Faculty of Electrical and Electronic Engineering Technology

DEVELOPMENT OF SPECTICAL FOR THE SPECIAL NEEDS WITH VOICE AND NAVIGATION TOOLS

VELU NAVINITHAN A/L LEKSHMANAN

Bachelor of Computer Engineering Technology (Computer Systems) with Honours

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DEVELOPMENT OF SPECTICAL FOR THE SPECIAL NEEDS WITH VOICE AND NAVIGATION TOOLS

VELU NAVINITHAN A/L LEKSHMANAN

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

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2021

DECLARATION

I declare that this project report entitled “Development Of Spectical For The Special Needs With Voice And Navigation Tools “ 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.

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Date	:	31/01/2022

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 Computer Engineering Technology (Computer Systems) with Honours.

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Name (if any)

Date :

DEDICATION

To my beloved mother, Mrs. Amudha D/O Arumugam, and father Mr. Lekshmanan S/O Velu,

and

My talented supervisor

Ms Nurliyana Binti Abd Mutalib and

My beloved siblings

ABSTRACT

The special need mainly visual impaired people will face difficulty to get used to surrounding environment. The current environment challenges this group, the inconvenience to adapt to their natural places could be held by new technology invented to able assist them. The 'Development of Spectical for The Special Needs with Voice and Navigation Tools' is mainly offering a wearable eyeglass with an ultrasonic sensor to assist the blind in comfortably navigating alone while preventing from obstacles. This project may already exist and the modification and originality on this current project are based on earlier study. This process made use of an Arduino Nano and Arduino Uno as microcontroller to control the activities of a device, ultrasonic sensors to detect an obstruction in the predefined surrounding, and an Arduino DF player module to generate voice audio. Rf module to communicate between microcontrollers. GSM is functioned to send a message to caregivers about his present location module and lastly GPS module to get real time location. This may allow the user to move more freely. This device is inexpensive, quick, and simple to use, and it is an innovation to aid the blindness and low vision in overcoming daily activities. Thus, this project implies both warning and action given to the user to ensure the safety and will be user friendly without cause any distress to circumstance surrounding it.

ABSTRAK

Keperluan khas terutamanya orang cacat penglihatan akan menghadapi kesukaran untuk membiasakan diri dengan persekitaran sekeliling. Persekitaran semasa mencabar kumpulan ini, kesulitan untuk menyesuaikan diri dengan tempat semula jadi mereka boleh ditahan oleh teknologi baru yang dicipta untuk membantu mereka. 'Pembangunan Spektikal untuk Keperluan Khas dengan Alat Suara dan Navigasi' terutamanya menawarkan cermin mata boleh pakai dengan penderia ultrasonik untuk membantu orang buta dalam menavigasi dengan selesa bersendirian sambil menghalang daripada halangan. Projek ini mungkin wujud, pengubahsuaian dan inventif pada penyelidikan berasaskan projek semasa ini yang dijalankan pada kajian terdahulu. Proses ini menggunakan Arduino Nano dan Arduino Uno sebagai mikropengawal untuk mengawal aktiviti peranti, penderia ultrasonik untuk mengesan halangan dalam persekitaran yang telah ditetapkan, dan modul pemain Arduino DF untuk menjana audio suara. Modul Rf untuk berkomunikasi antara mikropengawal. GSM berfungsi untuk menghantar mesej kepada penjaga tentang modul lokasi sekarang dan terakhir modul GPS untuk mendapatkan lokasi masa nyata. Ini mungkin membolehkan pengguna bergerak dengan lebih bebas. Peranti ini adalah murah, pantas dan mudah digunakan, dan ia merupakan satu inovasi untuk membantu buta dan rabun dalam mengatasi aktiviti harian. Oleh itu, projek ini membayangkan kedua-dua amaran dan tindakan yang diberikan kepada pengguna untuk memastikan keselamatan dan akan menjadi mesra pengguna tanpa menyebabkan sebarang kesulitan kepada keadaan sekelilingnya.

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I would also like to acknowledge with much appreciation the crucial role of the colleague that guide me from start in case need help to complete the Development of Spectical for The Special Needs with Voice and Navigation Tools. Special thanks go to Mr & Mrs Lekshmanan, whose have given their encouragement and support through financially to maintain our progress in track. Their love and prayer during the period of my study and motivation.

I want to appreciate the guidance given by other supervisor as well as the panels especially in our project presentation that has improved our presentation skills by their comment and tips. Finally, I would like to thank all the staffs, fellow colleagues and classmates, the faculty members, as well as other individuals who are not listed here for being co-operative and helpful.

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δ	-	Voltage angle
℃	-	Celcius
μs	-	Microsecond

LIST OF ABBREVIATIONS

V	-	Voltage
ms	-	Millisecond
IDE	-	Integrated development environment
Mhz	-	Mega hertz
dBm	-	decibel milliwatts
mA	-	Milliampere
GSM	-	Global System for Mobile communication
GPS	-	Global Positioning System
RF	-	Radio Frequency
DC	-	Direct Current
Kb	-	Kilobytes
g	-	Gram

LIST OF APPENDICES

CHAPTER 1

INTRODUCTION

1.1 Background

There are numerous types of disabilities which might be seemed in this day world. As an example, those who have physical disabilities, suffering hearing-impaired, low vision such as visually impaired, and many more. Visually impaired whose people that facing more risks in comparison to different disabilities. The eyes is the most important element of the body for avoiding obstacles and playing with minimal cognitive effort. The visually impaired must usually rely on both auditory and visual signs to compensate for their loss of vision. The difficulty with the visually impaired is that most of their bodily integrity has been compromised. Bouvrie (Bouvrie *et al.*, 2007) proves this claim in an experiment dubbed "Project Prakash." The purpose of this study was to see if blind people could use their thoughts to recognize groups of objects.

According to the World Health Organization (WHO), roughly 314 million pupils worldwide are blind or visually impaired. There are 45 million visual impaired people and 269 million people with limited eyesight. People aged fifty and up account for 82 percent of all blind people. It is estimated that 45 million blind people rely on other people for navigating. According to the NES II (National Eye Survey) on year 2014 in Malaysia, 216,000 people were blind because of cataract surgery delays. It also resulted in the blindness of 272,000 people. Diabetic eye disease is the second most prevalent cause of blindness in Malaysia, with 10% of people blind and 6% with poor imagination and foresight. The third

most common motive of blindness might be glaucoma wherein it brought about 7% blind and a couple of with low vision. subsequently, the rate of low vision people increase led to the rises of development of Assistive Technology. The blind cane highest frequently used often assistive technology (AT) used by visually challenged people. According to Mazo and Rodriguez (Mazo *et al.*, 1995), the blind cane is one of the most important pieces of help for the visually impaired. Traditionally, the usage of a blind cane has been focused on two main topics that is grip and arc. Someone's pace is quicker and more amazing outside. The palm dealing with at the waist peak while the index finger along with the cane and the last fingers and thumb softly wrapping over the cane is the proper approach to hold the blind cane.

When the person is indoors, the grasp of the cane changes to that of a pencil, with the grip upright at sternum position and nearer to the body. For both grips, one elbow is tucked tight to the body. Traditional blind canes, on the other hand, were initially fashioned of wood. Aluminum eventually took the role of wood. Aluminum, on the other hand, bends and breaks readily. As a result, both wood and aluminum were replaced with fiberglass and carbon fiber. Although fiberglass is less expensive than carbon fiber, it is heavier. Fiberglass, on the other hand, may flex slightly yet still return to its former shape. Carbon fiber, on the other hand, is more costly than aluminum and fiber glass. Although carbon fiber is lighter, it is more difficult to bend and shatter.

However, with the support of this blind cane, independence for the visually handicapped can no longer be delivered. Then, technology will continue to circulate closer to today's worldwide market. As there have been so many developments in assistive technologies in the years. For example, using Laser Cane, having Mowat Sensor, the Nav Belt, Sens Cap, Tyflos, Nottingham impediment Detection, Binaural Sonic manual, route voicer, Embedded Glove, smart Cane, and the spectacle itself. Most Assistive Technology

come in White Cane form type. The reason for planning and studying assistive technology is to decrease the challenged receive that concerning visually impaired as much as should. When persons with vision impairment go in unfamiliar circumstances, memorizing the part region or hindrance will be hard for them. But its kilometers on the waist might damage the neuronal machine via Nav Belt (Sankar Kumar et al., 2013). The Sens Cap is set on the top of the users besides Sankar Kumar et al., 2013. The neural device might potentially be damaged. Therefore, assistive technology for the visually handicapped is not acceptable currently. Every assistance equipment desires the necessity to be useful, portable, cheaper, handy, and safe.

1.2 Problem Statement

Most of spectical for the special needs using voice output technique that not friendly to public. For example, buffer that make continuous buzzing or beeping may cause irritation and stress to the user. Then the external noise may cause the user disturbs and unable to focus on their way. There are Mp3 module will be placed that will deliver output voice through earphone. The output is in human robotic voice that will also the distance and direction of obstacle detected. So, as it directly places on ear of user the user will not listen to any surrounding voice as able to estimate because distance is clearly said in output. Next mostly of obstacle detection device such as blind stick and smart cane it may provide with navigation tool. But in specticle is rarely placed because unable to avoid component compatibility in term of size and specification. As per solution placed to different remote using Rf Module that make the component no longer to placed together. The Rf module works to send data between remote and devices. It ensures the persons with visual impairments able to navigate freely.

1.3 Project Objective

After studying the above problem statement, the key objectives of the lead of PSM to propose a systematic and effective methodology are as follows:

a) To develop a system that could give a warning to visual impaired person if there are any obstacle detected.

b) To provide visual impaired person assist in case of emergency that notify and locate to caregivers.

c) To design voice output techniques with human based voice using mp3 Module attached to earphone that remove sound distraction to others.

1.4 Project Scope

This studies goal enables to assist low vision challenged pupils. The glasses are designed to help with a variety of jobs. The project demonstrates mode which is instruction using audio module as a prove of concept. Included with navigation of real time location and SOS massage by using GSM and GPS module. The assist the low challenged in obstacle detection on left, front and right side of person. The project prototype contains a customized built voice output border platform, an eyeglass is used with an obstacle detection and navigation, connected to the double board computer the Arduino Uno and Arduino Nano. Each board is connected via Rf Module transmitter and receiver. Arduino Ide package for board is used to undergo the modelling and coding.

1.5 Summary

The studies work we put forth in this work is to make use of contemporary technologies to develop the visually impaired mobility. This research paintings are based totally often detecting obstacle, guidance and course making plans in concise to reduce navigating problems associated to them. Navigating via someplace which is not known turns into a huge-time difficulty whilst we are able to even depend on our eye. Dynamic objects carry noise while shifting, visually impaired can construct the capability to listen and to help localize them. even though, they may be confined to the sense of contact like when the goal is determining the placement of an item location. The most common used technique for navigation making use of the taking walks stick or taking walks cane. one of the most important targets of this research paintings is through offering, real-time, relevant navigation information that makes the consumer or visually impaired to make correct and timely selections on which course to comply with through in space.

The next chapter stated will explain briefly more about:

- Chapter 2: The literature review and the technical methods theory.
- Chapter 3: Understanding study approach, recommended technological procedures, and tools and components are all included.
- Chapter 4: Reviews and analyzes the technical results.
- Chapter 5: All previous sections are concluded with proposed workflow and planning to future works.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This chapter specifically focuses on the data and concept, preceding research and comparison between methods used by the researcher. This chapter concerns the "Development of Spectical for the Special Needs with Voice and Navigation tools". The main goal of Spectical is to help blind people and people who have vision difficulties. In recent years, several measures to improve the mobility of blind persons who rely on sign processing and sensor technologies have been put in place. The literature shows that the primary factors are the sonar input (infrared signals, or ultrasonic signals). The device type can be operated such as an ultrasonic or sonar system to detect the impediment to moving items. Research from previous work is required to help this kind of people to live their life freely. This Spectical need to have several features that surely can help to make their life routines easier.

2.2 Related Previous Works

2.2.1 "Obstacle and Fall Detection to Guide the Visually Impaired People with Real Time Monitoring" by Rahman, Mohammad MarufurIslam, Md. Milon Ahmmed, Shishir Khan and Saeed Anwar.

A group of researchers (Rahman et al., 2020) wrote this article from University of Engineering & Technology, Khulna in the year 2020. This article introduces a system that can detect obstacles in front, irregular objects on the floor, and moving objects. The system also detects in case of emergency and notifies the person guardian. Then, the machine includes ultrasonic sensors, PIR movement sensors, accelerometers, smartphone programs, microcontrollers, and data of transmission device. The microcontroller board send transmits statistics to the consumer's phone via the Bluetooth module the phone utility produces audible commands to identify the character at best. The software moreover upgrade current vicinity of person to preserve audio and alert the guardians whilst the individual falls step down or in distress mode. The block diagram shows the system of project below in Figure 2.1 below. (Rahman et al., 2020)

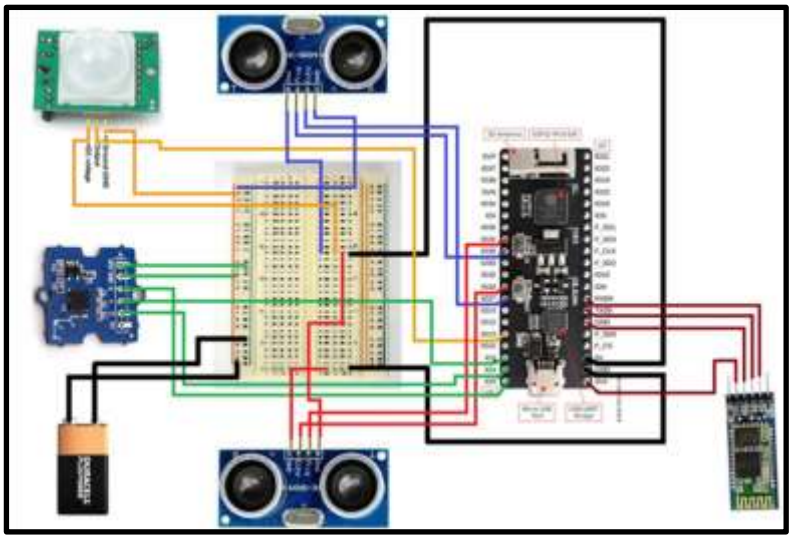

Figure 2.1 The block diagram of system(Rahman *et al.*, 2020)

An ultrasonic sensor able to sense or detect obstacles in the front users. Humps on the floor or the street are detected the usage of an ultrasonic sensor. The detection of moving objects in front of the purchaser, a PIR motion sensor is applied. In case client falls, a three-axis analog accelerometer is used to stumble on it. A Bluetooth module can send all the sensor statistics to the user's cellphone. If situation is an impediment, a hump condition, or on moving item on the front of the person, audio steering through user telephone will alert them. The smartphone module will immediately notify the guardian if the user falls. If necessary, an emergency signal may also be sent to the user. The two components of the system include a sensor device and a smartphone device. Procedure steps will go by each module. Figure 2.2 below shows the working flow of obstacle (Rahman et al., 2020).

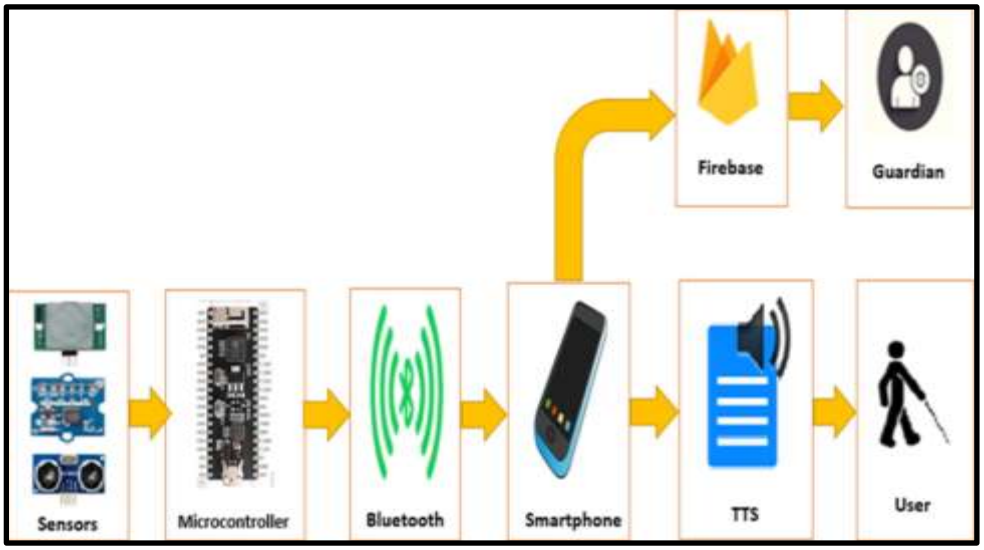

Figure 2.2 The process of obstacle detection (Rahman et al., 2020)

To gain from the signal from the prototype, an Android application is being created. It uses Text to Speech technology to alert the user and provide real-time instructions. TTS settings can be customized for various languages, voices, and volume levels. Positioning System used by app to determine person current location and load it to the Firebase info in real-time. As an outcome, the caregivers will use the system to measure the user's location.

The system guardian section informs caregivers the visual impaired current location. On Google Maps, the caregivers will monitor the user and find a route to them. They are informed immediately if the user sends out an emergency signal or falls. A cellular network is used to send the message.

Using Android Studio, the team created an Android application. The app will serve as a link between the user and the prototype. The application's guardian portion uses real-time data from Firebase to display the user's position. Non-users, such as guardians, must authenticate using a username and password. They can see the user's real-time location information after a successful login. The guardian can even use Google to find and map a location both the user. In the user device, there is an easy-to-find button. The user does not need to authenticate the programmed can connect to the embedded device on automatically. After connecting to the embedded device, the programmed will present the user with the required instructions. Figure 2.3 shows the application's interfaces (Rahman et al., 2020).

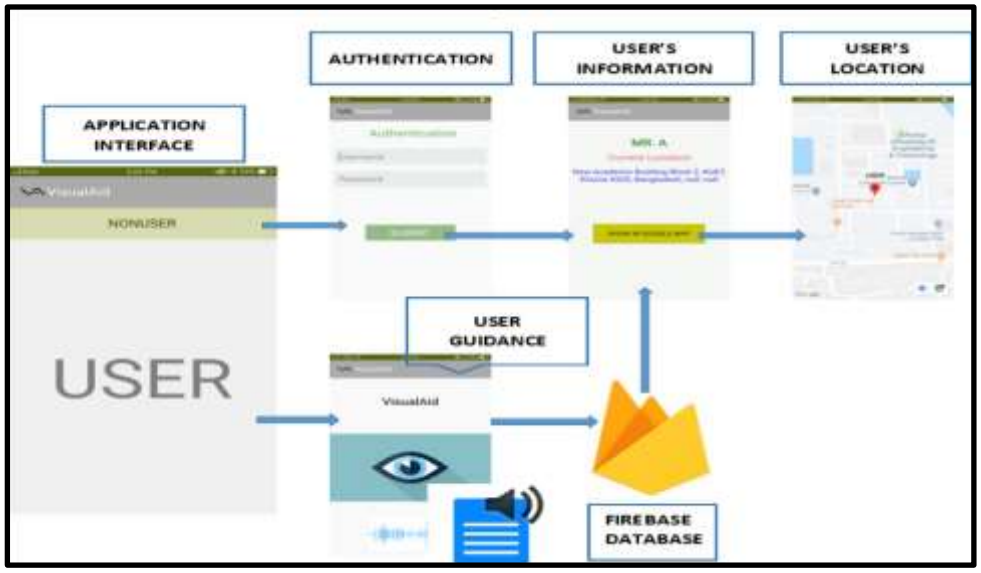

Figure 2.3 The application Interface (Rahman et al., 2020)

2.2.2 "Smart Blind Stick Connected System Using Arduino" by G.Srinivas, G.M.Raju, D.Ramesh, S.Sivaram.

