Faculty of Electrical and Electronic Engineering Technology

DEVELOPMENT OF MISSING PERSON TRACKER USING LORA

NUR HIDAYAH BINTI SAFRI

Bachelor of Electronics Engineering Technology (Telecommunications) with Honours

2021

DEVELOPMENT OF MISSING PERSON TRACKER USING LORA

NUR HIDAYAH BINTI SAFRI

A project report submitted
in partial fulfillment of the requirements for the degree of
Bachelor of Electronics Engineering Technology (Telecommunications) with Honours

Faculty of Electrical and Electronic Engineering Technology

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

2021

UNIVERSITI TEKNIKAL MALAYSIA MELAKA
FAKULTI TEKNOLOGI KEJUTERAAN ELEKTRIK DAN ELEKTRONIK

BORANG PENGESAHAN STATUS LAPORAN
PROJEK SARJANA MUDA II

Tajuk Projek : DEVELOPMENT OF MISSING PERSON TRACKER USING LORA

Sesi Pengajian : 2021/2022

Saya NUR HIDAYAH BINTI SAFRI 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**	

(TANDATANGAN PENULIS)
Alamat Tetap: LOT 492C, JALAN KENALAU, KAMPUNG BANGAU TANJONG, 28000 TEMERLOH, PAHANG

Tarikh: 10 JANUARY 2022

(COP DAN TANDATANGAN PENYELIA)

ELIYANA BINTI RUSLAN
Pensyarah
Jabatan Teknologi Kejuruteraan Elektronik & Komputer
Fakulti Teknologi Kejuruteraan Elektrik & Elektronik
Universiti Teknikal Malaysia Melaka

Tarikh: 11 Januari 2022

*CATATAN: Jika laporan ini SULIT atau TERHAD, sila lampirkan surat daripada pihak berkuasa/organisasi berkenaan dengan menyatakan sekali tempoh laporan ini perlu dikelaskan sebagai SULIT atau TERHAD.

DECLARATION

I declare that this project report entitled " Development Of Missing Person Tracker Using Lora" 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 HIDAYAH BINTI SAFRI

Date : 10 JANUARY 2022

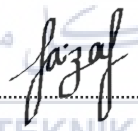
APPROVAL

I hereby declare that I have checked this project report and in my opinion, this project report is adequate in terms of scope and quality for the award of the degree of Bachelor of Electronics Engineering Technology (Telecommunications) with Honours.

Signature : 

Supervisor Name : TS. ELIYANA BINTI RUSLAN

Date : 10 JANUARY 2022

Signature : 

Co-Supervisor Name (if any) : TS. MOHD FAIZAL BIN ZULKIFLI

Date : 10 JANUARY 2022

DEDICATION

This project report is dedicated to the members of my family. My grateful heart goes out to my dear parents, Safri Bin Munir and Dahrah Binti Hamid, whose words of support and tenacity still sing in my ears. My siblings are incredibly precious to me and have never left my side. Thank you to my supervisor, Ts. Eliyana Binti Ruslan, and all of my lecturers for their assistance and support throughout this project. They've given me the motivation and discipline to approach any work with passion and dedication. Lastly , I'd like to thank all of my friends who have supported me. This project would not have been possible without their help.

ABSTRACT

Nowadays, climbing is one of the popular sports. This is because, many people like to enjoy the beautiful scenery and the land form with hills and mountains. Accordingly, this sport also cannot avoid the accident or lost. Therefore, this project was done to identify the actual position of the missing climbers in the jungle. Because in the jungle, this project uses Lora technology because this technology does not require internet to operate. This project or system consists of transmitter and receiver. The transmitter will be held by the hiker while the receiver can be held by the person in charge of the place. GPS data location will be sent by the transmitter and received by the receiver later, the receiver will used the latitude and longitude to be search and processed then the user can see the actual location of the hiker. By having this data, users will be able to save a lot of time for the search and rescue process because they can know where direction they need to go.

