



Road Guides and Special Location Monitoring for Blind People Using Ultrasonic Sensors and Microcontroller-Based GPS Modules

Pandu Maulana¹, Ucu Darusalam², Novi Dian Nathasia³

¹²³Informatika,

Fakultas Teknologi Komunikasi dan Informatika, Universitas Nasional, Jl. Sawo Manila, Pasar Minggu, Jakarta Selatan, 12520

Email: pandu.maulana44@gmail.com, ucu.darusalam@gmail.com, ivanovic77@yahoo.com

ARTICLE INFO

Article history:

Received: 25/01/2020

Revised: 30 / 01/2020

Accepted: 02/02/2020

Keywords:

Buzzer, GPS, coordinates, blind, ultrasonic

ABSTRACT

Limitations of blind people in the vision causes them difficulty to perform daily activities. In fact, not infrequently the word about a missing person who is blind majority served in a variety of media today. In this study guide and monitoring tool designed specifically location of the blind using HC-SR04 ultrasonic sensor and is equipped with U-blox GPS Module Neo 6M. HC-SR04 ultrasonic sensor is used to detect an obstacle at a distance of 150 cm. Buzzer detection results will enable the sound output. In monitoring the position, U-blox GPS Module 6M Neo will transmit data such as the coordinates through a cloud platform that can be monitored with the channel location. The test results show that the system of eight variations of distance testing data,

Copyright © 2020 Jurnal Mantik.
All rights reserved,

1. Introduction

The eye is one organ in humans that is very important to receive a light stimulus (photoreceptors). Through our eyes can see objects broadly as well as helping us to work optimally. Most of a person's information obtained through the sense of sight, and the rest through other sense it can be said that the eyes are the one organ that is very important for a person. Through the eyepiece can be focused beams of light from the object in order to know the shape of the object. This information will be sent to the brain for processing as determining an action to be taken. [1]

Not everyone is born with a perfect sense of sight, and some good eyesight loss was caused by an illness or an accident. The World Health Organization WHO (World Health Organization) merillis the data that at least there are approximately 40-45 million people with blindness or impaired vision. Annually no less than 7 million people are blind or permenitnya are the inhabitants of the earth to be blind. [1]

People who have a deficiency in terms of vision, especially for persons with visual impairment often have difficulty in performing daily activities. Not a bit blind into a wall or object in front of it [2]. Currently, peyandang blind generally use a walker in the form of a stick to help the movement as well as increase the security and independence on the current [3]. Means a lack of flexibility to use a cane for the blind. Moreover, often we see news about a missing person who is devoted to blind people. Referring to the background, the authors designed a tool specifically to guide blind people with technology developed at this time. To make the tool requires a software and hardware [4].

Tool is equipped with blind guide using HC-SR04 ultrasonic sensor as a measurement of distance to the object with Buzzer output media and U-blox GPS Module Neo 6M as a monitoring location. The reason for choosing this ultrasonic sensor since the sensor is a sensor that is the most effective in terms of distance measurements [5]. HC-SR04 ultrasonic sensor is used to detect an obstacle at a distance of 150 cm. Buzzer detection results will enable the sound output. Have sound output for blind people in general





have a high sensitivity in capturing information in the form of sound. On site monitoring, carried out by the method of geolocation. Geolocation generally uses Global Positioning System (GPS) and other related technologies to access and accurately determine the location of [6]. U-blox GPS Module 6M Neo will deliver data from satellites that form the coordinates [7]. There are 24 satellites orbiting the earth in the whole world, to obtain location data and time at minimum module must be connected with the three satellites [8]. The data is sent via ThingSpeak which will be monitored by the channel location. Therefore, when blind people who use these tools is lost, it can be easily found with the coordinates of the corresponding point.

This research aims to design special wake guiding tool for blind people in the form of a belt device that no longer need to use a cane guides encouraging flexibility for persons with visual impairment in the move, as well as tackling the loss of blind people in when traveling through the monitoring location.

2. Research Methods

a. Place and Time of Research

Research and design tool is done for several weeks. The study began in September 2019. The research, design and testing tools to do at home to stay writer and at the National University (UNAS). In Figure 1 below described the main activities on the research to be conducted.