This article (G.SRINIVAS *et al.*, 2019) describes the smart stick, is basically a built-in device that merges two ultrasonic stick sensors for the detection of hurdles to head level height from ground level height, the infrasound sensor for the detection up and down stairs and the water sensor for puddle detection from a distance 400cm covered. The sensors capture real-time information and forward it to the microcontroller. The Bluetooth earphone message is sent to the microcontroller with a warning message for the speech warning. A rechargeable battery powers the device. Figure 2.4 describes the developed application's interfaces (G.SRINIVAS *et al.*, 2019).

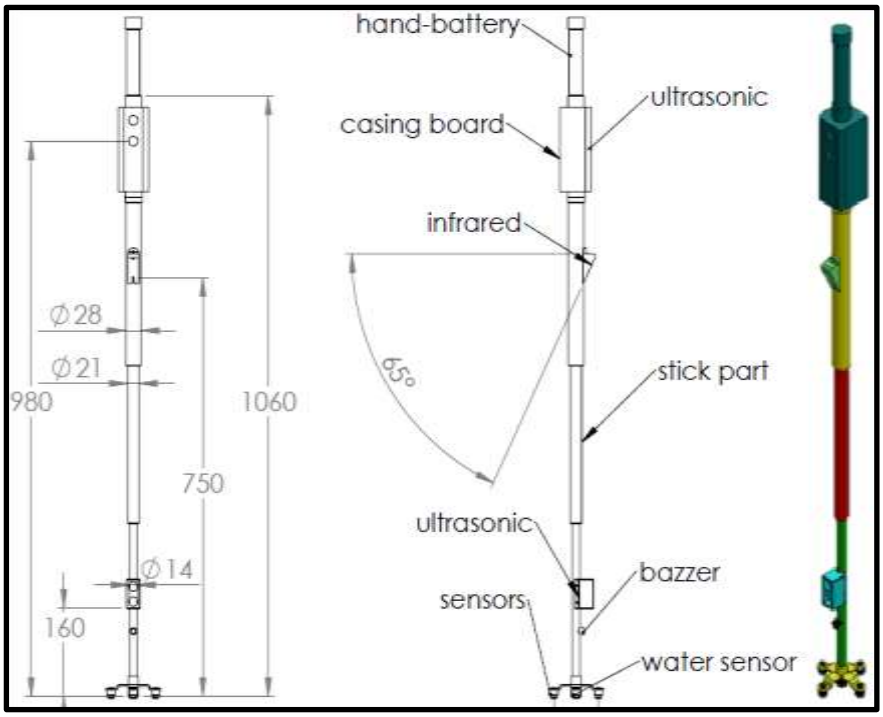

Figure 2.4 The working flow of system (G.SRINIVAS *et al.*, 2019)

When the person reaches destination, the GPS-based interface with user input interfacing gives a voice alert. This is comprised of a module for the microcontroller, a GPS, and a speech output. It holds data user's current position that it collects from the GPS system so that it can equate it to the user's desired destination location. When they hit an object, the echo signals are reflected to the sensor which uses the signal transmission of distance from time and the echo reception to determine the distance to the destination. Device uses 433 MHz to send a message from an Arduino to another Arduino board. The “Hello World!” message is sent using an Arduino board linked to a 433 MHz transmitter. To receive the messages, the other Arduino board is connected to a 433 MHz receiver. Device construct a wide range of applications by combining the two objects of. wireless communication with Arduino, such as remote controlled and wirelessly powered devices, easy data transfer, and so on. The device which two Arduino boards communicate with each other using an RF Module in this project. Figure 2.5 describes the block diagram of Smart blind stick (Issn et al., 2019).

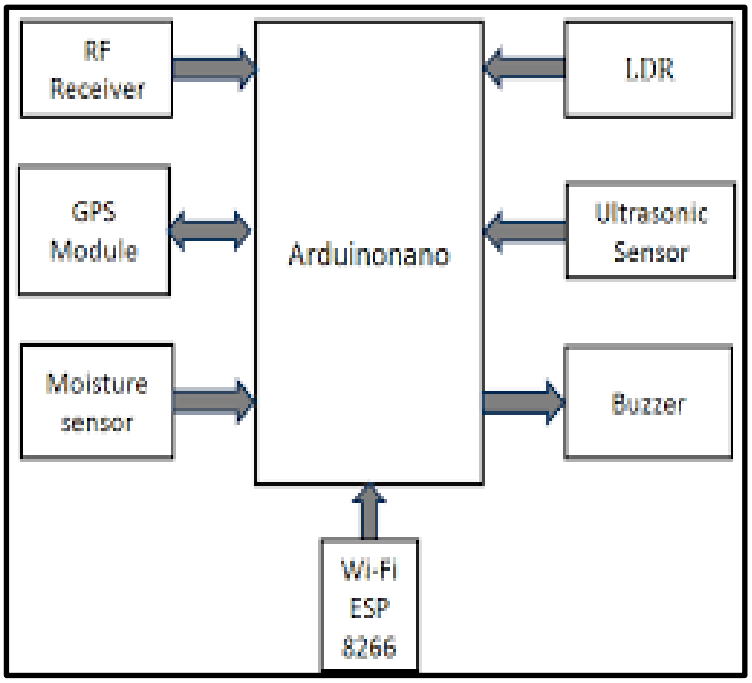

Figure 2.5 Block Diagram of Smart blind stick (G.SRINIVAS *et al.*, 2019)

2.2.3 "Smart Cane for Blind People using Raspberry PI and Arduino" by Prutha G, Smitha B M, Kruthi S, Sahana D P.

The research was proposed by (Prutha *et al.*, 2020) to present the usage of raspberry pi and second board Arduino that monitoring stick are produced. There are 3 unit of ultrasonic sensors identify barriers before users across 15 cm, while water sensors detect water and puddles. The stick has interfaces for the sensors listed above. Using a dc motor, the stick will make robotic decisions to step forward, backward, left, and right in response to obstacle detection. The buzzer and vibration will alert users. A flashlight is attached with stick, which can be seen others, allowing to move. The finger ring is applied to provide GPS for real time location. The consumer keeps up the system due to its fast response and low power consumption. This goal to assist visually disabled people navigating independently.

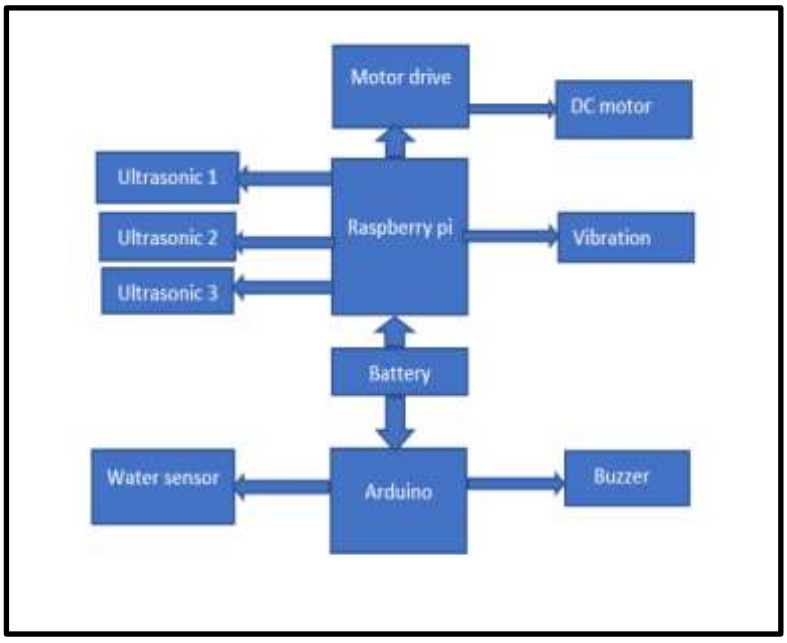

Figure 2.6 Block diagram of the system (Prutha *et al.*, 2020)

The Figure 2.6 (Prutha et al., 2020) above shows procedure of system using block diagram. The following comprise 3 pairs of ultrasonic detect obstacle, a sensor detecting water, a motor supply run gain from dc motor, a raspberry pie as Mcu, a buzzer to alert, Arduino and a vibrator. Table 2.7 (Prutha et al., 2020). Displays the water sensor circuit connection. It comprises of 2 resistors of 330ohm, 1 microFarad and 1 kohm resistor variable. If water enters touch with two open ends of variable resistance, the circuit is complete, and a buzzer is used to produce the result.

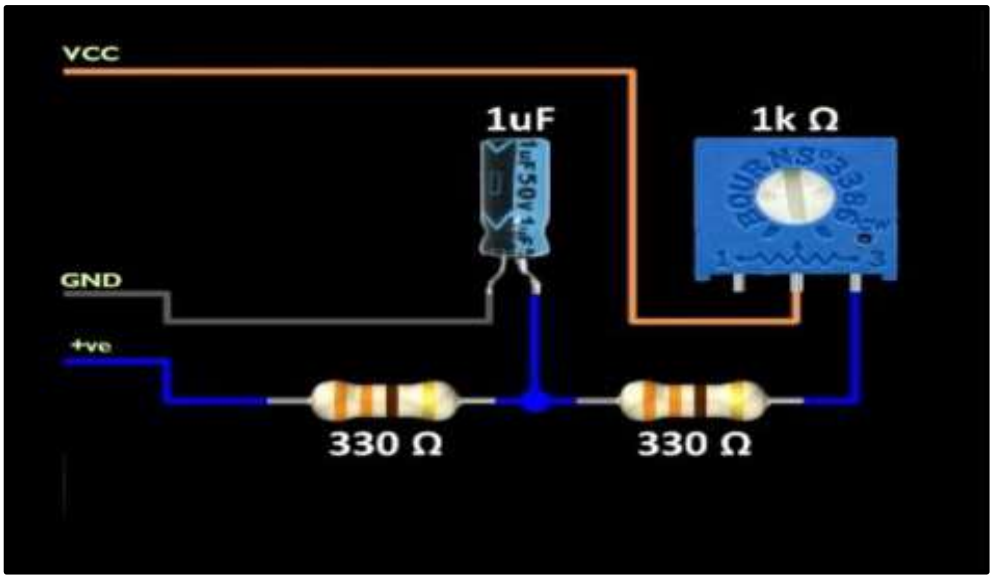

Figure 2.7 Circuit connection of water sensor (Prutha *et al.*, 2020)

The system being boil. Specific tools are used in structure, that allows the impaired person to take any warning alerts from the alarm system structure. The motor is attached to the tire to make movement. Obstacles and water are detected using an ultrasonic sensor and a water sensor. The system is composed of three pairs of ultrasound sensors to identify impediments. A power bank is used to give a power.

2.2.4 "Smart vision for the blind people" R.Mohanapriya,U.Nirmala,C.Pearlin Priscilla.

This article(Mohanapriya *et al.*, 2016) was written by a group of researchers in the year 2016. This article presents a smart way by removing the difficulties of moving in complete autonomy and the ability to identify and recognize objects. Figure 2.8 (Mohanapriya *et al.*, 2016). below shows the working flow of obstacle.

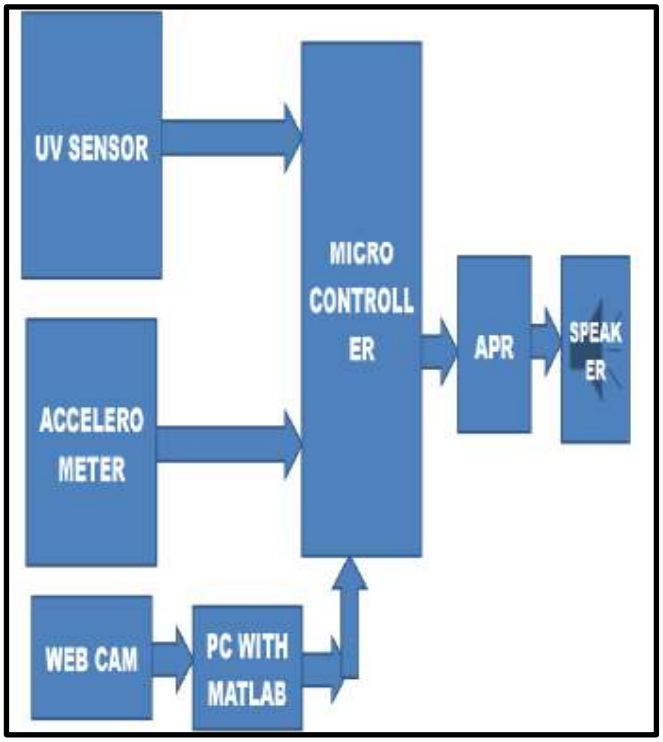

Figure 2.8 The flow of obstacle (Mohanapriya *et al.*, 2016)

This research system consists of an eyeglass contain camera along sensors, a hardware through audio system. It detects obstacles as well as traffic signal patterns using the MATLAB programmed. Image acquisition, feature extraction, feature matching, pattern recognition, and template matching are the techniques involved. These aids blind people in detecting obstacles, as well as traffic signals, and crossing the street.

The snapshot was then compared to templates stored using the template matching principle. A technique used in digital image processing is template matching. It will look of the target image that fit the prototype image in MATLAB. The template's features were then surfed, and circles were plotted. This was done using the MATLAB feature extraction process. A special form of dimensionality reduction is feature extraction. Feature extraction's is to extract the most important information from the original data and display it in a lower-dimensional space. The entire scene picture for the initial matches. Finally, filtered matches are created that fit the prototype exactly. After match is made, a message box appears to indicate that the obstacle been identified. Via a serial cable, the MATLAB output sent to the microcontroller kit with max232 serial.

The AT89C51 microcontroller was programmed with the keil-c software. The Baud rate was set to 9600 for serial communication, and the clock frequency was set to 11.0592 Hz. After receiving commands from MATLAB, the microcontroller sends them to the APR33A3 package. There are eight channels and three modes of service on the APR. The audio playback and recording kit allows the user to issue audio commands. The target bus is shown in figure 2.9 below (Mohanapriya *et al.*, 2016) which was extracted from the scene image. In MATLAB, this target bus is saved as a reference. The picture of a traffic scene taken from a live video model.

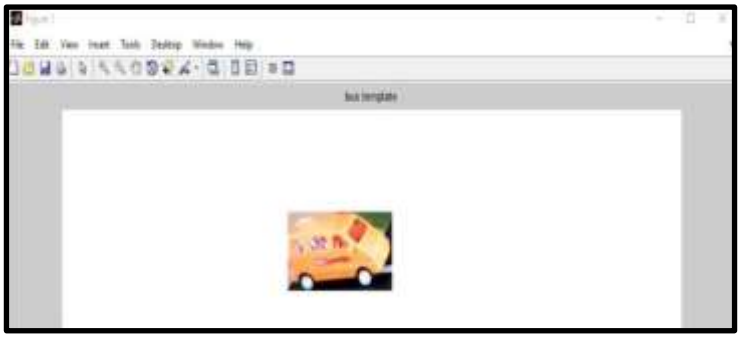

Figure 2.9 Bus template (Mohanapriya *et al.*, 2016)

A model car and a model bus were used to build the scene. As the target image, the snapshot image is used. The method of surfing the bus's features is depicted. On the bus, the circles are plotted in Figure 2.10 (Mohanapriya *et al.*, 2016). The circles drawn on the bus is matched to the picture of a traffic scene.

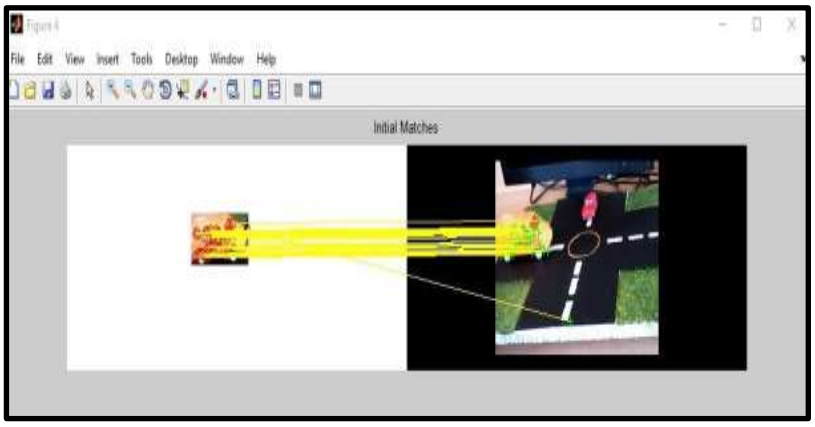

Figure 2.10 Initial matches (Mohanapriya et al., 2016)

The method of final matching is depicted in Figure 2.11 (Mohanapriya *et al.*, 2016). Only the specific template is matched with the scene picture in the final match. After the template has been developed a massage box will appear to give an instruction. In this example massage "bus detected "is obtained.

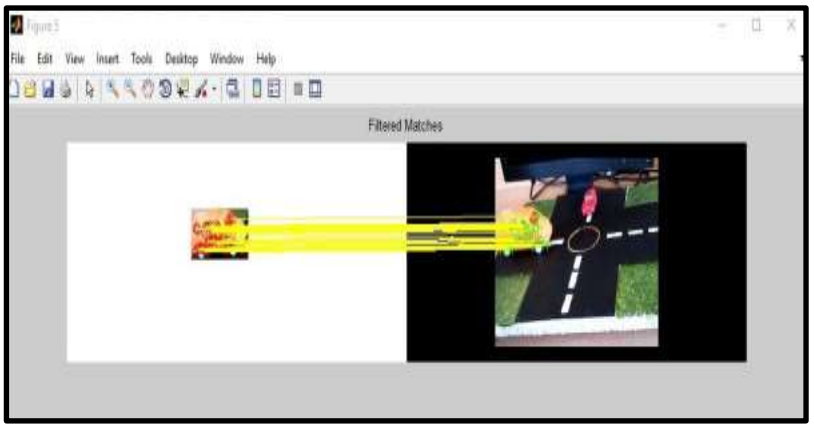

Figure 2.11 Final matches (Mohanapriya *et al.*, 2016)

2.2.5 “Blind Aid Stick: Hurdle Recognition, Along with Voice Based Cooperation & Via Gps & Gsm & Panic Alert System” By Ayesha Rafat Arkeri And Sumaiya Sadaf.

