as injuries that need to be treated immediately to avoid fatal consequences. A system has been created especially for tracking during hiking and mountain climbing activities. Therefore if there is any emergency case like missing person, getting lost or injuries that need to be treated as soon as possible, this system can help by receiving information in the form of longitude and latitude of the users in that area that marks as a checkpoint. This project has OLED display to display the date and time to user to the user to follow the schedule that has been set up for them when doing this kind of activity. It is has built-in GPS module to track and transmit the information to the user by using internet connection

© Universiti Teknikal Malaysia Melaka

DEDICATION

To my beloved parents, my supervisor and my friends.

© Universiti Teknikal Malaysia Melaka

ACKNOWLEDGEMENTS

Finally, I would like to say thank you to my supervisor, madam Nurliyana binti Abd Mutalib for her excellent guidance, manage, constant support, suggestion, patience and help to complete my Bachelor Degree Project. She has contributed towards my understanding and I had learn a lot from her. She has motivated and inspired me to done this project with a big spirit.

I wish to express my deepest appreciation to my parents Sabariah binti Mohd Said, Zulkaflie bin Zainuddin and also my siblings for gives me support and strength on me to successfully done my Bachelor Degree Project. Last but not least, I would like to express my feeling which always be my backbone to my friends who had lend their hands for helping me during the period of this project. I do appreciate so much, thank you.

© Universiti Teknikal Malaysia Melaka

TABLE OF CONTENT

CHAPTER 1: INTRODUCTION		**1**
1.0	Overview	1
1.1	Background	1
1.2	Problem Statement	2
1.3	Objectives	3
1.4	Project Scopes	4
CHAPTER 2: LITERATURE REVIEW		**5**
2.0	Introduction	5
2.1	The technology of GPS and GPRS based on Tele-monitoring System for Emergency Patient Transportation	5
2.2	Child Tracking System	7
2.3	Accurate and Energy-Efficient GPS-Less Outdoor Localization	8
2.4	Design and Development of an IoT System Prototype for Outdoor Tracking	9
2.5	Introduction to Electronics Prototyping Using Arduino	10
2.6	A New Real-Time Location Tracking Techniques Using	11

© Universiti Teknikal Malaysia Melaka

	Doppler Radar and Bio-Sensors in WSN	
2.7	The RF-based Locating of Mobile Objects	13
2.8	Tomo: Wearable, Low - Cost, Electrical Impedance Tomography for Hand Gesture Recognition	14
2.9	A Fitness Monitoring System based on Fusion of Visual and Sensorial Information	15
2.10	COIN-GPS: Indoor Localization from Direct GPS Receiving	16
2.11	The Design and Implementation of Hybrid Automatic Solar Tracking System	17
2.12	Identifying Logical Location Via GPS-Enabled Mobile Phone and Wearable Camera	18
2.13	Thrifty tracking: online GPS tracking with low data uplink usage	19
2.14	The Wrist-Conductor	21
2.15	Design and Implementation of Automatic Vehicle Tracker System for Accidental Emergency	22
2.16	Comparison of Literature Review	26
2.17	Conclusion	31
CHAPTER 3: METHODOLOGY		**32**
3.0	Introduction	32
3.1	Project Planning	34

© Universiti Teknikal Malaysia Melaka

3.2	Problem Solving Method	35
3.3	Block Diagram Project	36
3.4	Component Choices	40
3.5	Process of Creating Circuit Project	41
3.6	Process of Design Printed Circuit Board	45
CHAPTER 4: RESULT AND DISCUSSION		**47**
4.0	Introduction	47
4.1	Result Project Operation	48
4.2	Project Performance Testing	54
4.3	Result for Tracker System	60
CHAPTER 5: CONCLUSION AND RECOMMENDATION		**61**
5.0	Introduction	61
5.1	Conclusion	61
5.2	Recommendation	63
5.2.1	Search Engine	63
5.2.2	Accelerometer Sensor	63
5.2.3	Face Detection Sensor	64
5.2.4	Water Resistance Technology	64
5.3	Work Potential	64