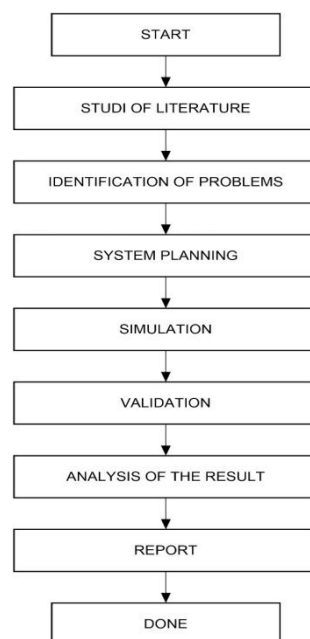


Fig 1. Steps Research

b. System Requirements Analysis

Analysis of the system needs to do is to determine what devices are needed in the construction of the system. As for the system requirements in the present study are as follows.

a. Hardware (Hardware)

The hardware in the present study consisted of:

- ESP8266
- Arduino Uno
- HC-SR04 Ultrasonic Sensor
- U-blox GPS Module Neo 6M
- Buzzer
- Jumper
- Power Supply

b. Software (Software)



The software in this study consists of:

- Windows 10 (Operating System)
- Arduino IDE
- The C language

c. Blind Special Equipment Design Guides

This tool is a central controller and Arduino Uno microcontroller ESP8266. Used 2 microcontroller intended that the power of each module has a more stable power input. Use of the power supply to the circuit using the power of banks with a capacity of more than 10000 mAh power so that the circuit does not lack power. Module used in this tool is HC-SR04 ultrasonic sensor as rangefinders and GPS Module U-Blox Neo 6M as the sender information coordinate data. Input and output pin configuration of the microcontroller can be seen in Figure 2.

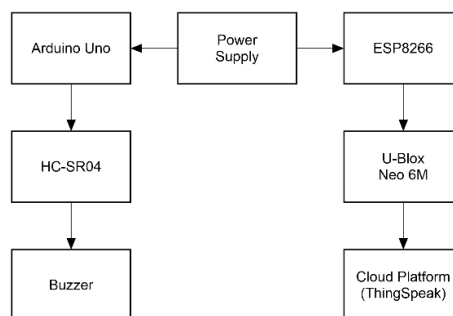


Fig 2. System Diagram

For the workflow diagram on the appliance can be seen in Figure 3.

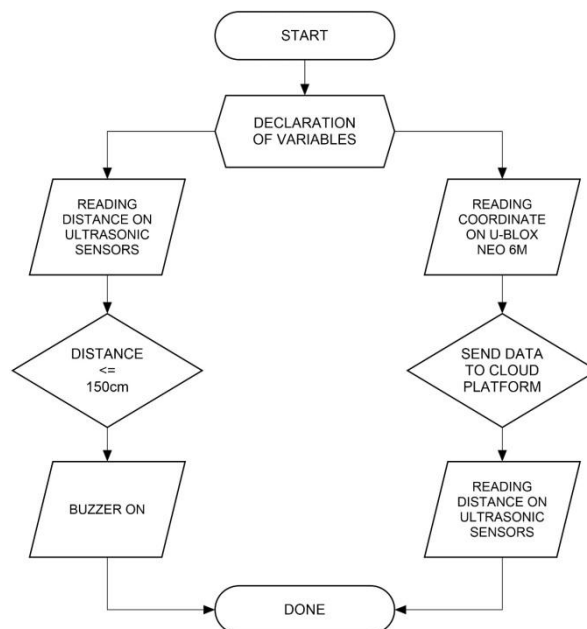


Fig 3. Work Flow Diagram

d. The Design of Microcontroller Arduino Uno

Arduino Uno has 14 pins that are equipped with a USB connection as power source connector like a microcontroller. In the design, the Arduino Uno has control over HC-SR04 ultrasonic sensor to detect the distance to the sound output through the Buzzer.



Fig 4. Arduino Uno

e. Microcontroller Design ESP8266

ESP8266 is not much different with the Arduino Uno, only on ESP8266 has been equipped with a WiFi module that is SoC (System on Chip). In the design, ESP8266 have control over U-blox GPS Module Neo 6M. At the time of submitting data in the form of coordinates, ESP8266 must be connected to the network. So that the coordinate data can be monitored via ThingSpeak (cloud platform).



Fig 5. ESP8266

f. Design HC-SR04 Ultrasonic Sensor

HC-SR04 ultrasonic sensor has a 4 pin, namely pin Vcc, Gnd, Trigger, and Echo. Vcc pin for positive electricity and Gnd pin as groundingnya. While the Trigger pin to transmit the signal from the sensor and the pin catcher Echo as a reflection signal from the object. This sensor has a range that can detect objects up to 400 cm. In the present study the sensor will transmit data to the buzzer to produce sound output as an information medium for the user tools. Here is a HC-SR04 ultrasonic sensor in figure 6.