A group of researchers Poojya Doddappa Appa College of Engineering, Kalaburagi, India consisting By Ayesha Rafat Arkeri And Sumaiya Sadaf in 2019 have submitted a visual impaired stick with obstacle detection system(Arkeri *et al.*, 2019), which is audio-based linking through GPS & GSM together with alert structure. The system allows the low vision person to navigate using an android programmed and a spectacle. The blind person is directed by the application's voice commands in Hindi/kannada/English, which are created based on the obstacle location, enabling visual impaired person to move freely any place in outside. It can also assist attached audio commands or an alert button that allows a low vision person to send a massage to an approved caregiver’s number without having to touch telephone by simply press an pushbutton. The technology programmed uses GPS and GSM to obtain the latitude and longitude, which it then sends to a server. Another android application points out the blind person's current location on a Google map is used to monitor their movements. For blind people, this programmed would be more useful. It is important to reflect on the importance of this application to refine it for the future. The machine is used for blind people, but it is also accessible to non-blind people. In the future, it able to spot potholes in the path of blind people. The shown block diagram of structure of the system in Figure 2.12 below(Arkeri *et al.*, 2019)

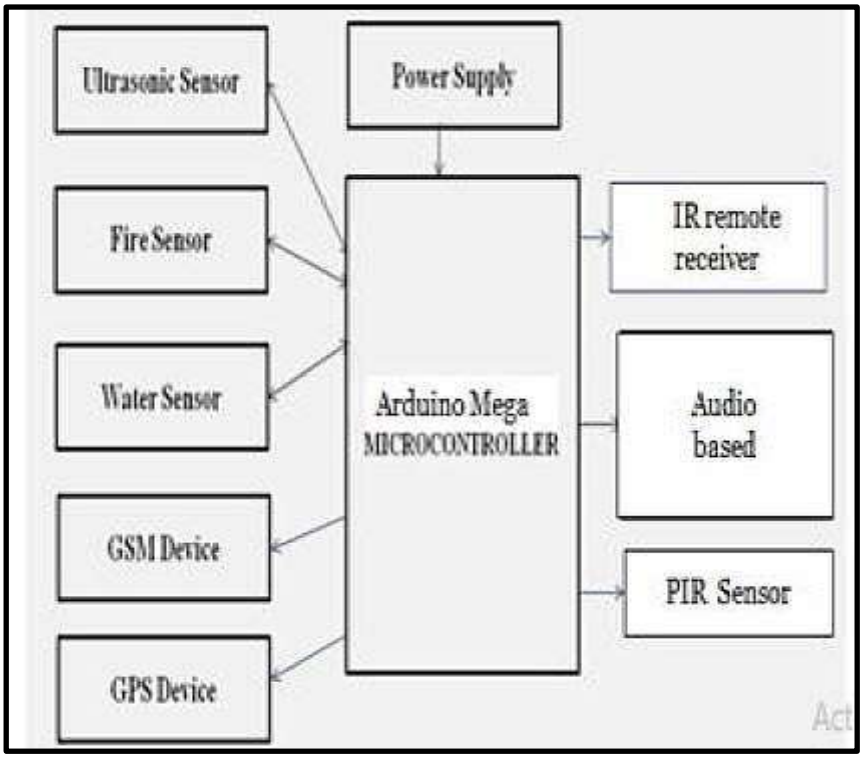

Figure 2.12 Block diagram of the system (Arkeri *et al.*, 2019)

A simple, low-cost, configurable, and simple-to-use electronic guidance system is proposed as a helpful aid and aid for persons with reduced vision and blindness. The findings suggest the system's capacity to indicate the source and distance of things that may come in touch with the blind is effective and extraordinary. It will look for locations to the left sides, right sides and front way of low eye vision individual irrespective tall or width. Those that included in the test thus preferred it. The ultrasonic sensor completely used to help blind and visually disabled people move about in a healthy and independent manner. The presence of water and fire is detected using water and fire sensors. This method does not necessitate the holding of a large device over a long distance, nor does it necessitate any special training. This system also eliminates limitations associated with most movement issues that may affect blind people in their environment.

2.2.6 "Location Based Navigation and Obstacle Detection System with Voice Alerts for Blind" by Chandni Asvitha Thumma, Shravya Amarnath, Hanna Philipose, and Gayathri P.

A group of researchers from India Global Journal of Engineering Science and Research Management Vol. 4, Issue 6, June, 2017 consist Chandni Asvitha Thumma, Shravya Amarnath, Hanna Philipose, and Gayathri P have proposed a system that emulates Location Based Navigation And Obstacle Detection System With Voice Alerts For Blind (Thumma *et al.*, 2017).

This project is designed to produce an intelligent stick for blind or visually challenged individuals. The stick is equipped with a GPS along GSM module and an obstruction structure. A user uses the GPS gadget to identify the current position and warn a friend, relative or family of the position. This can allow the user to move more freely. When required, a voice module is connected to the stick so that it can warn the person condition of obstacles and the current position way. GSM send a message to a friend or relative about their current location, and the device provides the user with a current location announcement that includes text to speech translation.

Obstacle detection methods, as well as navigation through audio controls, included in the system to be designed. Since noises are usually bad for the human body and can cause annoyance, system is device audio centric. Different speech announcements that match the input form are delivered as an output enabling the user to detect the barrier's magnitude. In order to resolve wearable problems, the gadget should be attached on a white stick that is already known by a blind person. The papers cited above cover individual facets of simple navigating for the blind. Plan to narrow the gap by merging all the components necessary

into one system that provides helpful services that a visually challenged person may need to simple navigation procedure. Technologies is utilized in the literature review are summarized in Table 2.1 (Thumma et al. 2017) using ultrasonic fascicles or sonars to identify the obstruction of stationary and mobile objects.

Table 2.1 Technology reviewed to detect obstacle (Thumma *et al.*, 2017)

Technology	Review	Advantages and Disadvantages
Infrared	Transmit the electromagnetic waves	Easily break or shielded, not accurate reading
RFID	Transmit of electromagnetic waves which reads from RFID tags	Requires RFID tags, Not efficient specially in outdoor environment
Ultrasonic	Transmit and receive of ultrasonic waves	Covers a respectable range, is cost-effective, and has a field of vision of 60 degrees.
Laser	Transmission and reception of light waves	In full daylight, it is ineffective, it is readily protected, and it is quite expensive.

Ultrasonic sensor is most appropriate sensor as reviewed from the table 2.1 survey. It is this component that allows the user to avoid 0-4 feet of obstacle, depending on their location and vicinity. Ultrasound sensors are used to transmit ultrasound waves and to receive continuous responses from obstacles around them. In order to estimate the distance from the user to the barrier, the microcontroller examines the answer. This enables the equivalent performance, a voice message over the speaker indicating the direction of the barrier.

2.2.7 "Design and Implementation of a Walking Stick Aid for Visually Challenged People" by Nilima Sahoo, Hung-Wei Lin and Yeong-Hwa Chang.

This article (Sahoo *et al.*, 2019) was written by a group of researchers in the year 2019 .This article offers a support to identify barriers and water puddles. This setup includes a smart stick and software apps (APPs). The Raspberry Pi and device component, a global position system, programmable interface controller using control kernel, and alert-offering additives are entirely embedded inside the walking stick. Sensors assist in the detection of boundaries, and the VCP is notified of the impediment detected through vibrations or a buzzer. The materials used in this system are described below in detail. The design architecture of the structure is shown in Figure 2.13(Sahoo et al., 2019).

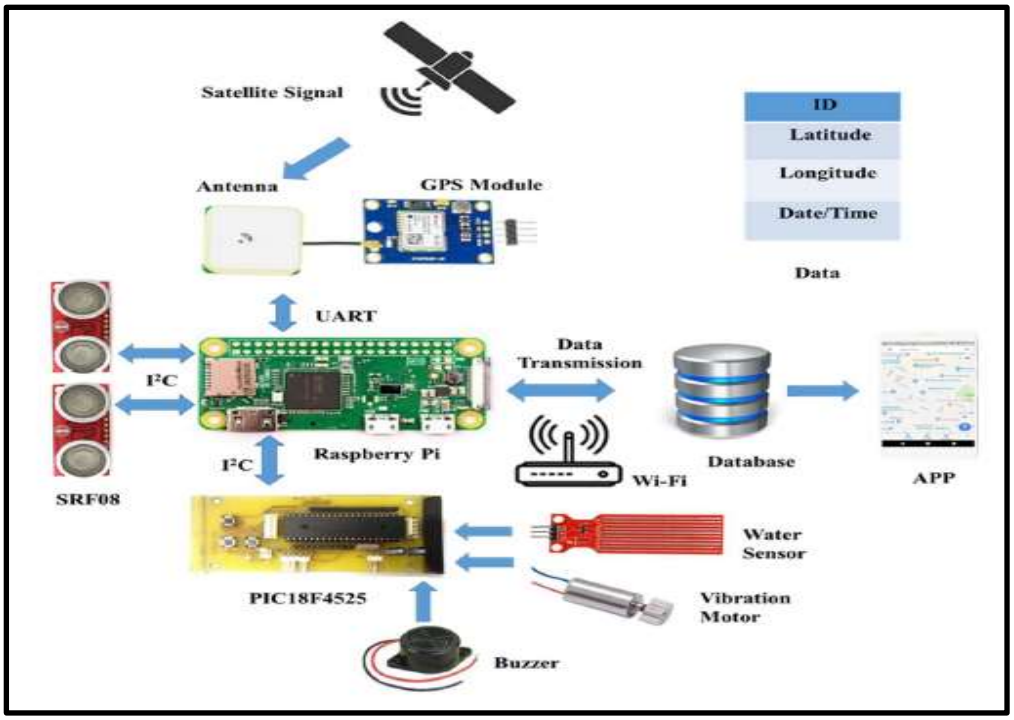

Figure 2.13 Architectural design of system (Sahoo *et al.*, 2019)

The GPS module gets the real time location of the visually challenged person navigation, so that parents may monitor the position of the visually challenged person using a software. A further important APP is a power APP, which allows the visually challenged person, four times in a crisis scenario, to connect to its parents or friends by simple shaking a user telephone or pushing the power button.

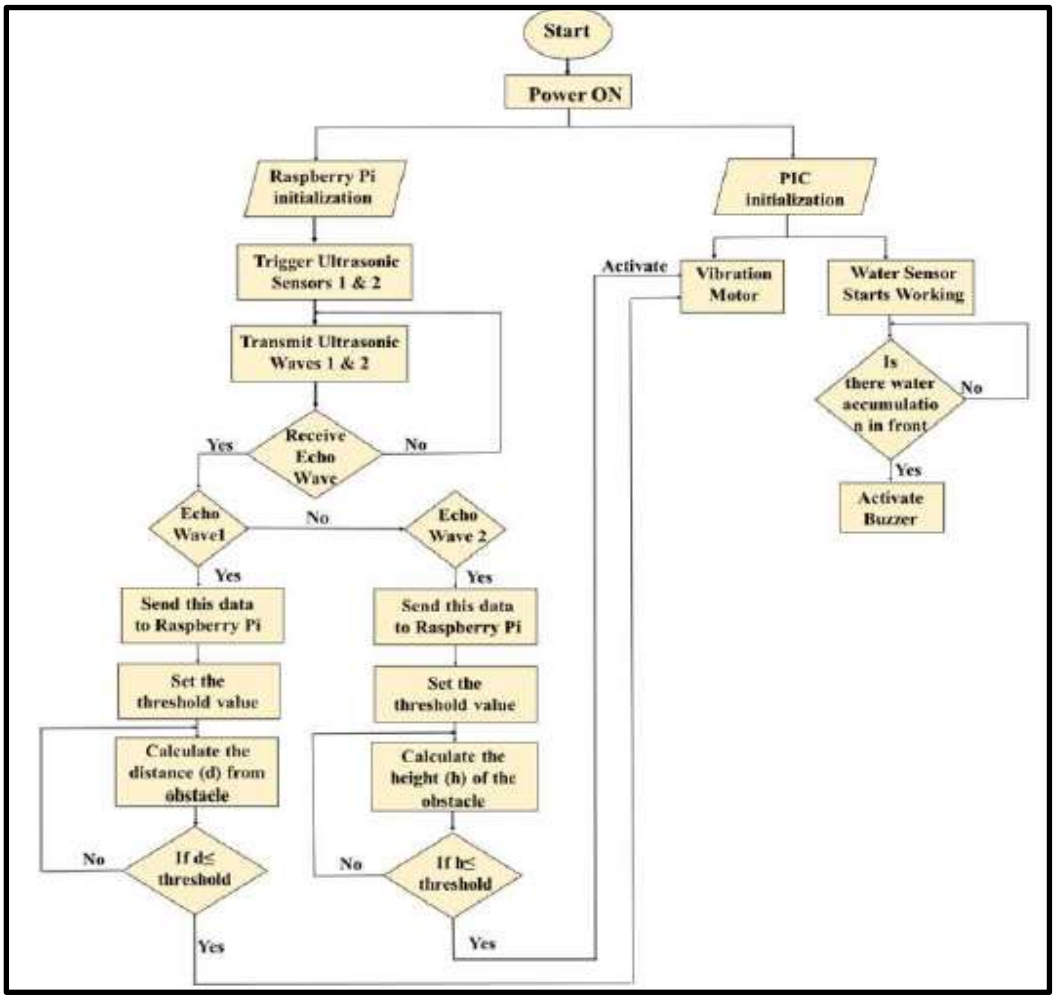

Figure 2 .14 Working flow of obstacle(Sahoo *et al.*, 2019)

From the figure 2.14 (Sahoo *et al.*, 2019)the ultrasonic sensor works on the same concept that a bat uses to locate its prey, known as echolocationThe ultrasound sensor transmits an ultrasound wave at the standard speed of a sound wave, outside the human

range, and awaits the echo wave. The sound wave in air moves at an average room temperature of 343 m/s. The wave flows out from the sensor in a conical manner and from any object in its direction sound and receive back signal to sensor. After radar wave of the ultrasonic sensors stops then waits for the coming echo wave. The Raspberry Pi is connected to both ultrasound sensors It signifies an obstruction was located when an echo wave is received. The sensor then transmits the data to the Raspberry Pi which calculates the distance to the item using the time elapsed between the transmitted and the received signals. In the Raspberry Pi code, the threshold values are determined to provide user comfort so that those with visual impairment are aware of the barriers.

The limit value is a set distance that may be distinguished from the impediment and adapted to the consumer's demands. The obstacle detection threshold settings for the ground level and the upper body part are 200 cm and 100 cm. The d and h distance measures are then compared to the threshold value in accordance with Raspberry Pi, the master controller Raspberry Pi will send the order to the slave controller PIC18F4525 to activate the vibration motor when estimated distances are less than or equal to the threshold value. The code is then performed in PIC18F4525, which activates the vibration engine. If ground barriers are identified, but it slows down and vibrates twice a second if barriers to the top of the body are identified. The motor vibrates constantly at high speed. A water level sensor is also used to detect small pots of water. If the module comes into contact with water, the buzzer attached to the microcontroller sends a sound to inform the user.

2.2.8 "Design and Development of Virtual Eye for the Blind" Pooja Sharma, and Mrs. Shimi.

The presented work (Sharma *et al.*, 2015) contains wearable equipment consisting of a head helmet, a little hand stick, and foot shoes to assist the blind person in securely navigating on their own and avoiding any impediments that may be encountered, whether fixed or mobile, to avoid any potential accidents. The ultrasonic sensor is the most important component of this system, as it is responsible for scanning a preset region surrounding the blind by producing and reflecting waves. The reflected signals obtained from the barrier objects are sent into the Arduino microcontroller, which acts as an input device. The SD Card Technology is used to send the state of a certain appliance or device back to the earphones after the orders have been carried out by the microcontroller. The device is inexpensive, quick, and simple to use, and it provides an innovative and economical solution visually challenged person in developing and third-world nations. The device may be seen in Figure 2.15, which follows. (Sharma & S. L., 2015).

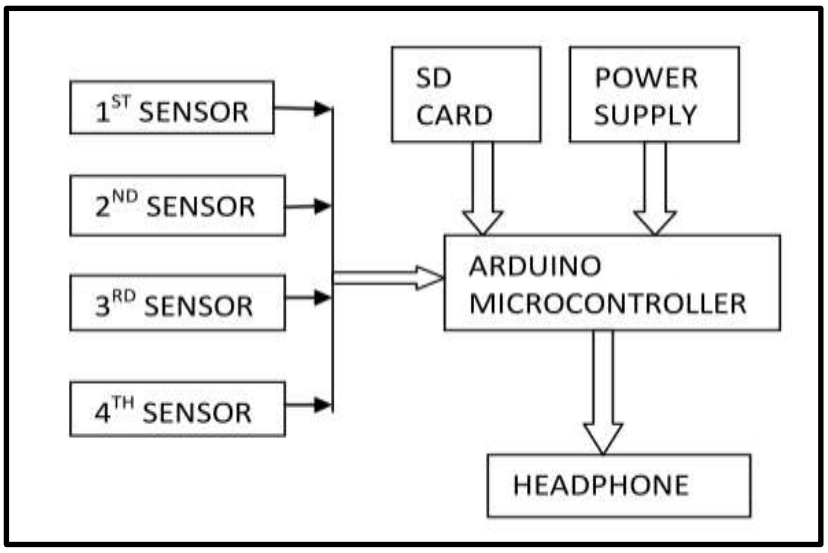

Figure 2.15 Diagram of system (Sharma & S. L, 2015)

2.2.9 “Embedded Glove’ To Aid the Visually Impaired” Sankar Kumar S, Abarna J, Lavanya G, Nithya Lakshmi.