© Universiti Teknikal Malaysia Melaka

REFERENCES 62

APPENDIX 67

© Universiti Teknikal Malaysia Melaka

LIST OF TABLES

2.1 Comparison of the literature review for each journal and research

4.1 Project Specification

4.2 Measured Value of Latitude and Longitude Data

4.3 Real Value of Latitude Longitude Data

© Universiti Teknikal Malaysia Melaka

LIST OF FIGURES

2.1 Block diagram for GPS and GPRS Based Tele-monitoring System for Emergency Patient Transportation

2.2 Block Diagram of Child Tracking System based on GPS System

2.3 Block Diagram for Dejavu system

2.4 Block diagram of the system

2.5 Red Panda Cloud Service

2.6 Example of Electronic Circuit Prototyping using Arduino

2.7 Block diagram for A New Real-Time Location Tracking Techniques Using Doppler Radar and Bio-Sensors in WSN

2.8 Block diagram of location estimation sensor module

2.9 Visualization of sensor data for different hand gestures

2.10 Block Diagram for Fitness Monitoring System based on Fusion of Visual and Sensorial Information

2.11 Simplified standard satellite acquisition

2.12 The Internal system of the project

2.13 Block Diagram of Automatic Solar Tracking System

2.14 The System Architecture for this project

© Universiti Teknikal Malaysia Melaka

2.15 Architectural diagram of this system

2.16 The relationship between SynchPoint with the player

2.17 Block Diagram

2.18 Hardware Circuit

2.19 Accident Notification System

2.20 Application for Accident

2.21 Application for Emergency Service

2.22 Result SMS received from GSM

3.1 Project Methodology Planning

3.2 Block Diagram for Project System

3.3 Block Diagram for Operation System

3.4 Flowchart for Project System

3.5 Flowchart for Operation System

3.6 Show the setting for Additional Boards Manager

3.7 Show library setting to be include library setting for the project

3.8 Board Manager setting

3.9 Board selection in Arduino IDE

3.10 Show the layout of PCB design for this project

3.11 PCB layout

4.1 PCB circuit with solder

4.2 PCB circuit top view with component

4.3 Top view complete prototype project

© Universiti Teknikal Malaysia Melaka

4.4 Bottom view complete prototype project

4.5 Side view complete prototype project

4.6 Blynk application screen

4.7 Search engine website using same value from result data

4.8 Starting point of Beruang Hill

4.9 Movement within area of Beruang Hill

4.10 Top hill of Beruang Hill

4.11 View from midpoint of Beruang Hill

4.12 OLED display show the value for date and time

© Universiti Teknikal Malaysia Melaka

LIST OF APPENDICES

APPENDIX	TITLE	PAGE
Appendix 1	Block Diagram of GPS Module Neo-6m	67
Appendix 2	Pin Configuration of ESP8266 NodeMCU	67
Appendix 3	Pin Definition of ESP8266 NodeMCU	68
Appendix 4	Pin Configuration of OLED Display 0.96 128x64 I2C	68
Appendix 5	Gantt Chart of Bachelor Project Degree 1	69
Appendix 6	Gantt Chart of Bachelor Project Degree 2	70

© Universiti Teknikal Malaysia Melaka

LIST OF ABBREVIATIONS, SYMBOLS AND NOMENCLATURE

GPS	-	Global Positioning System
IoT	-	Internet of Things
GPRS	-	General Packet Radio Service
LBS	-	Location Based Service
LCD	-	Liquid Crystal Display
SMS	-	Short Message Service
LDR	-	Light Dependent Resistor
ADC	-	Analog Digital Converter
IC	-	Integrated Circuit
RLTS	-	Real-Time Location System
USB	-	Universal Serial Bus
GSM	-	Global System for Mobile communication
MQTT	-	Message Queuing Telemetry Transport
ARM	-	Advanced RISC Machine
MQT	-	Materialized Query Tables
DSLT	-	Digital Single-Lens Translucent

© Universiti Teknikal Malaysia Melaka

WiFi	-	Wireless Fidelity
OLED	-	Organic Light-Emitting Diode
PCB	-	Printed Circuit Board

© Universiti Teknikal Malaysia Melaka

CHAPTER 1

INTRODUCTION

1.0 Overview

This chapter explains on the project which has been carried out. Besides that, this chapter also gives information to the user on some important elements like the background of the project, problem statement, objectives and project scopes.