Fig 6. HC-SR04 Ultrasonic Sensor

g. U-Blox Neo Design 6M

U-blox GPS Module Neo 6M is that you can access the location coordinates and send that information through the channel location. Once users get information such as the coordinate data derived from U-blox GPS Module Neo 6M, the next step was to use the coordinates of the channel location. Here is a U-blox GPS Module Neo 6M in Figure 4.



Fig 7. U-blox GPS Module Neo 6M



h. Using Arduino IDE Software

Use of the Arduino IDE software in this design is to program a microcontroller, both Arduino Uno and ESP8266. On the Arduino IDE, there are several libraries for the use of the microcontroller. Without these libraries, the circuit in the device will not work. For ESP8266, before entering the programming phase is required to install special firmware ESP8266. Here is a view of the Arduino IDE software.

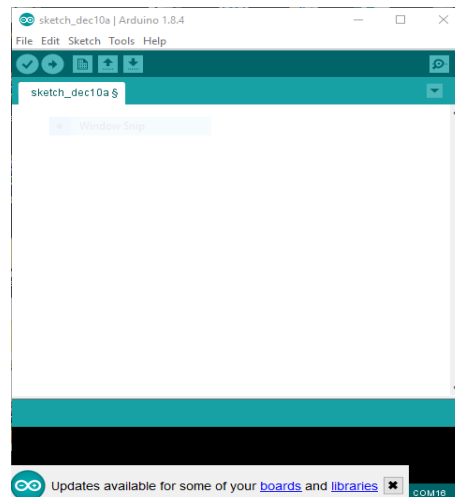


Fig 8. Display Software Arduino IDE

3. Results and Discussion

a. Testing Ultrasonic Sensor HC-SR04

In this test some data predetermined distance in centimeters to the reading of HC-SR04 ultrasonic sensor to the microcontroller Arduino Uno to the distance of the object. The maximum distance data testing as far as 200cm with Buzzer output media.

Table 1
Ultrasonic Sensor Testing Results

No. Test	Distance Specified	Sound Condition
1	=> 200 cm	Off
2	175 cm s / d 199 cm	Off
3	150 cm s / d 174 cm	Off
4	125 cm s / d 149 cm	Weak
5	100 cm s / d 124 cm	Normal
6	75 cm s / d 99 cm	Normal
7	50 cm s / d 74 cm	Normal
8	<50 cm	Strong

b. Testing Monitoring Locations

In this test is performed to determine whether the U-Blox Neo 6M have an accurate coordinate data by region and precisely with what is programmed on the microcontroller ESP8266. Coordinate data on the cloud platform has a term of an update every 15 seconds. Before conducting the test, there is a testing time coordinate data connection on the U-Blox Neo 6M which takes less than 1 minute to 10 minutes. The following are the test table synchronization within the space coordinates that have been tested.

Table 2
Time Test Result Data Connections

No. Test	The Specified Region	Space Determined	Connection Time
1	Kebagusan (1)	House (1st Floor)	2m 18s
2	Kebagusan (2)	The house (2 nd Floor)	1m 2s
3	Kebagusan (3)	Yard	32s





No. Test	The Specified Region	Space Determined	Connection Time
4	Jagakarsa (1)	Building (1st Floor)	3m 46s
5	Jagakarsa (2)	Building (2nd floor)	2m 54s
6	Jagakarsa (3)	Yard	13s
7	Ragunan (1)	Building (2nd floor)	1m 45s
8	Ragunan (2)	Yard	54s
9	Cilandak (1)	Building (2nd Floor)	3m 32s
10	Lenteng Agung (1)	House (1st Floor)	1m 57s
11	Lenteng Agung (2)	Yard	42s
12	Pasar Minggu (1)	Building (4th Floor)	1m 22s
13	Pasar Minggu (2)	Basement	9m 12s
14	Kalibata (1)	Building (1st Floor)	3m 22s
15	Kalibata (2)	Yard	29s

Here is the result of latitude and longitude data testing that has been adjusted to a predetermined area.