This paper (Sankar Kumar et al., 2013) provides a version of 'Embedded Glove,' a hand placed device with vibration structure. The Sound Navigation and Ranging (SONAR) by alerting visually impaired users to vibration of vehicles. This equipment functions as an ETA, providing impartial movement for the visually handicapped. This version has a wrist-banded glove integrated with ultrasonic sensors, a battery, a microprocessor, and vibrator vehicles. Besides being entirely trustworthy, this gadget is also a very expensive--powerful navigation tools for the visually challenged person. The tools are built to cover large region using two ultrasonic sensors that display an effective and quickness of obstacle sensing. Then identified hurdle is alerted to the owner without delay, thereby transmitting the existence of the barrier in combination with its route to visually impaired individual through a tactile machine. Using a Photovoltaic (PV) panel manages the power intake for the full device, making it more efficient. The schematic for the device is shown in Figure 2.16 below. (Sankar et al., 2013)

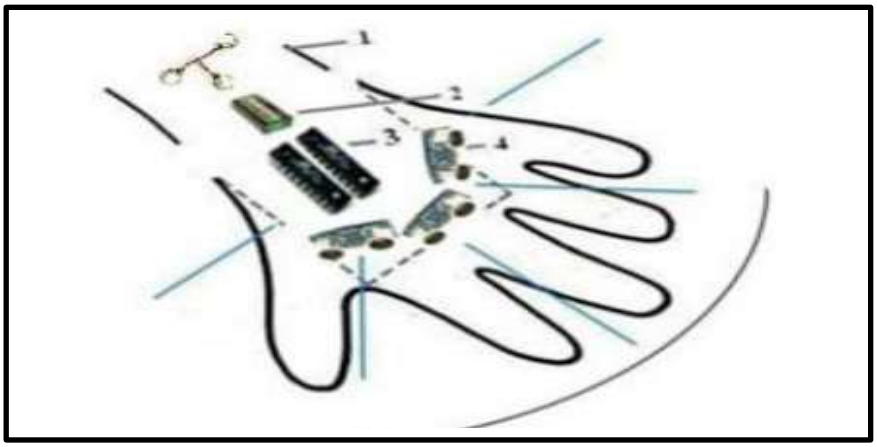

Figure 2.16 Sensor Glove design of Proposed System(Sankar Kumar *et al.*, 2013)

2.2.10 "Wearable Smart System for Visually Impaired People" Ali Jasim Ramadhan.

This article (Ali Jasim Ramadhan, 2018) generalize wearable smart mechanism to visually-impaired to live freely without help. System tracks path the wristband worn by the user. When an object is detected in front user, the device sounds a warning that gets louder as the user gets closer to the object. The users with less hearing loss or in noise state settings a sound warning has been provided. When a person is using the devices, an alert sounds to warn someone in the nearby and alert SMS will be sent to the caregivers of the user to report the event. In the same manner, if you need help, the user will tell us "Help," and the device will start a suitable alarm to notify people in the area and send the user families an SMS with user location details and a contact request. In addition, family members may send a Text to request the position of the system so that they can locate and monitor the unit as needed, for instance, when the system is stolen or lost. Figure 2.17 below is the diagram of the system.(Ali Jasim Ramadhan, 2018)

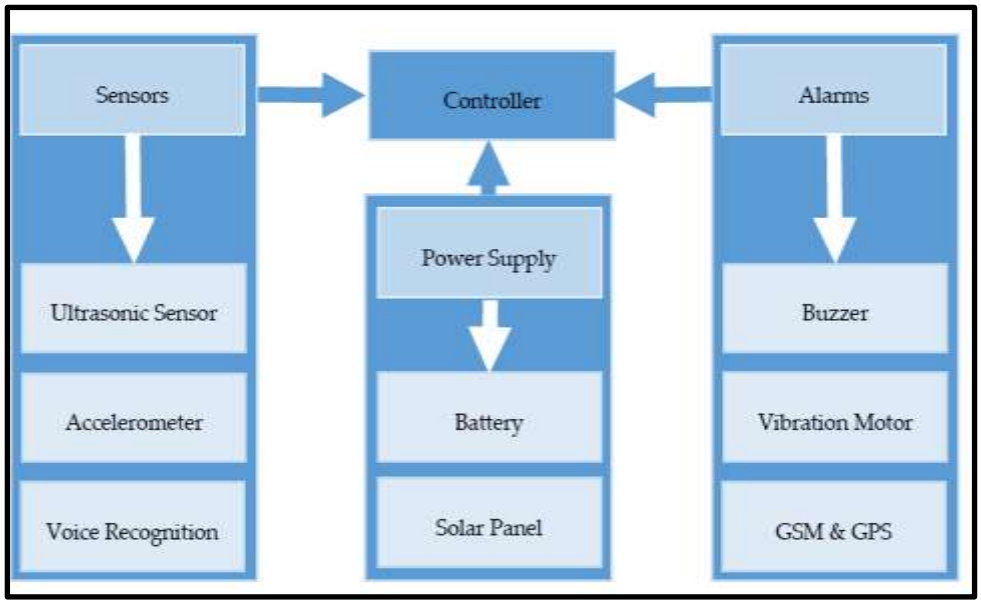

Figure 2.17 Diagram of system (Ali Jasim Ramadhan, 2018)

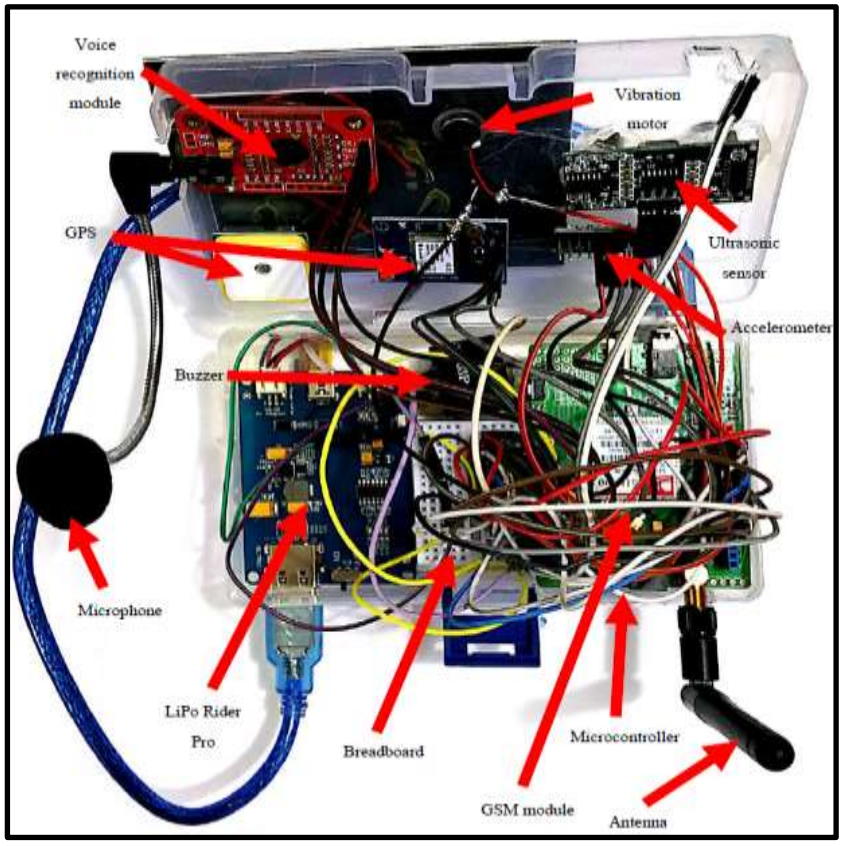

Figure 2.18 Fabricated system prototype.(Ali Jasim Ramadhan, 2018)

Figure 2.18 above show fully connected system look like. The system was implemented by combining the various components as described. The board application is in charge of controlling the various system and function. We utilized linked circuits design whose system was built using several techniques to increase performance. Overall, the device has key features such as a smart watch-like wearable system. It may be a remote user control system that senses when the user trips. You can then request support from the user. Sonic and vibrating alarms are employed to prevent this. Finally, a solar panel driven high-capacity battery is employed.

2.3 Comparison Table

	Article		Purpose	Application	Advantages	Disadvantages
	Title	**Author**				
1	Obstacle and Fall Detection to Guide the Visually Impaired People with Real Time Monitoring	Mohammad Marufur Rahman, Md. Milon Islam, Shishir Ahmmed , Saeed Anwar Khan (2020)	Assisting visually disabled people in travelling safely without the use of external assistance and tracking their real-time location information.	ESP 32 Ultrasonic Sensor Accelerometer PIR Sensor Bluetooth Module Android Studio	Detecting acceleration by varying both speed and direction. Setup of a wireless serial link that is clear. In certain range, detect the movement of any obstacles.	The uses of Bluetooth technology for not suitable to connect earphone instead normal earphone that announcements clearer and without external noises.
2	Smart Blind Stick Connected System Using Arduino	G. Srinivas, G.M. Raju, D. Ramesh, S. Sivaram (2019)	A smart handle is meant to detect barriers that allow the blind to move securely. The audio would keep the user attentive and drastically prevent accidents. There is also a voice-enabled automated switching mechanism for your own area.	Arduino Nano WIFI ESP Ultrasonic sensor Moisture sensor GPS LDR RF Receiver	Detection of obstacle together with water and fire source, Precise location while danger through WIFI warning massager Transmitter to locate the stick presentation of loss.	The connection of system can be improved. Such as using wireless connection. Consumption of voltage is high .

	Article		Purpose	Application	Advantages	Disadvantages
	Title	**Author**				
3	Smart Cane for Blind People using Raspberry PI and Arduino	Prutha G, Smitha B M, Kruthi S, Sahana D P (2020)	Introducing a stick to assist blind people in moving around on their own. Blind people may use this system to walk in a safe direction by being alerted to the presence of obstacles.	Raspberry PI Arduino Ultrasonic sensor Water sensor GPS Motor drive	If there is an obstacle in front of you, the direction is changed automatically by dc motors. A GPS-enabled finger ring that allows for secure navigation.	Require high-capacity battery. The connection of system can be improved. Such as using wireless connection. Should be able to send an SOS message.
4	Smart vision for the blind people	R.Mohana priya, U.Nirmala, C.Pearli n Priscilla (2016)	Create a product that will assist blind people in crossing the road, as in. This initiative aims to assist the blind in recognizing traffic signal patterns, as well as nearby barriers, and crossing the road without the assistance of others.	AT89C51 UV sensor Accelerometer	Ability identifies to seek and recognize objects. Able to identify the distance between moving object such as vehicles and intimate them.	The process of template making is hard. Need to capture all possible object to able to recognize object. Although system able to detect object, failure may happen so system should be able to send SOS message in case emergency. .

	Article		Purpose	Application	Advantages	Disadvantages
	Title	**Author**				
5	Blind Aid Stick: Hurdle Recognition, Along with Voice Based Cooperation & Via Gps & Gsm & Panic Alert System	Ayesha Rafat Arkeri, Sumaiya sadaf (2019)	Provide a user-friendly interface for blind users to get about in unfamiliar environments, whether indoors or outside. Outside. travel towards a blind person and watch all movements of a blind person, who may be employed later in panic or in a team of any lost person to assist them rescue him/her.	Arduino Mega Ultrasonic sensor GPS GSM Water sensor Flame sensor PIR sensor	Sense motion used to detect whether a human has moved in or out of the sensors range. Detect presence of a fire source or water.	Not everywhere can be easily removed for many components used. Different heat sources might readily interfere with this.
6	Location Based Navigation and Obstacle Detection System with Voice Alerts for Blind	Chandni Asvitha Thumma, Shravya Amarnath, Hanna Philipose, Gayathri. P (2017)	Aid visual impairment, as its capacity and the quality of life and capacity to communicate with the environment might influence their performance of everyday duties.	Arduino Uno Ultrasonic sensor GSM GPS Audio module	gives a robotic voice and not human voice as output. navigate when the location announcement button is pressed.	Wireless communication between system components can be enhanced.

	Article		Purpose	Application	Advantages	Disadvantages
	Title	**Author**				
7	Implementation of a Walking Stick Aid for Visually Challenged People.	Sahoo, Hung-Wei Lin and Yeong-Hwa Chang (2019)	Provide a tool that helps you spot obstructions and puddles on your way. live an autonomous life (with security) that increases confidence in unexpected surroundings	PIC18F4525 Ultrasonic sensor water sensor GPS	Separate alert vibration to ultrasonic and buzzer to water sensor. Precise location of the satellite with apps.	System should be able to send an SOS message. Less function used and it to simple.
8	Wearable Smart System for Visually Impaired People	Sankar Kumar S, Abarna J, Lavanya G, Nithya Lakshmi. (2013)	Present a wearable intelligent device to assist visually disabled people (VIPs) in walking through the streets on their own, navigating in public spaces, and seeking assistance.	Arduino Uno Ultrasonic sensor Voice recognition Accelerometer LiPo Rider Pro Vibration motor GPS GSM	Remote monitoring of the user to request assistance. Gives a robotic voice using sound and vibration	Require high-capacity battery. Consumption of voltage is high.

	Article		Purpose	Application	Advantages	Disadvantages
	Title	**Author**				
9	Implementation of a Walking Stick Aid for Visually Challenged People.	Pooja Sharma, and Mrs. Shimi. (2015)	Today, blind individuals fight a lot to survive their terrible existence. The proposed work builds and deploys a simple, affordable, user-friendly virtual eye to increase the mobility of both blind and visually impaired people in a specific region.	Arduino Uno Ultrasonic sensor Sd Card Headphone	Remote monitoring of the user to request assistance. Gives a robotic voice using sound	System should be able to send an SOS message. Less function used and it to simple.
10	Embedded Glove' To Aid the Visually Impaired	Ali Jasim Ramadhan (2018)	This device includes a wrist-linked glove equipped with ultrasonic sensors, batteries, a microprocessor, and vibrator motors. Along with being entirely trustworthy, this device also offers cost-effective advice to the visually handicapped. .	(PIC16F628A Ultrasonic sensor Vibration motor	Using a vibration motor instead buzzer that reduce noise distraction in environment.	The function is less because only have obstacle detection and vibration motor as output.

2.4 Summary

To conclude, the result of the numerous above literatures consists of the possibility and a better know-how concerning the improvement of Spectical for the special needs with Voice and Navigation tools. The improvement and research from the many authors come from different place apply other kind of concept to plan on the way simulate development of Spectical for the special needs with Voice and Navigation tools according to their research. hence, the numerous literature review obtained that have been studied a right and higher technology assignment may be made to make a goal done successfully. There might be several upgrades may have added to development of Spectical for the special needs with Voice and Navigation tools. in this project, a latest advancement technology can be use in hardware and software program element. moreover, the project is extra convenient and less complicated to use by the consumer.

More advancement and ideas of the Development of Spectical for the Special Needs with Voice and Navigation tools project can be referenced in Chapter 3 showing the project's hardware and software and system progress. Development of Spectical for the Special Needs with Voice and Navigation tools. flowchart, block diagram, overview and additional details of the circuit project is discussed more in Chapter 3.

CHAPTER 3

METHODOLOGY

3.1 Introduction

In this section, the part will be clarified, as well as the theoretical layout and procedure, in a definitive and definite manner. As a result, the improvement of the flow chart would tend to be more logical and easier to comprehend. In addition, the material used and procedural detail about how the circuit association in the task was set up is discussed. Similarly, the utilization of programming such as Arduino IDE will analyzed to Development of Spectical for the Special Needs with Voice and Navigation tools

3.2 Methodology

The idea is to Development of Spectical for Special Needs with Voice and Navigation Tools. The power supply adapter is wired to Arduino Nano for the transmitter and Arduino Uno for the receiver. Three ultrasonic sensors are used in the transmitter component to detect obstacles, and a DF Player mini Mp3 module is used to provide voice assistance through a 3.5 audio jack connection. In the event of an emergency, the transmitter receives a signal from the button. When the button is pressed, the transmitter sends data to the Arduino Uno through the receiver, activating the GSM and GPS modules. An SOS message and map-based navigation is sent to the person's phone number that is set.

3.3 Project Workflow

A flowchart is explanation of the method understanding the technique used to execute the process and flow in this project organization. It is important to have a good flow chart to get a good outcome on the upcoming project. There are a variety of approaches and tools that can be used to gather much knowledge more higher to aid in the design understanding of the project. For instance, journal published engineering bookable research and studies may be used to design a high-quality or desired project. The next step is to conduct an overview of the desired parameter and aspect, as well as the advantages and disadvantages. Finally, once the previous phase has gone smoothly, the enforce operation is carried out. Figure 3.1 shows the example of a productive project workflow.

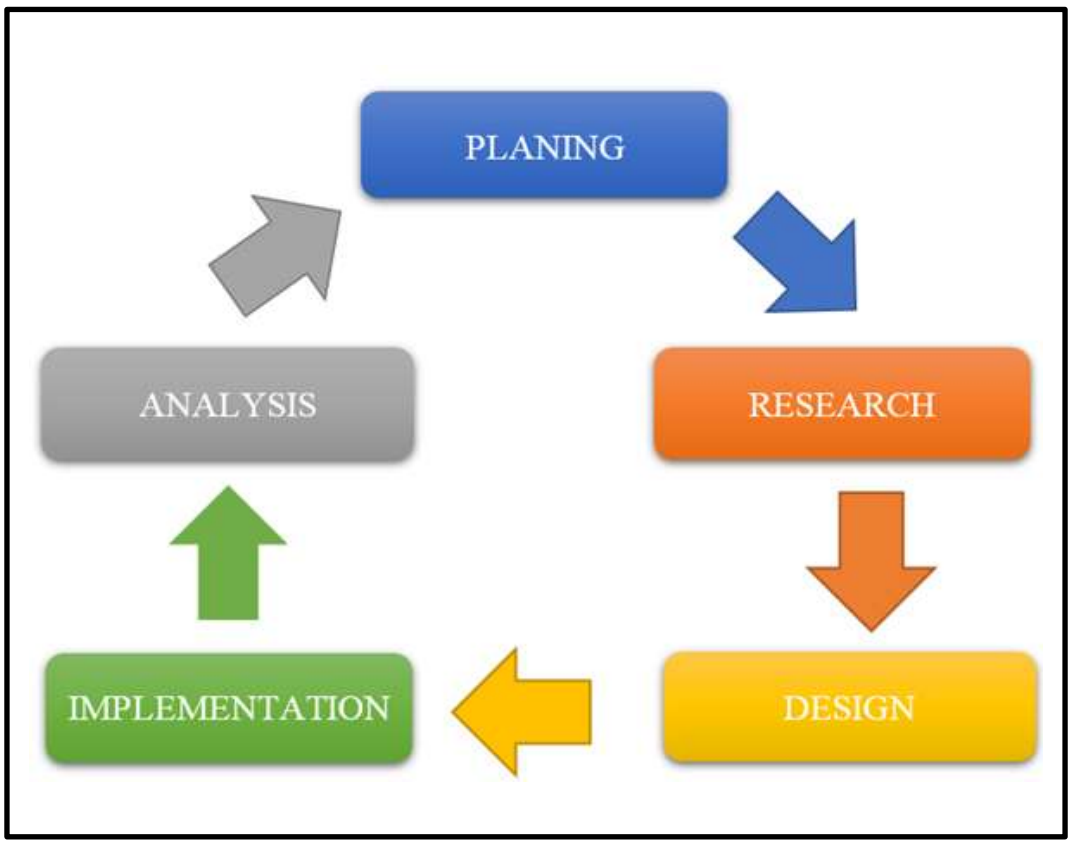

Figure 3.1 Project work flow

3.4 Planning

At the planning phase, the plan goal was previously created to design specific Spectical for the Special Needs with Voice and Navigation tools. After that, there are a few evaluations or tasks to achieve the goal. The plan was developed to build a process for knowing the workflow. Figure 3.2 below displays the structured flow diagram of 'Project Sarjana Muda's projected flow, which starts with the proposed project title and ensuing action requiring the outcomes of the PSM report and hardware and software parts executing.