1.1 Background

The development of tracking system for hiking and mountain climbing project consists of main component which is Global Position System (GPS) sensor. The GPS sensor are used to transmit the data to the receiver for tracking. When the data has been received, the user location can be found by the search engine which receives the data from GPS antenna using Internet Of Things. This will make it easier for search and rescue team to help people in need immediately. The idea of this project came from the usual problems faced by hikers during their hike or outdoor activities. So, the project is used to help the hikers and people who love outdoor activities from getting lost during their activities. The project will be created in the small and compact size to make it easier for the users to bring and wear it during their activities so that the device can always be activated at any time that gives information by using Blynk application.

© Universiti Teknikal Malaysia Melaka

1.2 Problem Statement

There are some possible problems that could occur and need to be focused on this tracking system project. Firstly, people nowadays seem to be fond of outdoor activities such as hiking and mountain climbing, especially youngsters. The possibility to get lost while doing this activity is pretty high.

This is probably due to the carelessness of the hikers themselves, causing them to forget the right pathways and end up getting lost. Natural disaster is also one of the reasons as to why hikers could get lost during their activities. This is because, hikers will be forced to use different path if their original track was affected by the natural disaster.. The research and rescue team should get the correct and accurate information on the location of the hikers to save them as soon as possible after receiving the report from their family or friends.

The other problem that has been found is some tracking systems are not friendly-sized and hard to bring during outdoor activities such as hiking. The sizes of product should be highlighted because the sizes can make the user uncomfortable and will be inconvenient with those activities like hiking and mountain climbing.

© Universiti Teknikal Malaysia Melaka

Moreover, the tracking system did not have a system that gives information about its location to the user whenever the program is running. Some of tracking systems are already irrelevant with this era of technology. This happens because the information received is too slow because of some obstacles like limitation in communication and using the old system. Therefore, it is hard for the rescue team hard to reach the hikers location or the information of location of the lost users will take longer time to be received. This will create another problem since rescuing should be done as soon as possible to prevent life-endangering threats.

1.3 Objectives

The objectives of this project are:

- To investigate the problem of user location by using tracking system and the information can be recorded for safety purpose.
- To develop and implement the tracking system with Blynk application so that the location and details of the user can be found through the system.
- To analyze the performance of the proposed system.

© Universiti Teknikal Malaysia Melaka

1.4 Project Scopes

The scopes of project for hiking and mountain climbing tracking which has a bigger size of product for outdoor activity. The limitation of this project is to be used in hiking and mountain climbing within the checkpoint area that is suitable with the condition and less risks area. The idea came up to focus more on receiving the exact location of the user and find the user by using Blynk application.

The mountain and jungle should be relevant in size with the size of area that is supported the device by using the method of checkpoint, this can reduce the inacurate information given for the user location. The checkpoint should be in the safe area that can be seen through the information given by Blynk application. The checkpoint method is used because the information received from user could be very general in term of location itself considering the wide area of the mountain and jungle involved. Thus, it could be hard for the rescue team to find when the exact location of the person who are lost. The method of checkpoint could reduce the hard possibility which limit in some area.

When the tracking device transmit data of the person location cannot be indicate whether the user are still moving around or stop. With this device the user easily and comfortable to wear and bring during the activity so that helps to prevent the problem for user left the devices when hiking or mountain climbing. The rescue team could reach the location of the user whenever the user are still wearing or bring the device during the activity.

© Universiti Teknikal Malaysia Melaka

CHAPTER 2

LITERATURE REVIEW

2.0 Introduction

This chapter gives a guide and relevant topic about Tracking System for Hiking and related with electronic circuit that consists of microcontroller and motion sensor which have been discussed and reviewed. All the references and sources of writing this thesis are mainly from books, research journals and online articles that are already verified to be suitable to support this thesis. This section also includes the details on other main parts and information such as input output voltage, types of microcontroller, sensor, advantages and disadvantages.

2.1 The technology of GPS and GPRS based on Tele-monitoring System for Emergency Patient Transportation

The technology of GPS and GPRS in this article shows that it is suitable and relevant to be used in emergency cases and to be a problem solver based on some situations. This article states that the problem on traffic and it will take longer time that happened in India. The technology of GPS and GPRS based on Tele-monitoring System for Emergency Patient Transportation articles from the research of (Satyanarayana *et al.*

© Universiti Teknikal Malaysia Melaka