ABSTRAK

Zaman sekarang, mendaki adalah salah satu sukan yang popular. Ini kerana, ramai yang suka menikmati pemandang yang cantik dan bentuk muka bumi yang dipenuhi dengan bukit-bukau dan gunung-ganang. Sehubungan dengan itu, sukan ini juga tidak boleh mengelak dari kemalangan atau sesat. Oleh sebab itu, projek ini dilakukan untuk mengenalpasti kedudukan sebenar pendaki yang hilang di dalam hutan. Disebabkan di dalam hutan, projek ini menggunakan Lora teknologi kerana teknologi ini tidak memerlukan internet untuk beroperasi. Projek atau sistem ini terdiri daripada pemancar dan penerima. Pemancar akan dipegang oleh pendaki manakala penerima boleh dipegang oleh orang yang jaga tempat tersebut. Data GPS lokasi akan dihantar oleh pemancar dan diterima oleh penerima kemudian, penerima akan menghantar latitud dan longitud untuk diproses lalu pengguna boleh melihat lokasi sebenar pendaki tersebut. Dengan data ini, pengguna akan dapat menjimatkan banyak masa untuk proses mencari dan menyelamat kerana mereka boleh mengetahui dimana mereka perlu tuju.

ACKNOWLEDGEMENTS

First and foremost, I would like to express my gratitude to my supervisor, Ts. Eliyana Binti Ruslan and co-supervisor, Ts. Mohd Faizal Bin Zulkifli for their precious guidance, words of wisdom and patient throughout this project.

I am also indebted to Universiti Teknikal Malaysia Melaka (UTeM) and my siblings for their financial assistance in completing the project. Not to mention Khairunnajwa, a female friend who was prepared to share her thoughts and views on the project.

My gratitude is extended to my parents and family members for their love and prayers during my studies. Ahmad Athir Hazim Bin Johari deserves special recognition for all of his motivation and understanding.

Finally, I'd want to express my gratitude to all of my friends, colleagues, and classmates, as well as Faculty members and those who aren't named here, for their cooperation and assistance.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

GPS	-	Global Positioning System
RFID	-	Radio Frequency Identification
LCD	-	Liquid Crystal Display
ID	-	Identity Document
mAh	-	Milli Ampere Hour
GSM	-	Global System Mobile Communication
MySQL	-	My Structured Query Language
IOT	-	Internet Of Things
SQL	-	Structured Query Language
LiPo	-	Lithium Polymer
USB	-	Universal Serial Bus
MQTT	-	MQ Telemetry Transport
LPWAN	-	Low Power Wide Area Network
API	-	Application Programming Interface
PHP	-	Personal Home Page
TTN	-	The Things Network
IP	-	Internet Protocol
RF	-	Radio Frequency
RSSI	-	Received Signal Strength Indicator
OLED	-	Organic Light Emitting Diode
V	-	Voltage
A	-	Ampere
W	-	Watt
URL	-	Uniform Resource Locator
HTTP	-	Hyper Text Transfer Protocol
GND	-	Ground
Tx	-	Transmitter
Rx	-	Receiver
MIT	-	Massachusetts Institute of Technology

LIST OF APPENDICES

CHAPTER 1

INTRODUCTION

1.1 Background

The development of missing person tracker using Lora is a project to track the position of missing people who are trap in the mountains or forest areas. Usually, the current tracker system requires a strong internet line and if used in rural areas, the system may not function properly. Therefore, this project uses the Lora technology because Lora does not require internet [1]. In addition, Lora can operate in long distance [2]. This project consists of three parts, which is transmitter, receiver, and application. The transmitter contains a Lora module and a GPS module to send the victim's location to the receiver. The receiver is the same component with transmitter but will receive the data and use it to send latitude and longitude to the application. So, the process is, the transmitter is a Lora node held by the hiker. While the receiver will be placed at the base station or can be held by rescuer. The base station is where the climb begins or known as the guardhouse. Moreover, the distance between the receiver and transmitter can be in a distant state. Next, on the application, rescuers will be able to see the victim's current location. Finally, this project will help rescuers to conduct search and rescue operations and can shorten the time to find victims [3].