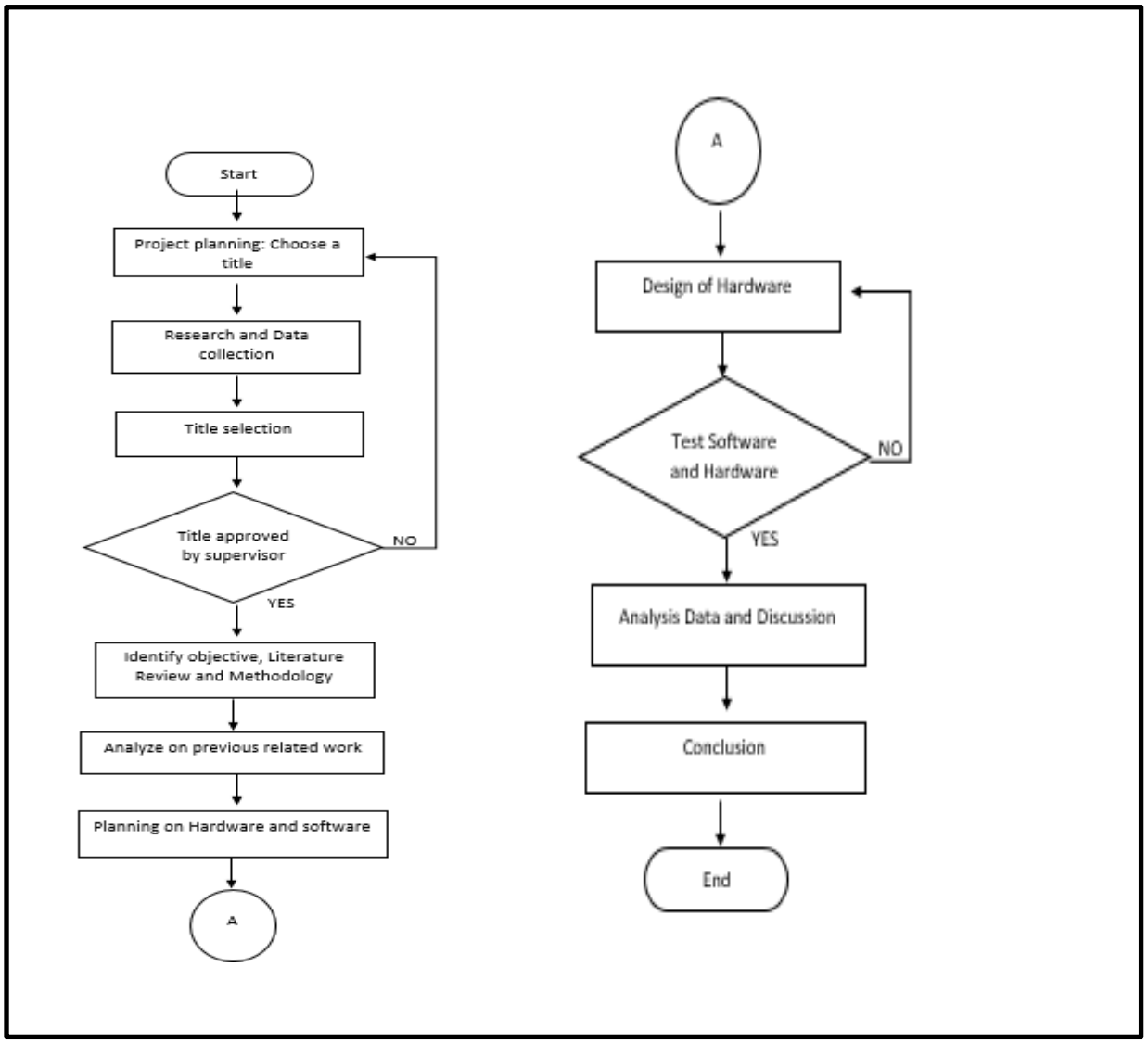

Figure 3.2 Flowchart of the overall project

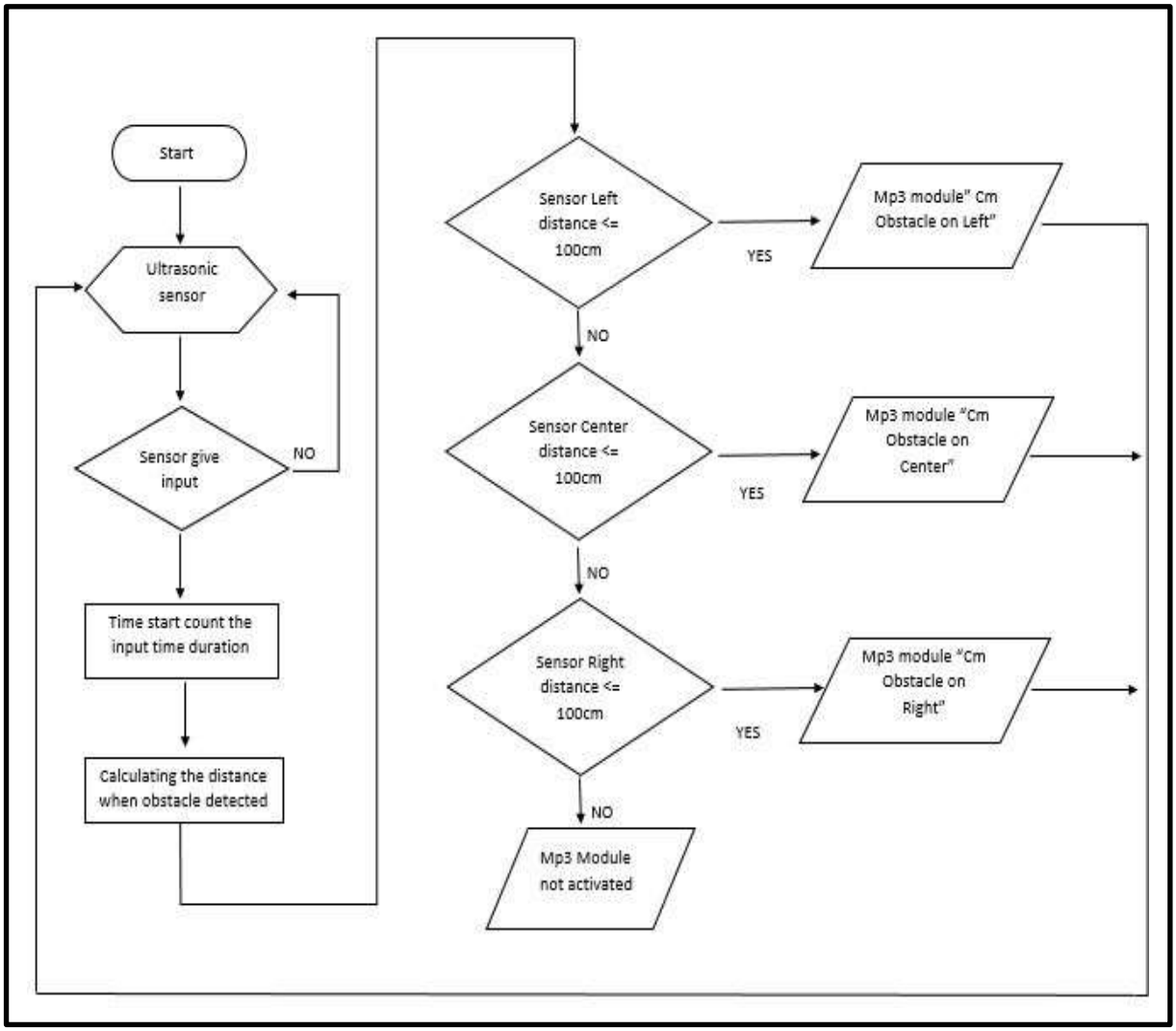

Figure 3.3 Flowchart of Obstacle detection

Figure 3.3 shows process of flowchart transmitter side where will start by initializing the sensor. Then ultrasonic sensor will read input and begin calculation of time start count of input time direction that enable to calculate the distance when obstacle detected. There included three sensors detached on the left, center and right. Once any of sensor detect obstacle, will trigger Mp3 module that is Df player Mini to play audio file that inserted through Sd Card connected. They audio file will play the distance and the side of direction detected. For example, left sensor detected at 100 Cm the voice output is like "There are obstacle detected at 100 cm left"

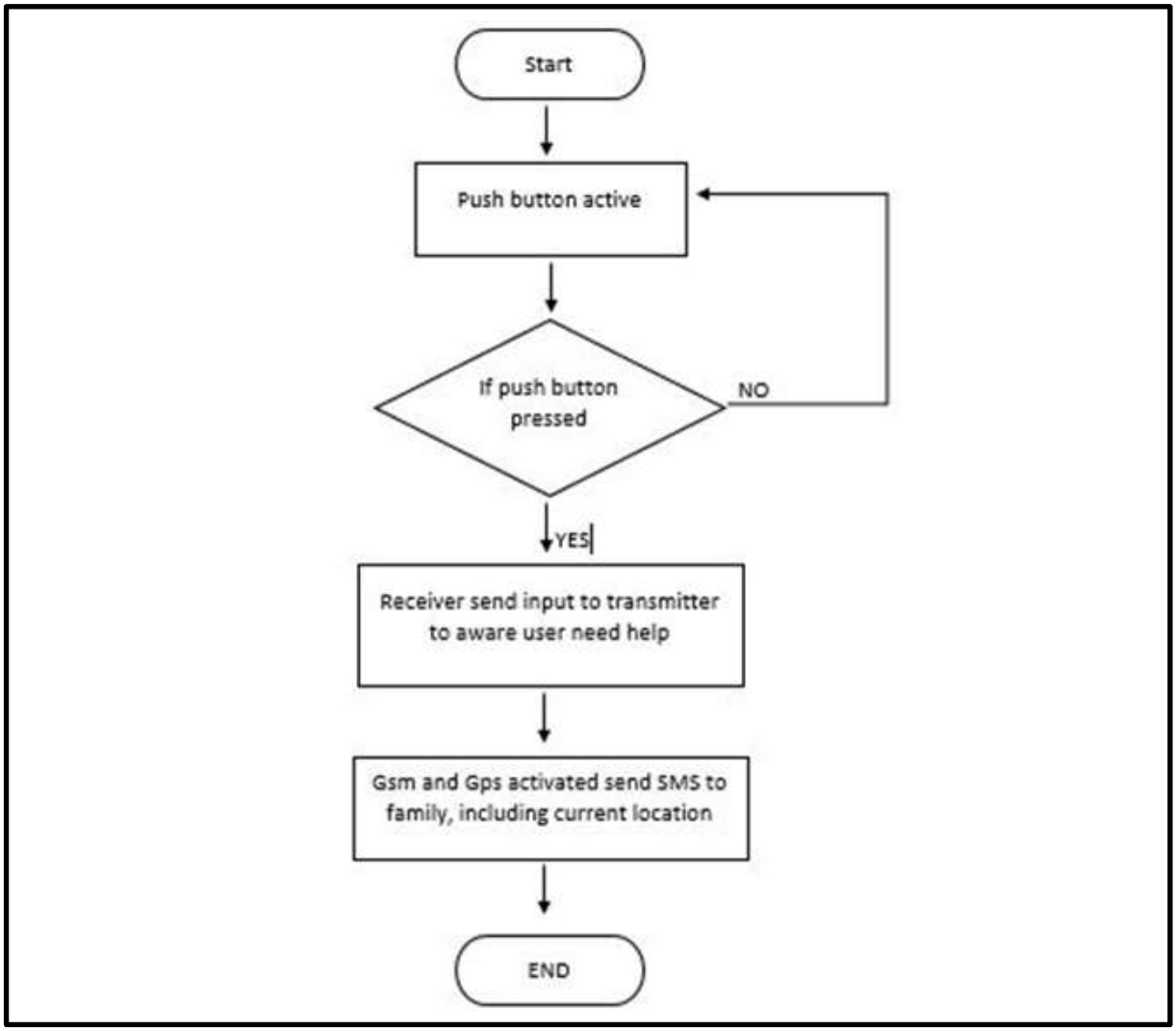

Figure 3.4 Flowchart of Navigation tools

Figure 3.4 shows the flowchart used for navigation connected on Arduino Uno. The Push button will be placed on the transmitter side. Once the push button is pressed, the data value is transmitted to receiver via Rf module. Then, receive data will trigger the UNO board to aware user need help. The GSM and GPS module will be activated to send SOS SMS to either family or caregivers including the current place location. The number of family will be automatically detected once we inserted in source code.

3.5 Research

The first section of studies to attention on identifying the aim to analyses the development of the project. As a result, the literature study will use because of the connection with accumulating the facts collection and records for the task. The capabilities of microcontrollers interface with sonars sensors are analyzed. Additionally, the functions are in comparison so that you can pick out similarities and differences in several the forms of sensors. Eventually, the in among ultrasonic, infrared, and passive infrared the ultrasonic became endorsed as the maximum appropriate to be used in this undertaking.

3.6 Design

3.6.1 Development of Spectical for the Special Needs with Voice and Navigation tools

Figure 3.5 and 3.6 shows the block diagram for receiver and transmitter Development of Spectical for the Special Needs with Voice and Navigation tools. This diagram of block determines exactly how the circuit works and laterally combines with software and hardware procedures. Arduino Nano and Uno microcontrollers are also the core brain of the project. It connects input devices to output devices. In addition, the small DF Player needs a memory card to play files. Every component has its own role to play in the success of the project.