Table 3
Coordinate Data Test Results

No. Test	Regional Determined	Data Latitude	Data Longitude
1	Kebagusan (1)	-6.3129	106.8314
2	Kebagusan (2)		
3	Kebagusan (3)		
4	Jagakarsa (1)	-6.3237	106.8189
5	Jagakarsa (2)		
6	Jagakarsa (3)		
7	Ragunan (1)	-6.3139	106.8251
8	Ragunan (2)		
9	Cilandak (1)	-6.3017	106.8139
10	Lenteng Agung (1)	-6.3239	106.8374
11	Lenteng Agung (2)		
12	Pasar Minggu (1)	-6.2807	106.8391
13	Pasar Minggu (2)		
14	Kalibata (1)	-6.2522	106.8430
15	Kalibata (2)		

Graph the average on this test are presented in Figure 9 and 10. The sample on the test chart coordinate data below Kebagusan located in the village area.



Fig 9. Latitude Graph Data Test Results

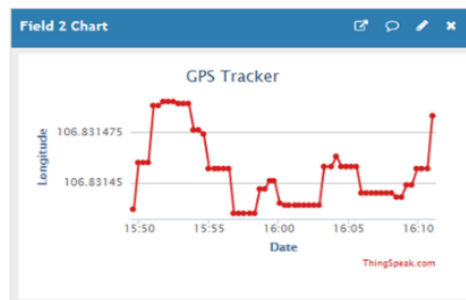


Fig10. Longitude Graph Data Test Results

Coordinate data have been obtained to be inputted to the channel so that the field channel location location location can be detected accurately.

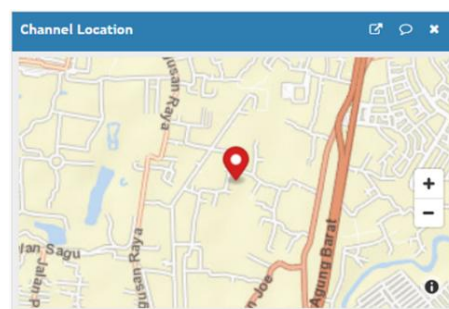


Fig 11. Test Results Channel Location

4. Conclusion

Based on testing means of a guide and monitor specific locations blind people use ultrasonic sensor HC-SR04 and GPS Module U-Blox Neo 6M-based microcontroller, it can be concluded that the tool guide way and monitors specific locations blind people can work well and accurately in improving flexibility for blind people in the move, as well as tackling the loss of blind people in when traveling through the monitoring location.

5. Reference

- [1] Tangdiongan, R. C. G., Allo, E. K., Sompie, S. R. U. A., & Elektro-ft, J. T. (2017). "Rancang Bangun Alat Bantu Mobilitas Penderita Tunanetra Berbasis Microcontroller Arduino Uno". *E-Journal Teknik Elektro Dan Komputer*, 6(2), 79–86.
- [2] Fauroq, A., Rahmawati, D., & Alfita, R. (2018). "Rancang Bangun Tongkat Cerdas Untuk Penyandang Tunanetra Berbasis Mikrokontroler Menggunakan Fuzzy Logic Metode Sugeno". *Jurnal Teknik Elektro Dan Komputer TRIAC*.
- [3] Vicky Alvian F., Septi Andryana, Ucu Darusalam. (2018). "Alat Pemandu Jalan Untuk Penyandang Tunanetra Menggunakan Sensor Ultrasonic Berbasis Arduino". *Seminar Nasional Teknologi Informasi Dan Multimedia 2018*, I(1), 55–60.
- [4] Setiawan, C. (2017). "Prototype Alat Bantu Tuna Netra Berupa Tongkat Menggunakan Arduino dan Sensor Ultrasonik". *J-Intech*.
- [5] Soni, A. (2018). "Distance Measurement of an Object by Using Ultrasonic Sensors with Arduino and GSM Module", 4(11), 23–28.
- [6] Rumi Juwairiyah. (N/A). "Geolocation using NodeMCU". *International Journal of Advance Research, Ideas, and Innovations in Technology*, 4(5), 466–468.
- [7] Hlaing, N. N. S., Naing, M., & Naing, S. S. (2019). "GPS and GSM Based Vehicle Tracking System". *International Journal of Trend in Scientific Research and Development*, Volume-3 (Issue-4), 271–275.
- [8] Koyuncu, Baki, Z. (2016). "Real Time Position Detection by Using GPS + GSM + GPRS and Arduino Mega Based Telit GL865". *International Journal of Electronics Communication and Computer Engineering*, 7(1), 44–48.