1.2 Problem Statement

Hiking or climbing is one of the sports that Malaysians love. This is because Malaysia has a landform that is filled with hills and mountains with beautiful scenery. From the report, it's stated that the number of people missing were increasing every year due to

the increase in interest in climbing activity even though some amateur does not have the skill to venture into the field. Among those who had missing, they told, unfamiliar with the environment as well as lack of focus while following the guide. When these hikers or climbers missing, it is very hard for rescuers to find them moreover with the dense forest conditions.

In addition, although nowadays there is a system that can track the position of the victim using mobile phone, it requires an internet connection. It is very hard to find an internet connection on a mountain or hill because there is no coverage. Because of that, it will be easy if the rescue team has something that can track victims easily and without an internet connection.

Other than that, some size of the tracking device is not suitable and very impractical for rescuers to use in this era of technology. Tracking device nowadays is hard to hold, takes up a lot of space if stored in a pocket or bag and inconvenient during outdoor activities like hiking.

1.3 Project Objective

The objectives are;

a) To study characteristics and functionality of this system to scan or sweep region by region to find the missing person.

b) To develop one system which is user-friendly for the hikers and the rescue team.

c) To analyze whether Lora technology is suitable to be used in the rural area.

1.4 Scope of Project

The scope of this project is for outdoor activities especially for climbers or hikers who are in rural areas. The idea is to get the exact location of the victim using the Lora devices which can communicate over long distances.

This system consists of transmitter and receiver. This transmitter and receiver also known as Lora nodes which typically can operate using batteries only. A microcontroller with ESP32, WiFi, Bluetooth, GPS, Lora, and battery handling are also included in these nodes. As a result, it's especially well-suited to off-grid applications. This device will communicate via radio, which is ideal for outdoor activities when we don't have access to internet connection. These nodes also communicate in mesh network. Every member of the private mesh may see the location and distance of every other member, as well as any text messages that have been sent. These nodes form a mesh automatically to forward packets as needed.

As a result, if we use a big number of nodes, our system may cover a greater area. The plan for this project is to employ only one node on each side. To communicate with the other nodes, the node will use a radio module. Via this technique, rescuers can view the victim's exact location using an app that is connected to the phone and can view the location even if there is no cellular service. As a result, it has the potential to reduce the time required for rescue operations.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This chapter offered a research overview of the project's components. All data was gathered from a variety of sources, including journal papers, conference proceedings, and websites. The functions were explained in this chapter, as well as a comparison of the components.

2.2 Systematic Review of Mountaineers Using Lora

This systematic review is called Telehealth. It can send the information in a long distance with enough data about health diagnosis. Article [4] said it can be used for monitoring people in a long distance, especially for hikers or climbers. It processes and analyzes the problem then provides rescue. This system consists of a transmitter system and receiver system.

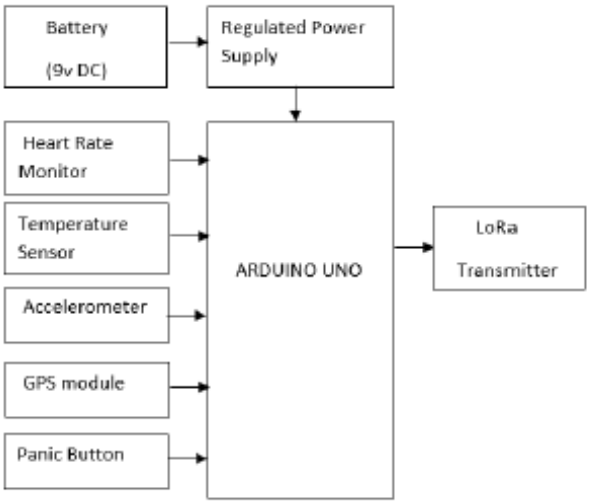


Figure 2.1: Transmitter

This transmitter contains a heart rate monitor, temperature sensor and accelerometer and is connected with Arduino which then transmits a signal using Lora transmitter to its gateway. As shown in Figure 2.1, there is another alternative which is a panic button for emergencies if the sensor doesn't detect anything.