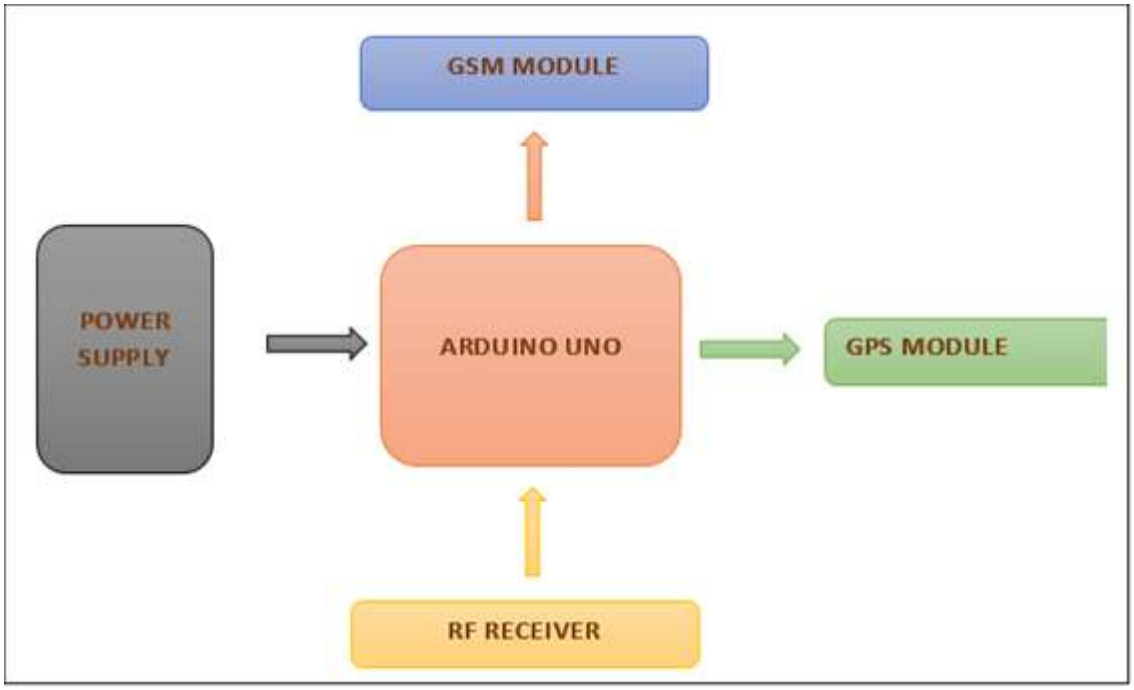

Figure 3.5 Block diagram of the project Receiver

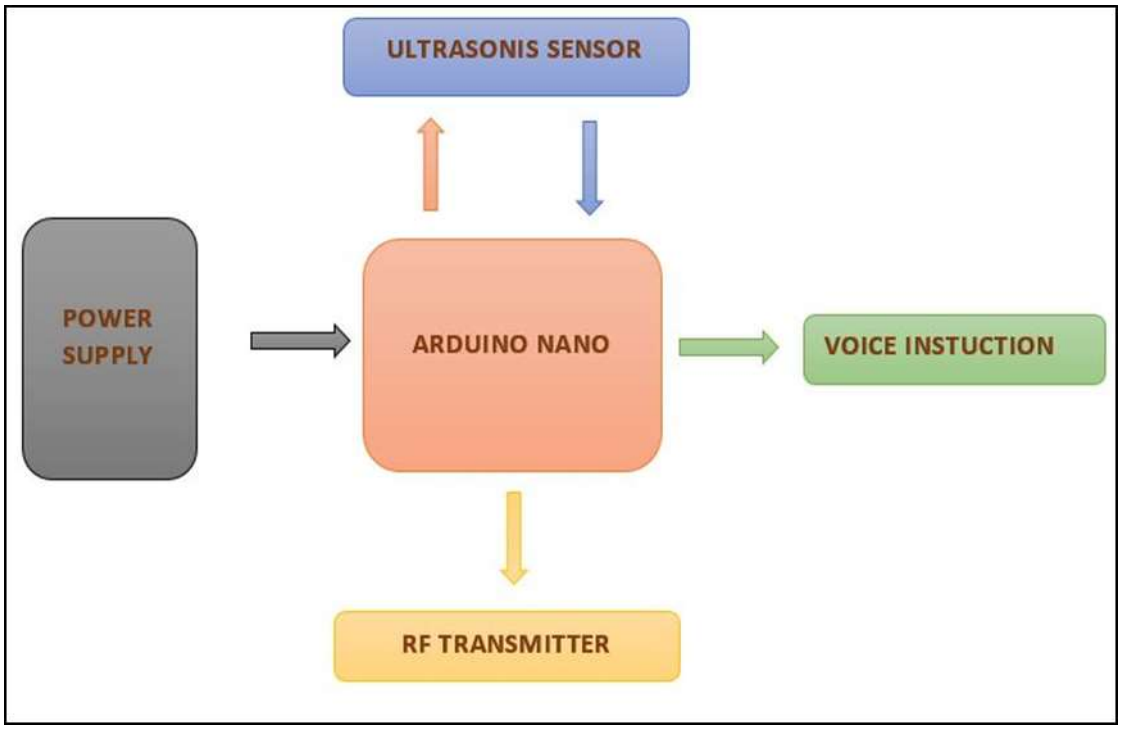

Figure 3.6 Block diagram of the project Transmitter

3.7 Implementation

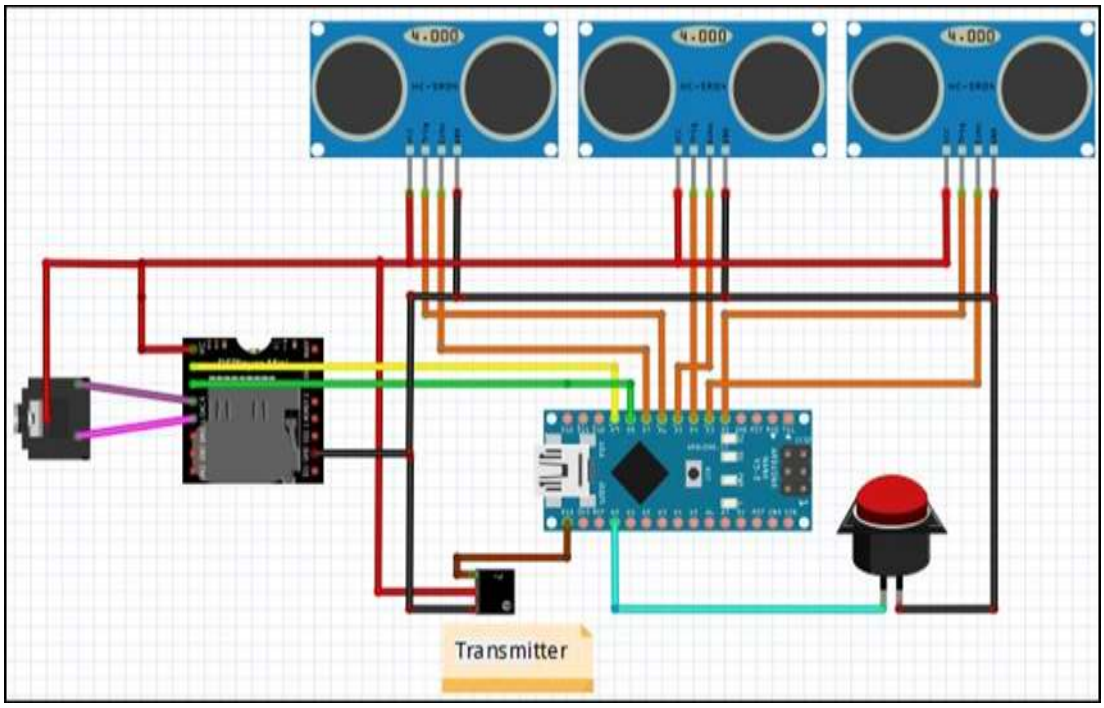

Figure 3.7 Overview of the project Transmitter

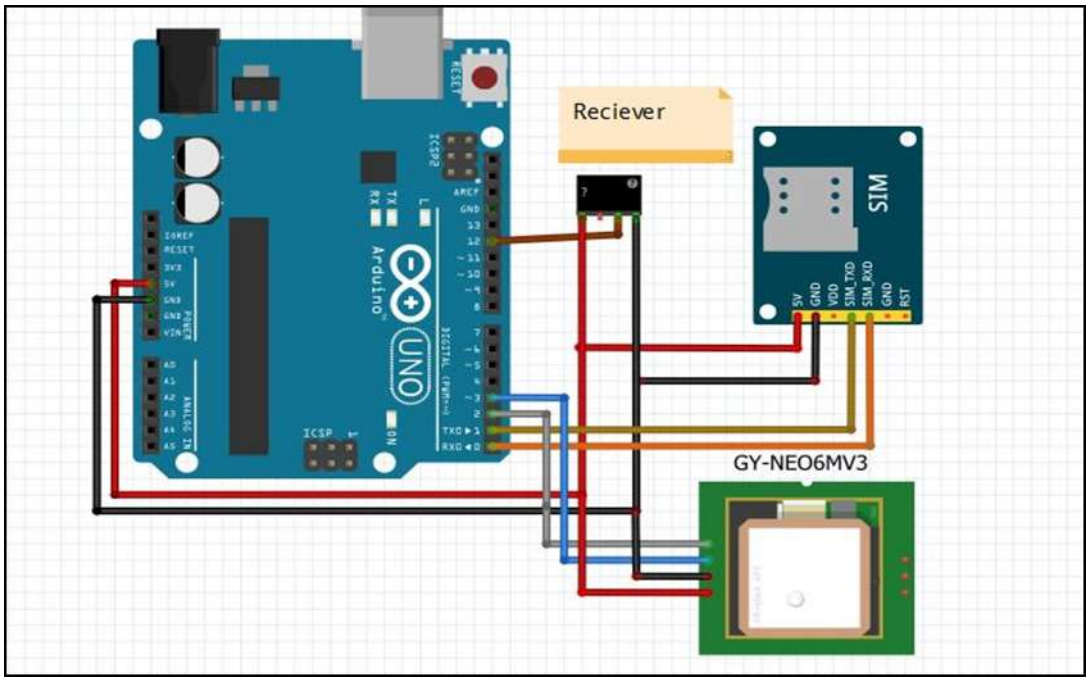

Figure 3.8 Overview of the project Receiver

The description and operation of Development of Spectical for Special Needs with Voice and Navigation Tools are shown in Figures 3.7 and 3.8. The power supply adapter is wired to Arduino Nano for the transmitter and Arduino Uno for the receiver. Three ultrasonic sensors are used in the transmitter component to detect obstacles, and a DF Player mini Mp3 module is used to provide voice assistance through a 3.5 audio jack connection. In the event of an emergency, the transmitter receives a signal from the button. When the button is pressed, the transmitter sends data to the Arduino Uno through the receiver, activating the GSM and GPS modules. An SOS message and map-based navigation is sent to the person's phone number that is set.

3.8 Hardware configuration

3.8.1 Arduino Uno

Figure 3.9 Front view of Arduino Uno

The UNO R3 Arduino is a microcontroller board built from the ATmega328 AVR microcontroller, a removable dual-inline package (DIP). It contains 20 digital input/output pins, 6 for PWM outputs and 6 for computer program. The Arduino has an extensive community of guides that makes starting with built-in electronics relatively simple. The R3 is Arduino Uno's third modern update. The figure 3.10 below shows pin configuration while table 3.1 stated the Arduino Uno specification.

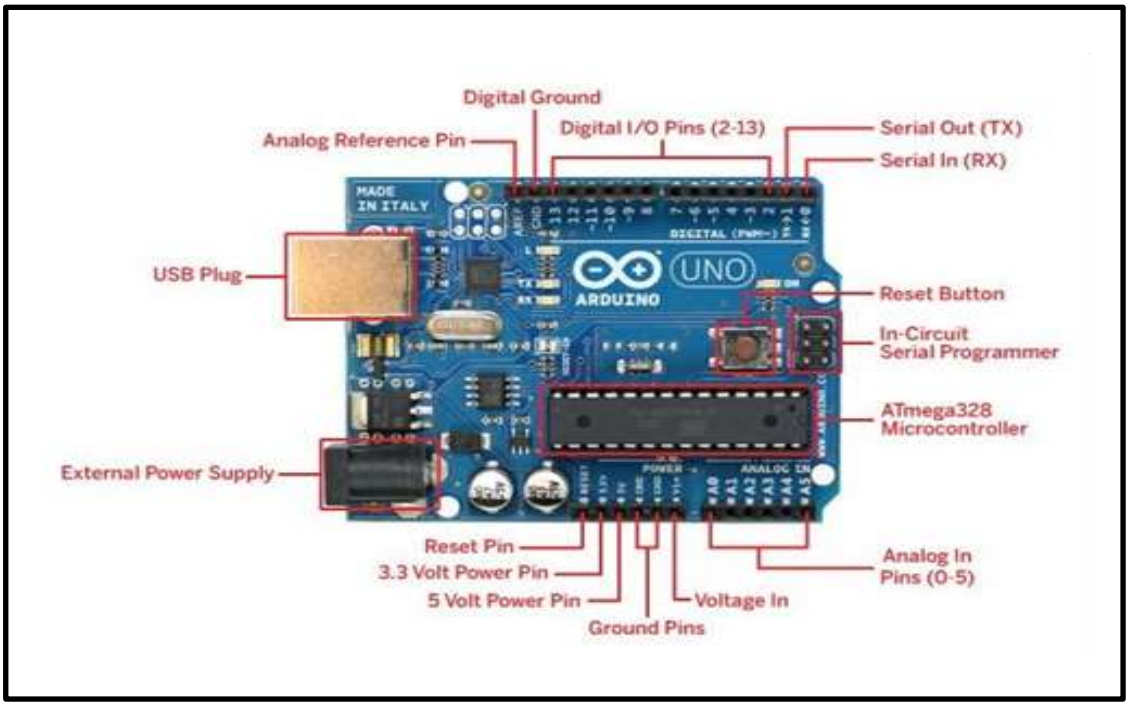

Figure 3.10 Pin configuration of Arduino Uno

Table 3.1 Arduino Uno specification

Type of Microcontroller	ATmega328P
Needed voltage for operating	Operating Voltage
Required Input Voltage	7 to 12V
Required Inout Voltage	6 to 20V
I/O Pins of Digital	14 and 6 of it provide PWM output
Total PWM Digital and Analog Input and Output Pins	6
SRAM Size	2 KB with ATmega328P
EEPROM Size	1 KB with ATmega328P
DC Current used per Input and Output	20 mA
DC current used for 3.3V Pin	50 mili Ampere
Clock Speed	16 MHz
Flash Memory Size	32 KB ATmega328P of which 0.5 KB used by bootloader

3.8.2 Arduino Nano

Figure 3.11 Front view of Arduino Nano

A total of 14 pins and 8 analogue pins are available on nano boards. The digital pins can be utilized as input pins and as output pins for interface sensors. To regulate its functionality, you can use a basic function such as pinMode () and digitalWrite(). For virtual pins, operating voltage is 0V and 5V. In the usage of an easy function like analogread (), analogue pins are depending Analog Voltage from 0V to 5 V for any of the 8 analogue pins. These pins can also be utilized for unique tasks mentioned below in figure 3.12, other than serving their purpose.

Pin No.	Name	Type	Description
1-2, 5-16	D0-D13	I/O	Digital input/output port 0 to 13
3, 28	RESET	Input	Reset (active low)
4, 29	GND	PWR	Supply ground
17	3V3	Output	+3.3V output (from FTDI)
18	AREF	Input	ADC reference
19-26	A0-A7	Input	Analog input channel 0 to 7
27	+5V	Output or Input	+5V output (from on-board regulator) or +5V (input from external power supply)
30	VIN	PWR	Supply voltage

Figure 3.12 Pin configuration Function of Arduino Nano

3.8.3 Ultrasonic Sensor

The HC-SR04 obstacle ultrasonic sensor, like bats, measures an object's distance via SONAR. With high accuracy and consistent reading of 2 cm - 400 cm, or 1" to 13 feet, it delivers excellent non touch range detection in a small way that is easy to use. The action does not affect in sunshine and dark materials, while soft surface such as fabric may be disturbed to detection accurate. It consists of Tx and Rx module for data communication.

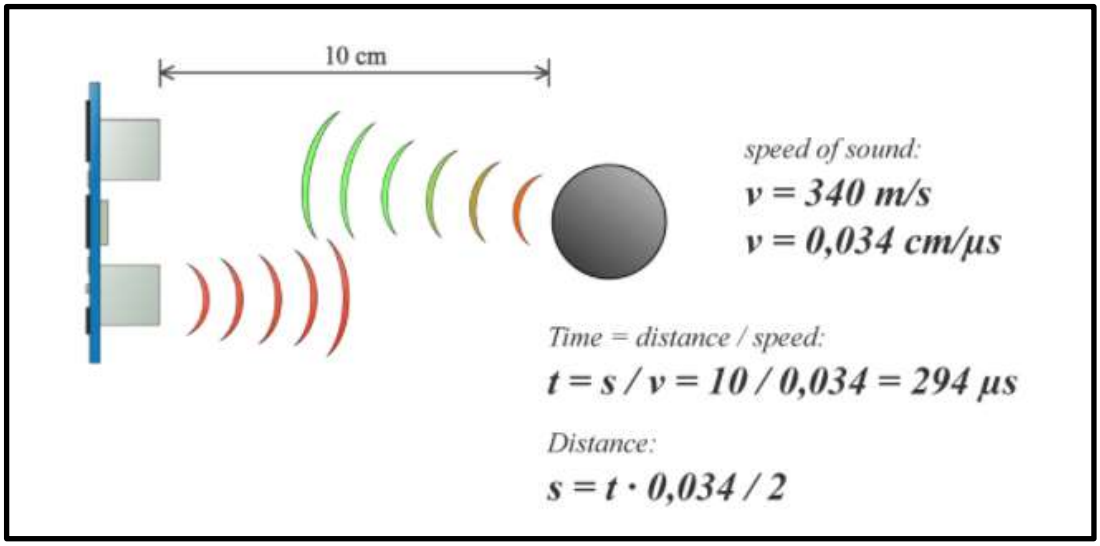

Figure 3.13 The distance measurement Of Ultrasonis Sensor

Ultrasound at 40,000Hz is emitted by the Ultra Sonic HC-SR04 and passes through the air. If it meets an object or obstacle, it makes contact and revert back to the Ultrasonic component. Total distance calculated using formula distances = speed*time. From the figure 3.13 Assume that an object is positioned at 10 cm distance from the sensor with sound speed in air is 340 m/s (0.034 cm/s). It indicates that the sound wave must travel in 294 seconds. The Echo pin will double the distances (forward and bounces backwards distances). So, multiply the obtained distance time value with echo pin by 0.034 and divide by 2 to get the distance in cm.

3.8.4 GSM Module

Figure 3.14 Front view GSM Module

The smallest and most affordable module for GPRS/GSM connection is the SIM900A GSM Module. In most embedded applications, it is common to Arduino and microcontrollers. GPRS/GSM technology is available in the module for the communication with mobile sim applications. The SMS.A GSM module (SIM 900) is coupled with a PCB with multiple output kinds from the board. This allows the user to receive / send mobile phone calls. If the output of TTL and RS232 is said to connect to a computer directly. The panel also has pins or supplies for attaching a microphone and speaker to remove +5V or any other power and ground connection values. The provisions of these kinds vary with various modules. Under the operating requirements of the GSM Module Figure 3.15.

GSM/GPRS Specification	
GSM/GPRS Module	SIM900
Frequency	850MHz/900MHz/1800MHz/1900MHz
Modem Interface	RS232 Serial Interface
Baud Rate(Default factory)	9600bps
Power requirement	4.5V to 12V
Current requirement	<590mA
SIM900 module operating temperature	-40^{0}C to +85^{0}C
Weight	40g

Figure 3.15 Specification of GSM Module.

3.8.5 DFPlayer Mini

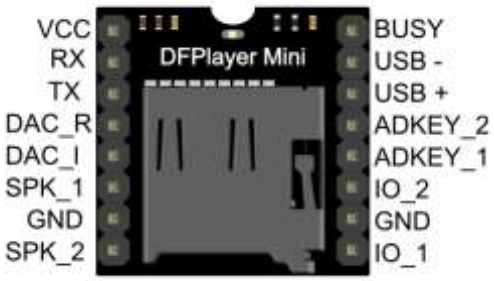

Figure 3.16 Labelled pin configuration DF Player Mini

A compact, cheap priced MP3 module with simple output direct to your speaker is the DFPlayer Mini MP3 Player for Arduino. A freestanding module can be used as an Arduino UNO or other module with the RX/TX functionality or with attached battery's, speaker and push buttons to module can be operated. The pins other than serving their reason also can be used for unique functions which are discussed below in figure 3.17.

Pin	Description	Note
VCC	Input Voltage	DC3.2~5.0V;Type: DC4.2V
RX	UART serial input	
TX	UART serial output	
DAC_R	Audio output right channel	Drive earphone and amplifier
DAC_L	Audio output left channel	Drive earphone and amplifier
SPK2	Speaker-	Drive speaker less than 3W
GND	Ground	Power GND
SPK1	Speaker+	Drive speaker less than 3W
IO1	Trigger port 1	Short press to play previous（long press to decrease volume）
GND	Ground	Power GND
IO2	Trigger port 2	Short press to play next（long press to increase volume）
ADKEY1	AD Port 1	Trigger play first segment
ADKEY2	AD Port 2	Trigger play fifth segment
USB+	USB+ DP	USB Port
USB-	USB- DM	USB Port
BUSY	Playing Status	Low means playing \High means no

Figure 3.17 Pin configuration Function of Df Player Mini

3.8.6 GPS Module

Figure 3.18 Front view of GPS Module

The NEO-6MV2 is a GPS module mainly applied to navigation purposes. The module merely monitors location on the ground and delivers output data that are its position longitude and latitude. It comes of family of standalone GPS receiver with the u-blox 6 positioning of excellent performance. Its innovative that provides NEO-6MV2, even the demanding circumstances, outstanding navigational efficiency. Below is the module specification.

Specification:

- It is standalone GPS receiver
- Below 1s duration to first fix for hot and aided starts
- Receiver type have 50 Channels - GPS L1 frequency - SBAS (WAAS, EGNOS, MSAS, GAGAN)
- Maximum navigation update rate is 5Hz
- Default baud rate is 9600bps
- EPROM with battery backup
- Sensitivity with -160dBm
- Supply voltage consume 3.6V
- Maximum DC current at any output take10mA

3.8.7 Rf Module

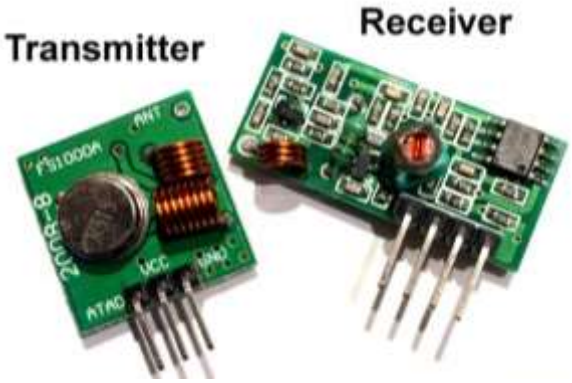

Figure 3.19 View of RF Module Transmitter and Receiver

The electrical device used to send radio signals and receive them between two devices is an RF module using short area connection wireless for radio-frequency module. You often want to communicate wirelessly with another device. In essence, 433 MHz RF transmitter and receiver modules are RF modules. The transmitter does not consume power when logic zero is transmitted, while the carrier frequency is completely suppressed. When the logic is transmitted, one carrier has a power supply of about. 4.5mA. Data produced transmit serially from the receiver of the tuned transmitter. Transmitter and the receiver are fully interfaced to two microcontrollers for data transfer. The specification of RF module is discussed below.

Specification

- Receiver frequency is 433MHz
- Receiver typical frequency is 105Dbm
- Receiver supply current is 3.5mA
- Receiver operating voltage is 5v
- Transmitter supply voltage is 3v to 6v
- Transmitter output power is 4v is 12v

3.9 Software configuration

The Arduino Integrated Development Environment (IDE) job is to parse C code and put it into the Arduino, which then generates the programmed. It is used to upload and add apps to the Arduino board and is developed in the Java programming language. A programming language is a collection of commands that can be used to do any job and is written in code or on a computer. A programming language is a collection of commands that can be used to do any job and is written in code or on a computer. A programming language usually comprises computer instructions. Programs that implement certain algorithms may be written using the programming language. The syntax and semantic components of a programming language may be separated. The Arduino IDE programmed, shown in Figure 3.20, is used to develop and create C language code.

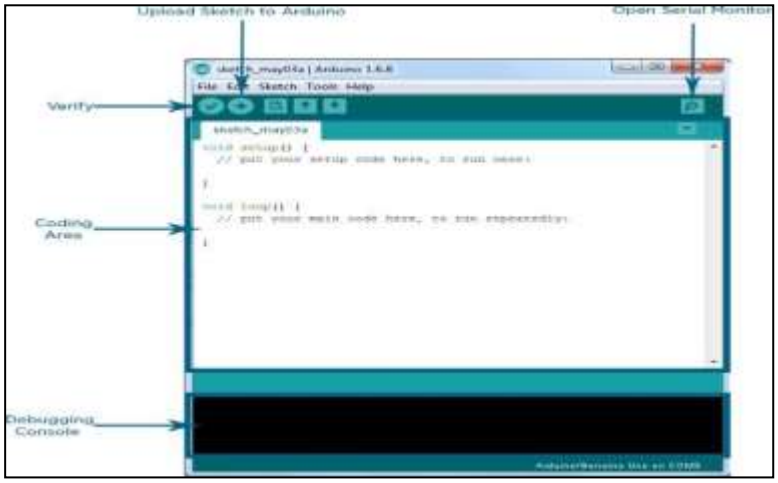

Figure 3.20 Arduino IDE software

3.10 Summary

To summaries, they can be implemented if all the hardware and software are properly connected and meet the requirements outlined above. Any errors in the project are troubleshooted for the project to meet its goals. In Chapter 4, the data collection and analysis will be completed and discussed.

CHAPTER 4

RESULTS AND DISCUSSIONS

4.1 Introduction

The findings and consequences of the Development of Spectical for The Special Need with Voice and Navigation architecture will be explained, as well as the capabilities will be tested in this area. Furthermore, the Arduino IDE's utilization and design will be demonstrated. Another important part was the detection and navigation analysis, which was carried out over several distances to test the detection. The project's findings will also be discussed near the end.

4.2 Project Implementation Stages

These sections will cover process of software and hardware, as well as the actions that will be taken to create the Development of Spectical for The Special Need with Voice and Navigation tools.

4.2.1 Development Tool

This project's development tools include open-source software applications. It focuses on the following items:

a) Arduino IDE: This is an accessible process which makes programs efficiently and uploading it to the board easier.

b) Fritzing: this is functioning in the designing of circuit design of both detection and navigation part.

c) SolidWorks: This is solid modeling that used to develop 3d design.

4.2.2 Spectical Creation

The development of designing is begin using solid works. From the figure 4.1 shown there a space allocated in middle of spectacle that will be used to store the component. This will be act as transmitter part where the spectical will store 18650 battery shield V3 to make supply. Then 3 ultrasonic sensor, switch button to trigger the Rf Transmitter, mp3 module to receive input and give output to audio voice, Rf transmitter to send data to receiver and lastly Arduino Nano act as microcontroller.

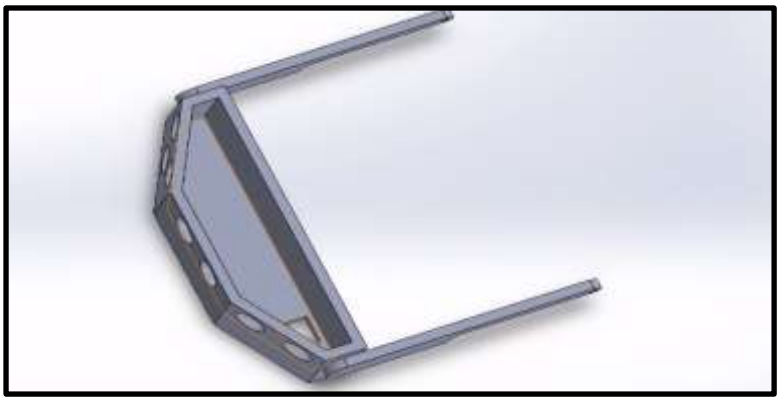

Figure 4.1 Internal Spectical Design

The figure 4.2 shows how the full design how the spectacle shape will be placed. The hole to place all the component also is detailed to fit properly make best presentation. The roof part can be opened to make component placement easier.

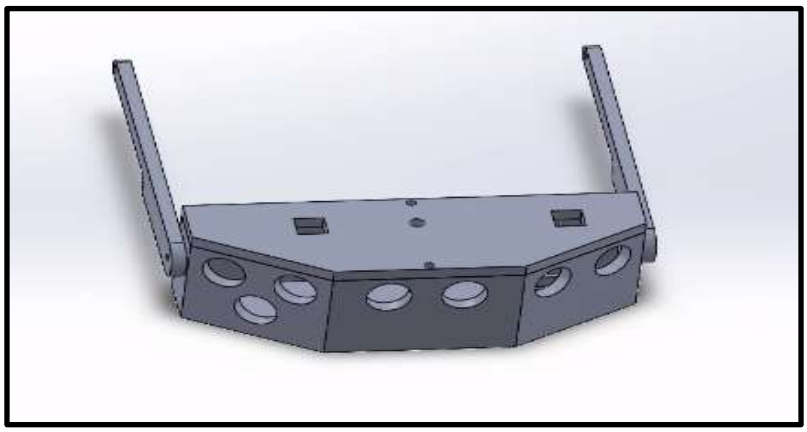

Figure 4.2 Full Prototype Design

4.3 How Does Project Works

As mentioned before this, software and hardware are implemented to design the Development of Spectical for The Special Need with Voice and Navigation tools. Ultrasonic sensor, switch button, mp3 module, Rf Module, Arduino Nano, Arduino Uno, GPS module and GSM Module used to work the whole device.

Figure 4.3 Hardware design of Spectical

The figure 4.3 shows the hardware design of Spectical mainly used to obstacle detection, voice output dan transmit data. This part where the spectical will store 18650 battery shield V3 to make supply. The three ultrasonic sensors detached on left, center and right will detect obstacle and mp3 module will receive input and give output to audio voice through connected earphone. The audio play from file that inserted through Sd Card connected. In case if the left ultrasonic is detected it will send signal to mp3 module via Arduino nano. Later the coding will count distance detected a will read the file of detected file that named as the distance. The file for left sensor is “folder 1”. If the distance detected at 20 cm so will read the file is in folder 1 named 20. The audio file will play the distance and the side of

direction detected like “There are obstacle detected at 20 cm left”. Then the switch button placed bottom right ultrasonic to trigger the Rf Transmitter to send data to Rf receiver to navigation. Lastly, Arduino Nano act as microcontroller.

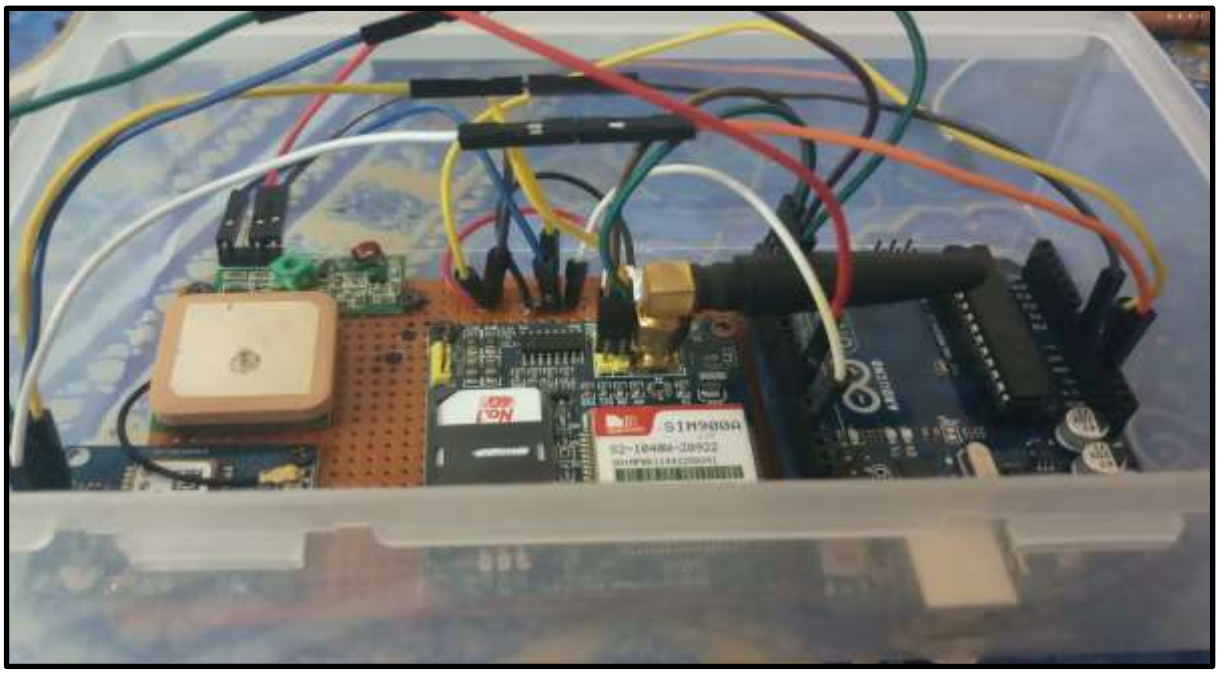

Figure 4.4 Hardware design Navigation tool

The figure 4.4 shows the hardware design of receiver mainly used to navigation tool and receive data. This part will store 18650 battery shield V2 to make supply. The receiver that connected will receive input from transmitter once the switch button pressed. Then the GPS module will be activated and identify the location in term of latitude and longitude. Then the location received will trigger the GSM Module to send SOS massage to the number of settled before. The massage will be included with the emergency message and the location that will be loaded in google maps. It easy for the massage receiver just to click to URL and direct to google maps. Lastly, Arduino Uno act as microcontroller.

4.4 Project Coding

To complete the aims and get the desired results, this project uses a standard interface and the necessary algorithm. Arduino IDE and other open-source software were used in its creation. The Arduino IDE has a specific guideline of code structure to accommodate the C and C++ programming languages. To make the input and output hardware work, the Arduino IDE programmed will be compiled in a microcontroller. Beside that all the components connected with in obstacle detection part main coding to interacting with the mp3 module as shown in Figure 4.5.

```
void leftAlert(int distance) {

  if (millis() - timer > waitTime) {
    timer = millis();
    DFPlayer.playLargeFolder(01, distance+1);
  }
  if (DFPlayer.available()) {
    printDetail(DFPlayer.readType(), DFPlayer.read()); //Print the detail message from DFPlayer
  }
}
void centerAlert(int distance) {

  if (millis() - timer > waitTime) {
    timer = millis();
    DFPlayer.playLargeFolder(02, distance+1);
  }
  if (DFPlayer.available()) {
    printDetail(DFPlayer.readType(), DFPlayer.read()); //Print the detail message from DFPlayer
  }
}
void rightAlert(int distance) {

  if (millis() - timer > waitTime) {
    timer = millis();
    DFPlayer.playLargeFolder(03, distance+1);
  }
  if (DFPlayer.available()) {
    printDetail(DFPlayer.readType(), DFPlayer.read()); //Print the detail message from DFPlayer
  }
```

Figure 4.5 Intraction between sensor and mp3 Module

Figure 4.5 shows the part of source code done of audio speech output from obstacle detection. There will be three sensors detached on the named leftAlert, centerAleart and rightAlert. Once any of sensor detect obstacle, will trigger Mp3 module that is Df player Mini to play audio file that inserted through Sd Card connected where stated in declaration DfPlayer.PlayLargeFolder(01, distance+1) above. In case if the left ultrasonic is detected it will send signal to mp3 module via Arduino nano. Later the coding will count distance detected a will read the file of detected file that named as the distance. Same goes to center and right sensor. The file for left is "folder 1", center is "folder 2" and right is "folder 3". For example, if the sensor center detected at 20 cm so will read the file is in folder 2 named 50. The audio file will play the distance and the side of direction detected. For example, left sensor detected at 100 Cm the voice output like "There are obstacle detected at 100 cm left".

```
  }
    int x=digitalRead(A4);
    const char *msg1 = "Turn LED ON!";
    const char *msg2 = "Turn LED OFF";
    if(x==1)
    {
    driver.send((uint8_t *)msg1, strlen(msg1));
    }
    else
    {
      driver.send((uint8_t *)msg2, strlen(msg2));
      }
    driver.waitPacketSent();
    delay(1000);
}
```

Figure 4.6 Transmitter Coding Code

Figure 4.6 shows the part of source code of transmitter of sending data to receiver with the push button. This will turn on data pin output to high or low based on push button state. Data will send by message on the receiver part that will enable navigation tool to be activated. The figure 4.7 stated how the receive data will activate the GPS Module and Figure 4.8 to activate GSM module.

```
void loop()
{
sgps.listen();
  while (sgps.available())
  {
    int c = sgps.read();
    if (gps.encode(c))
    {
      gps.f_get_position(&gpslat, &gpslon);
    }
    uint8_t buf[12];
    uint8_t buflen = sizeof(buf);
    String x="";
    String y="Turn LED OFF";
    if (driver.recv(buf, &buflen)) // Non-blocking
    {
      int i;
      // Message with a good checksum received, dump it.
      Serial.print("Message: ");
      x=((String)(char*)buf);
      x.trim();
      Serial.println(x+ " :"+x.length());
```

Figure 4.7 GPS positioning code

```
     if(x=="Turn LED ON!")
     {
      Serial.println("true ");
      digitalWrite(13,1);
    sgsm.listen();
    sgsm.print("\r");
    delay(1000);
    sgsm.print("AT+CMGF=1\r");
    delay(1000);
    sgsm.print("AT+CMGS=\"+60103938400\"\r");
    delay(1000);
     sgsm.print("https://www.google.com/maps/?q=");
    sgsm.print(gpslat, 6);
    sgsm.print(",");
    sgsm.print(gpslon, 6);
    delay(1000);
    sgsm.write(0x1A);
    delay(1000);
      }
      else
      {
        digitalWrite(13,0);
        }
```

Figure 4.8 GSM activating code

4.5 Project Testing

The system that is being described has been created and set to be used in a practical manner. The system reacts to each state based on a software that has been programmed and put in the Arduino microcontroller. There were no mistakes reported by the computer's data from the sensor because all of the device's components operated together. The device was able to measure the distance with every turn at ultrasonic speed and in turn, sent feedback to the Arduino, which triggered the mp3 module then give voice output. For example, left sensor detected at 100 Cm the voice output like “There are obstacle detected at 100 cm left”. Then the transmitter works as implemented that take 2 to 4 seconds to receiver take input. The planned system into action and tested its operation with people were wearing it., as shown in Figure 4.9. The battery in the power supply lasts for 6 hours, including standby time.

Figure 4.9 Testing Operation

After receiving the input data from the transmitter, the GSM module sends out a message to the friend or relative without latency, and the receiver was able to effectively view Google maps for that position. Figure 4.10 shows the alarm SMSs sent from the program to the family and careers' cell phones. The GPS module in this design systems a quick reacquisition time. Figures 4.11 illustrate the system location in Google Maps and the device tracking, respectively. The battery in the power supply lasts for 4 hours, including standby time

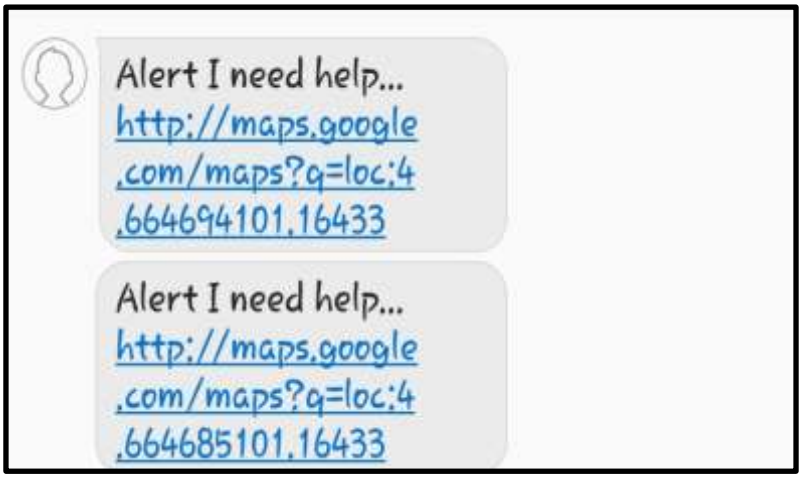

Figure 4.10 Emergency alert SMS

Figure 4.11 Location Detection

4.6 Project Analysis

The device was place to the test in a practical situation. The data collected by the sensors revealed the distance between an obstacle and the position of the object. The distance data between the two was measured in centimeters using a ruler for a 30 cm, 60 cm, 90 cm, 120 cm, and 150 cm the obstacle's distance. sensor. The experiment separates the outcomes from the distance it would take.