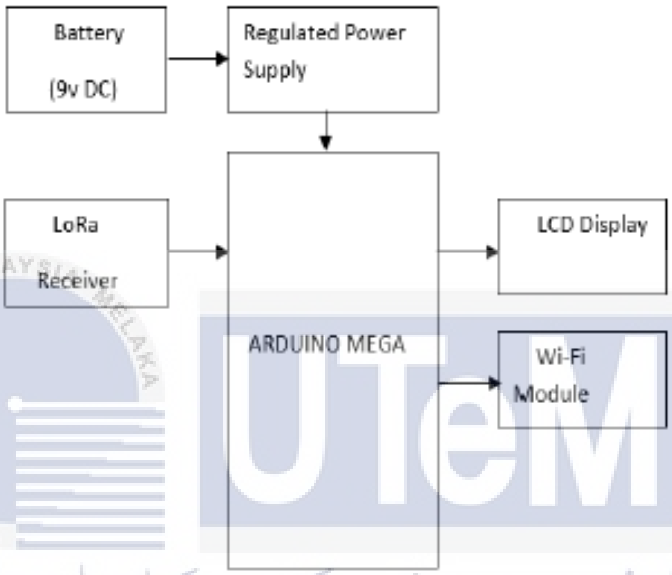


Figure 2.2: Receiver

Then, Figure 2.2 shows the receiver contains Lora receiver also interface with Arduino and operates in internet connection. Besides, this system also came with its webpage. Many people such as family can view if they have login data. So they can share login data with any people for user monitoring. As a result, the LCD will display the heart rate, temperature, and accelerometer readings and the geolocation will be sent when there is an abnormality in each of the readings.

2.3 Tracking System Using Rfid for Hiking Activity With IoT Technology

The article from [5] creates a system that can find the missing person using RFID. According to them, each climber or hiker will be given an RFID tag. Hikers will use this tag to tap at each checkpoint in the forest. Each time the hikers tap their RFID tag, this data will be saved to the memory card. Rescuers in turn can extract the data at every checkpoint. With this method, rescuers can identify the last location of the missing hiker. In addition, the search area can also be reduced thus shortening the time of rescue work.