Table 4.1 Ultrasonic distance measured

Actual distance (cm)	Measured distance (cm)					Average distance	Average error	Accuracy (%)	Error (%)
	1	2	3	4	5				
30	29	30	31	28	30	29.60	0.80	97.33	2.67
60	57	62	58	57	64	59.60	2.80	95.33	4.67
90	86	84	83	87	80	84.00	5.60	93.78	6.22
120	124	114	129	133	135	118.80	9.40	92.20	7.80
150	135	160	155	160	170	146.80	12.00	92.00	8.00

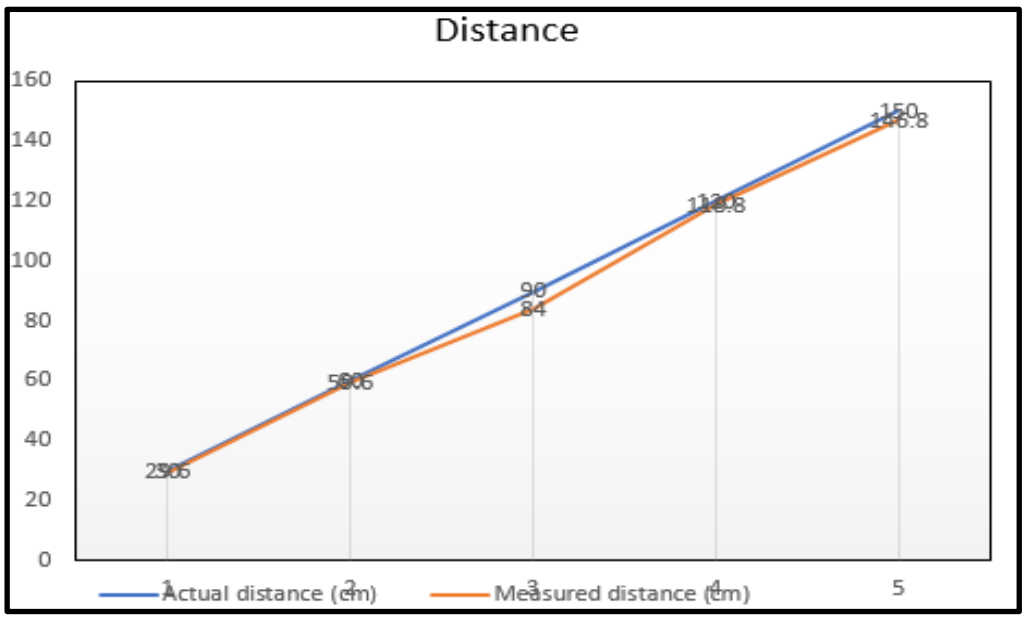

Figure 4.12 Comparing Distance actual and Measurement

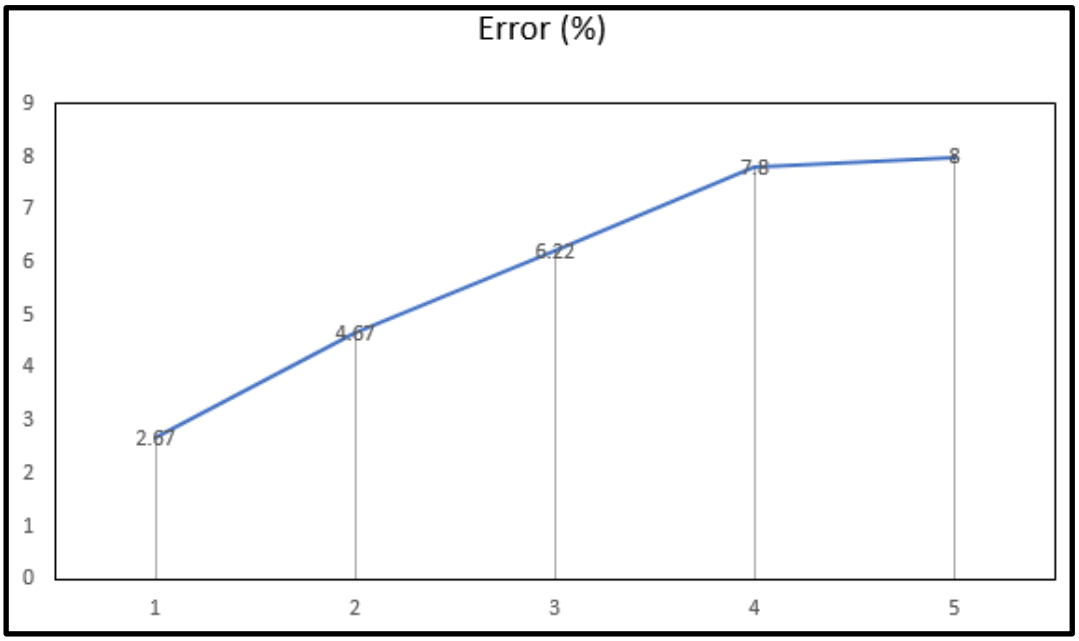

Figure 4.13 Error rate obtained

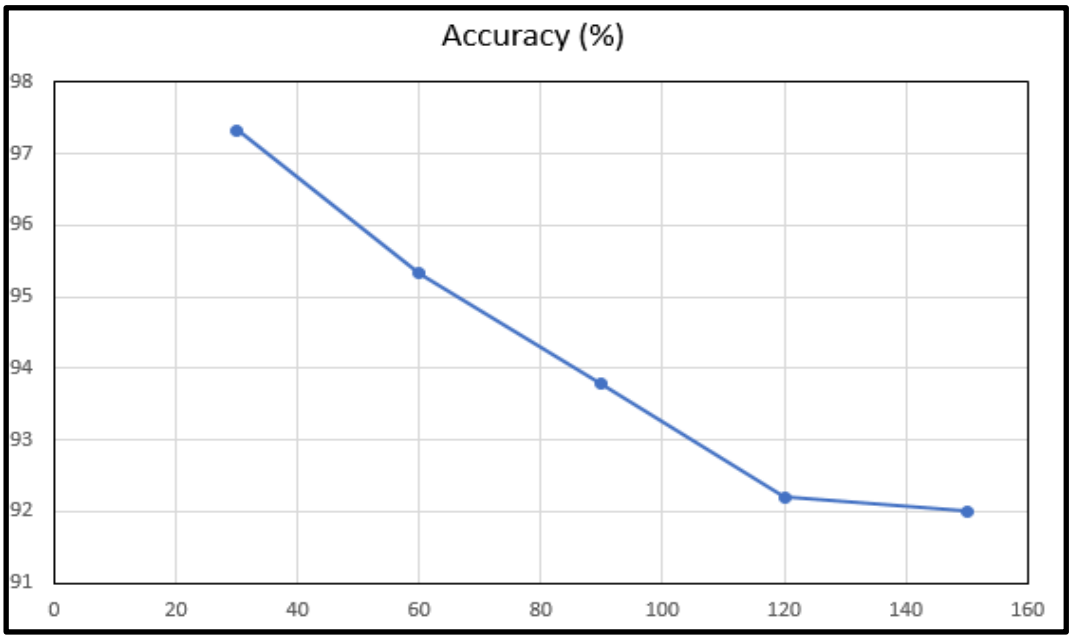

Figure 4.14 Accurancy rate archived

Data were calculated three times for each interval and determined the average value in those values. Accuracy rates were calculated, or the difference between measured and unmeasured data. From the observation distance is constantly shifting in a minor state. Because ultrasonic sound waves are used to determine the distance between the item and the observer. An ultrasound transducer is used to send and receive information about an item's vicinity. Thus, the distance is changed because high frequency waves reflect distant echo patterns from borders. It is essential to free the front of the ultrasound transducer of any obstacles to prevent disturbances of the ultrasonic signals from the sensor. Metal, ice, and other condensate are common impediments. Table 4.1 shows the measures data of sensor, including the accuracy and error rate. The relationship between the measured and actual distance is shown in Figure 4.12. This image depicts the disparity between the measured and real distances. The deformity result is not in severe state, and the calculated distance are tolerable, according to the presentation. Figures 4.13 and 4.14 demonstrate the ultrasonic sensors' accuracy and error rate, as well as the distance between them. The best accuracy of 97.33 was attained by a device at the actual distance position of 30 cm, as shown in Table 2. As the distance between two points grows longer, the efficiency decreases. The largest inaccuracy was discovered at a distance of 150 cm, which is around 8.00 percent.

After putting it through its trials in a variety of places, it was discovered that navigation is beneficial to both blind and partially sighted people. The following are some characteristics of: An urgent SMS is sent to saved emergency contacts when the power button is pressed. Only one person will receive an SMS, and that contact will be retained as the primary emergency contact. The location's latitude and longitude, as well as a link to Google Maps, are included in the SMS. By clicking on this link, the user is redirected to Google Maps, which displays the user's exact location. Figure 4.10 on previous show an example of SMS forwarding in an emergency to primary and other emergency contacts.

When users push the push button, it also records a location image with a detailed address to get a better understanding of where the user is in an urgent situation. Persons who are partially sighted may benefit from this feature. Figure 4.15 shows a google location at Dewan Komuniti Taman Sri Tanjong. Figure 4.16 shows, respectively the location of Hospital Raja Pemaisuri Bainun. This enables the user location obtained so the user's family can find him or her easily. The test was carried out when the user was moving around in public areas, both indoors as well as outside. The latitude and longitude of the location indicated on the map were displayed.

Figure 4.15 Dewan Komuniti Taman Sri Tanjong

Figure 4.16 Hospital Raja Pemaisuri Bainun

4.7 Discussion

To begin, each component was separately tested by running each function's code and examining the results. Then the codes are merged for each function, executed them at once, and put the elements into the spectacle for use. This capability is part of the system, which also includes emergency navigation and obstacle detection. This is beneficial because it allows the user to communicate with a family member while simultaneously sending an SMS by simply pressing the push button. To reduce money and simplify things, have tried to employ a few simpler electronic components. When the location announcement button is pushed, this device will assist the user in navigating to their location by notifying them of their present location. GPS is utilized to obtain the user's locations, which are then into the microcontroller and activating GSM. When the coordinates matched, the location name associated with the coordinates is displayed on the SMS received.

Obstacle detection methods using an audio module will be included in the system is created. The audio file played to speech converter is used to make these announcements. This component will beep differently based on the position and distance of the obstacle identified, assisting the user in avoiding range of 0-4 feet. Ultrasonic sensors are utilized, which broadcast ultrasonic waves and continuously receive responses from the barriers around them. The microcontroller analyses the answer to determine the distance between the user and the obstacle. This activates the corresponding output, which is a voice announcement that mentions the obstacle's distance and a position the user through the microphone using the data saved on the SD card. The output of this technology is a robotic voice, not a human voice. This is because a waveform is created by changing the frequency or pitch. Thus, the speech output is created via the speaker based on the waveform formed.

CHAPTER 5

CONCLUSION

5.1 Introduction

The performance level of the development of Special for The Special Need with Voice and Navigation aids for visually impaired people will be discussed in this chapter. In addition, some important suggestions for improvement will be made in the near future.

5.2 Conclusion

The study outlines the process and functioning of a device that looks for visually impaired people in the environment and alerts them if they are in danger. A based algorithm is designed to detect any objects or impediments ahead of them. Blind persons can move from one place to another independently and with greater accuracy using the terms above. Because of its small size, low cost, and low power consumption, the production approach stands out. The project's purpose is to develop a device that will aid visually impaired people.

This system is designed to detect obstacles and alert users when they are close enough to be detected. It functions as a 'Mobility Aid,' assisting persons who are visually impaired in leading a daily life and performing at best everyday activities independently. The information system is straightforward, portable, yet easy to control. With a few changes with the goal of extending the uptime and making it last longer, as well as providing voice assistance to users to make things easier for users. A GPS tracker and GSM function were included into the spectacles to aid the wearer in the event of an emergency.

The device concentrated on three modules, obstacle detection, position tracking, and SMS alert, by examining current aids and designing our new concept for a better assistance.

All these modules are functional, and a voice module has been added to make the system more user-friendly. The Mp3 Module serve as the output interface, while the buttons serve as the input device. The ultrasonic sensor-based technology for visually impaired people has been fully utilized to boost blind and visually impaired people's mobility in a secure and autonomous way.

5.3 Recommendation for Future Work

The project has a very good scope in future as well as in present. The project can be implemented with the different sensor to guide the visually challenged people in the world. The main theme of this project is to help the blind people and make them to interact with the physical world. In This project uses a simple interface and necessary algorithm to satisfy the objectives. It is important to develop this application for the future by focusing on its weight. In future work it can also detect the potholes which are coming across way of blind person. The principles of mono pulse radar can be utilized for determining long range target objects. The system can give most accuracy of obstacle detection for range of 0.3cm Thus, can increase range of obstruction detection speed by upgrading components.

Instead of using the conventional DC batteries, solar charged batteries can be used to make the product Ecofriendly. This an advantage to the user, which not charge the system consciously. Future work must focus enhancing performance in system to assist the user by adding the camera to guide user. The image captured with a web camera and NI-smart cameras aids in the identification of things and searches the surrounding place for the existence of many artifacts in the user's path. This can determine the object's substance and form. If it is to be recognized and credible, the perfectly matched Percentages must be almost always accurate, because there is no chance for correction for a blind individual.

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APPENDICES

Appendix A Grant Chart of Project

Week	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
TASK		**SEMESTER 6**													
Discuss the project title with SV															
Inquiry into the research project															
Create or simulate a project plan.															
Preparation of the project report															
Presentation and proposal for PSM 1.															
TASK							**SEMESTER 7**								
Examine both the software and the hardware.															
Algorithm development and creation															
System analysis.															
Preparation of the project report															
Project presentation for PSM 2.															

MIDTERM - BREAK

Appendix B Obstacle Detection Code

```
#include <Arduino.h>
#include <NewPing.h>
#include <SoftwareSerial.h>
#include <DFRobotDFPlayerMini.h>
#include <RH_ASK.h>
#include <SPI.h>
RH_ASK driver;

#define MAX_DISTANCE 50

const int trigPin1 = 2;
const int echoPin1 = 3;
const int trigPin2 = 4;
const int echoPin2 = 5;
const int trigPin3 = 6;
const int echoPin3 = 7;

int minLeftDistance   = 100;
int minCenterDistance = 100;
int minRightDistance  = 100;

static unsigned long timer = millis();

int waitTime = 3500;

NewPing sonarLeft(trigPin1, echoPin1 ,MAX_DISTANCE);
NewPing sonarCenter(trigPin2, echoPin2 ,MAX_DISTANCE);
NewPing sonarRight(trigPin3, echoPin3 ,MAX_DISTANCE);

SoftwareSerial mp3SoftwareSerial(8, 9); // RX, TX
DFRobotDFPlayerMini DFPlayer;

void printDetail(uint8_t type, int value){
 switch (type) {
   case TimeOut:
     Serial.println(F("Time Out!"));
     break;
   case WrongStack:
     Serial.println(F("Stack Wrong!"));
     break;
   case DFPlayerCardInserted:
     Serial.println(F("Card Inserted!"));
     break;
   case DFPlayerCardRemoved:
     Serial.println(F("Card Removed!"));
```

```
break;
  case DFPlayerCardOnline:
     Serial.println(F("Card Online!"));
     break;
   case DFPlayerPlayFinished:
     Serial.print(F("Number:"));
     Serial.print(value);
     Serial.println(F(" Play Finished!"));
     break;
   case DFPlayerError:
     Serial.print(F("DFPlayerError:"));
     switch (value) {
       case Busy:
         Serial.println(F("Card not found"));
         break;
       case Sleeping:
         Serial.println(F("Sleeping"));
         break;
       case SerialWrongStack:
         Serial.println(F("Get Wrong Stack"));
         break;
       case CheckSumNotMatch:
         Serial.println(F("Check Sum Not Match"));
         break;
       case FileIndexOut:
         Serial.println(F("File Index Out of Bound"));
         break;
       case FileMismatch:
         Serial.println(F("Cannot Find File"));
         break;
       case Advertise:
         Serial.println(F("In Advertise"));
         break;
       default:
         break;
     }
     break;
   default:
     break;
  }
}

void leftAlert(int distance) {

  if (millis() - timer > waitTime) {
    timer = millis();
```

```
printDetail(DFPlayer.readType(), DFPlayer.read()); //Print the detail message from DFPlayer
  }
}

void centerAlert(int distance) {

  if (millis() - timer > waitTime) {
    timer = millis();
    DFPlayer.playLargeFolder(02, distance+1);
  }
  if (DFPlayer.available()) {
    printDetail(DFPlayer.readType(), DFPlayer.read()); //Print the detail message from DFPlayer
  }
}

void rightAlert(int distance) {

  if (millis() - timer > waitTime) {
    timer = millis();
    DFPlayer.playLargeFolder(03, distance+1);
  }
  if (DFPlayer.available()) {
    printDetail(DFPlayer.readType(), DFPlayer.read()); //Print the detail message from DFPlayer
  }
}

void setupDFPlayer() {

  mp3SoftwareSerial.begin(9600);
  Serial.println();
  Serial.println(F("Blind assistancs smart glass..."));
  Serial.println(F("Initializing DFPlayer ... (May take 3~5 seconds)"));

  if (!DFPlayer.begin(mp3SoftwareSerial)){
    Serial.println(F("Unable to begin:"));
    Serial.println(F("1.Please recheck the connection!"));
    Serial.println(F("2.Please insert the SD card!"));
    while(true);
  }
  Serial.println(F("DFPlayer Mini online."));

  DFPlayer.setTimeOut(500); //Set serial communictaion time out 500ms
  DFPlayer.volume(29);  //Set volume value (0~30)
  DFPlayer.EQ(DFPLAYER_EQ_NORMAL);
  DFPlayer.outputDevice(DFPLAYER_DEVICE_SD);
}
```

```
void setup() {
 Serial.begin(9600);
 setupDFPlayer();
  pinMode(A4,0);
   Serial.begin(9600);    // Debugging only
   if (!driver.init())
        Serial.println("init failed");
}

void loop() {
 delay(29);
 int leftDistance  = sonarLeft.ping_cm();
 int centerDistance  = sonarCenter.ping_cm();
 int rightDistance   = sonarRight.ping_cm();

 // For debugging
//   Serial.print("Left: ");
//   Serial.print(leftDistance);
//   Serial.print(", Center: ");
//   Serial.print(centerDistance);
//   Serial.print(", Right: ");
//   Serial.println(rightDistance);

 if(leftDistance < minLeftDistance && leftDistance > 1) {

   Serial.print("Obstacle ");
   Serial.print(leftDistance);
   Serial.println(" CM to the left");
   leftAlert(leftDistance);
 }

 if(centerDistance < minCenterDistance && centerDistance > 1) {

   Serial.print("Obstacle ");
   Serial.print(centerDistance);
   Serial.println(" CM ahed");
   centerAlert(centerDistance);
 }

 if(rightDistance < minRightDistance && rightDistance > 1) {

   Serial.print("Obstacle ");
   Serial.print(rightDistance);
   Serial.println(" CM to the right");
   rightAlert(rightDistance);
 }
```

```
  if(x==1)
  {
  driver.send((uint8_t *)msg1, strlen(msg1));
  }
  else
  {
    driver.send((uint8_t *)msg2, strlen(msg2));
    }
  driver.waitPacketSent();
  delay(1000);
}
```

Appendix C Navigation Tool Code

```
#include <SoftwareSerial.h>
#include <TinyGPS.h>
#include <RH_ASK.h>
#include <SPI.h> // Not actualy used but needed to compile
RH_ASK driver;

int state = 0;
int states = 0;
const int pin = 9;
float gpslat, gpslon;

TinyGPS gps;
SoftwareSerial sgps(4, 5);
SoftwareSerial sgsm(2, 3);

void setup()
{
 sgsm.begin(9600);
 sgps.begin(9600);
 pinMode(13,1);
   Serial.begin(9600);  // Debugging only
   if (!driver.init())
        Serial.println("init failed");
}

void loop()
 {
   uint8_t buf[12];
   uint8_t buflen = sizeof(buf);
   String x="";
   String y="Turn LED OFF";
   if (driver.recv(buf, &buflen)) // Non-blocking
   {
    int i;
    // Message with a good checksum received, dump it.
    Serial.print("Message: ");
    x=((String)(char*)buf);
    x.trim();
    Serial.println(x+ " :"+x.length());
     if(x=="Turn LED ON!")
     {
      Serial.println("true ");
      digitalWrite(13,1);
         sgsm.listen();
    sgsm.print("\r");
    delay(1000);
```

```
sgsm.print("AT+CMGS=\"+60103938400\"\r");
    delay(1000);
    //The text of the message to be sent.
     sgsm.print("https://www.google.com/maps/?q=");
    sgsm.print(gpslat, 6);
    sgsm.print(",");
    sgsm.print(gpslon, 6);
    delay(1000);
    sgsm.write(0x1A);
    delay(1000);
      }
      else
      {
        digitalWrite(13,0);
        }

  }}}
```