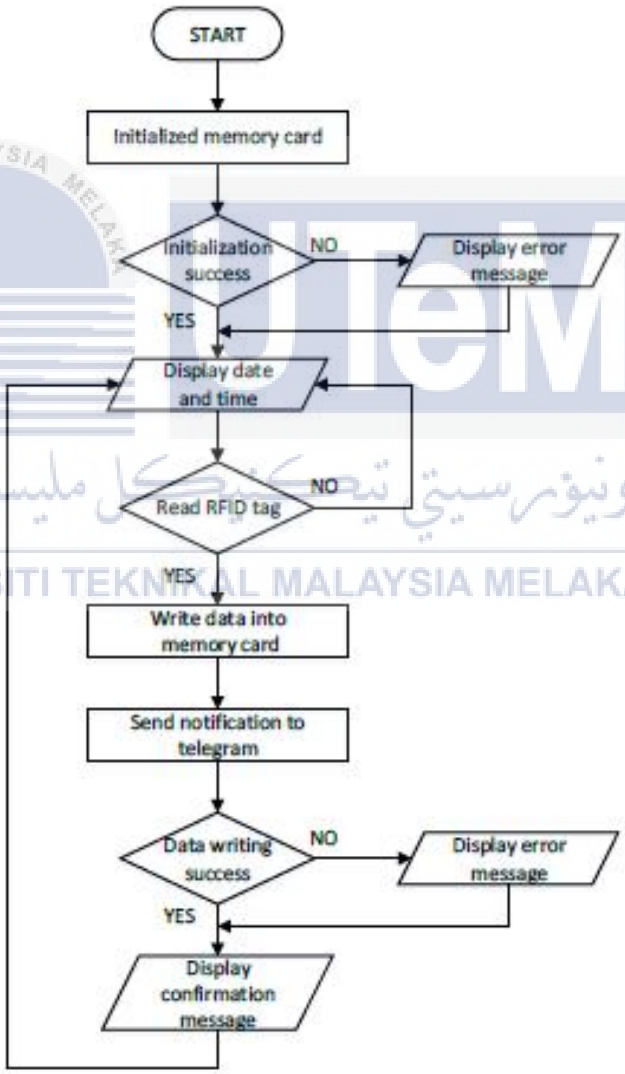


Figure 2.3: Flow of the system

Figure 2.3 above shows the flow of the system or how each component works. To control all components and modules, Arduino UNO has been used and programmed using Arduino IDE. The LCD will display the current time before the RFID tag is detected by the radar. When it is identified, it will read the value of the tag's radio frequency and send the information to the microcontroller. So, here where the information will be saved in text formatted file on a memory card. It can be accessed using whatever text file reader on a laptop or smartphone.

When anyone taps their RFID tag, it sends a Telegram notification message with the same information that was saved in the memory card. To get the notification from Telegram, the user needs to install Telegram. ESP32 is used to send information to a certain user using the internet. To submit a message to a particular user, the user 8 must obtain their specific ID by searching for the IDbot in Telegram and sending the "/getid" command. By using that, it can be encoded into ESP32 to deliver the message straight to the recipient. Different for the group, they can get their specific ID's group using the "/getgroupid@myidbot" command. Finally, this system requires a 20000 mAh power bank to run for 5 days nonstop, with the power usage increasing with each passing day.

2.4 Gps-Free Geolocation Using Lora in Low-Power Wans

This project focused on design a system that uses low energy and without the use of GSM and GPS. The system consists of four important key features: the end node, gateway, server, and application. The end node will transmit the data through air using the LoraWan protocol to the nearest gateway. In the end node, the Waspmote's core is built based on Atmel ATmega1281.

Waspmote was chosen because of its low energy consumption and compatibility to connect with LoraWan. The Waspmote parsed the GPS coordinates and send them as a

payload in the packet. This data will send about 10 seconds over the LoraWan. Next, the gateway is used to directing the received data from the end node to the server. To make the location more precise, they need to use four gateways to apply the multilateration algorithm as shown in Figure 2.4 below. Multilateration is a method of identifying someone's location by measuring the arrival times of energy waves with a known waveform and velocity as they propagate through numerous system nodes.

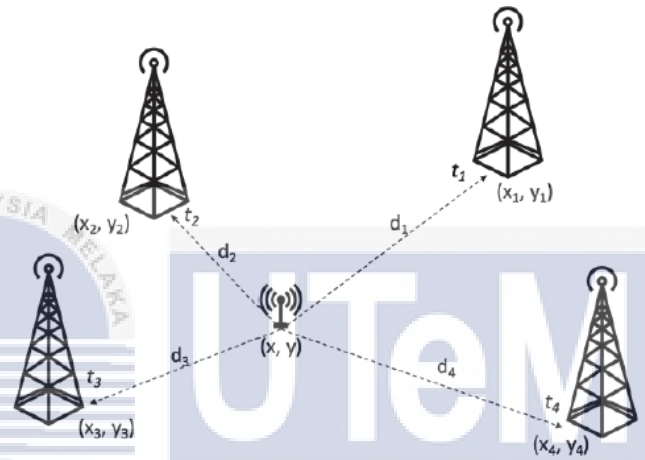


Figure 2.4: The multilateration algorithm

They choose Kerlink as their gateways because it has embedded GPS in it. To make all the gateways synchronized, they are using timestamp from the GPS satellites. Then, the things network was charged with decoding and transmitting data from the four gateways to the application. For the application, it consists of MySQL database and Java application. This is where the data from the things network is obtained and put in the database for the next process. In addition, the location of all gateways was chosen according to latitude. The higher the antenna, the wider the coverage. In conclusion, this IOT system was invented to show the precision result using Lora technology [1].