SMART STICK AND HELMET FOR BLIND PEOPLE

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8 JULY 2020

APPROVAL

This Project/internship titled **"Smart stick and helmet for blind people**",submitted by Md.Rashadul Islam Sumon ,Md ShahAlam Mondal ,Mst Jesmin Ara to the Department of Computer Science and Engineering, Daffodil International University has been accepted as satisfactory for the partial fulfillment of the requirements for the degree of B.Sc. in Computer Science and Engineering and approved as to its style and contents. The presentation has been held on 8 JULY 2020.

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We hereby declare that, this project has been done by us under the supervision of **Amit Chakraborty Chhoton, lecturer, Department of CSE** Daffodil International University. We also declare that neither this project nor any part of this project has been submitted elsewhere for award of any degree.

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ACKNOWLEDGEMENT

First we express our heartiest thanks and appreciation to all-powerful Allah for His celestial gift makes us conceivable to finish the last year venture/temporary position effectively.

We extremely appreciative and wish our significant our obligation to **Amit Chakraborty Chhoton, Lecturer, Department of CSE, Daffodil International University**, Dhaka. Profound Knowledge and unmistakable fascination of our boss in the field of "Equipment" to do this venture. His unending persistence, insightful direction, nonstop consolation, steady and vigorous supervision, productive feedback, significant guidance, perusing numerous second rate draft and redressing them at all stage have made it conceivable to finish this project.

We would like to express our heartiest gratitude to **Dr. Syed Akhter Hossain, Professor and Head, Department of CSE, and Dr. S. M. Aminul Haque , Associate Professor and Associate Head Department of CSE** for their kind help to finish our project and would like to extend my deepest appreciation to faculty member, all our course mate who took part in this discuss while completing the course work and staff of CSE Department of Daffodil International University for kind support and help on the technical and the administrative aspect of the study. Finally, we must have acknowledged with due respect the constant support and patience for our parents. Their love, encouragements, and continuous pray have made us stronger each and every day on completing this study.

ABSTRACT

The World Health Organization (WHO) reported that there are 285 million visually-impaired people in the world. Among these individuals, there are 39 million who are fully blind. There have been several systems designed to help visually-impaired people and to improve the quality of their lives. Unfortunately, most of these systems are confined in their capabilities. In this paper, we present a comparative observation of the wearable and portable assistive devices for visually-impaired people in order to show the progress in assistive technology for this group of people. They cannot do any movement outside or inside independently. They have just about one helping hand which is stick. But sometimes this stick cannot save the man from danger. By watching this matter here comes an idea to give a smart life to a blind person. A stick and a smart helmet that can detect obstacle in front of a person. – This paper proposes a prototype, Smart Helmet, for helping visually impaired to identify common real life object such as a person, car, cat, dog, bottle, etc. Our system use Object Detection of Computer Vision to identify objects and will give an audio output about object is in front of the user. The main objective of this project is to help user identify the object on real-time. So comparably this stick can be more useful and can make a blind person's life easier.

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CHAPTER 1

INTRODUCTION

1.0 Introduction

One day when I was passing a road then I saw an old blind man was trying to cross the road with a stick. But it was quite hard for him to cross the road because of traffic and other obstacles. From that day I find out that a smart stick and smart helmet which can detect obstacles can help him to cross the road simply. But when I searched on internet I found that there is a lot of project of stick that is made for the person who are blind. But since I took it as my project I have decided that I will add some extra feature with it to make it more helpful. And then I have come out of the box with a new idea about adding and smart helmet. Because the stick can to help the person fully for movement. If the person move his/her head then it also can detect obstacle in front of it

1.1 Motivation

The people who are blind they cannot move freely in unknown place. Those who are blind they need some aid to feel safe while moving. Smart stick and helmet comes a proposed solution to improve mobility of both blind and visually impaired people. A blind person can easily use this stick and the helmet. There is a vibrator which vibrates when it gets any obstacle. So if the blind person is deaf too he/she can use it also.

1.2 Objectives:

This are objectives of the project:

- Blind people can move in the road freely.
- Detecting obstacles.
- It gives vibration and sound.
- To less the cost.

1.3 Drawbacks:

- It cannot measure the height of any obstacle that it detects.
- It will be stop if the battery in it runs out the power.
- No system for tracing.
- There is no such option to send an automatic SMS to the relative if the blind person falls down anywhere.
- This stick cannot detect the water.

1.4 Expected Outcome

✓ All visually impaired people can control it.

✓ Reducing cost.

CHAPTER 2

PROBLEM STATEMENT

2.0 Problem Definition

As it is seen that many obstacle detection systems on Blink stick have been developed simultaneously but these are developed for obstacle detection and notify the blind person via vibration. There have vibration system included to the stick and helmet. There has some stick with bell which is noise able and can be annoying to other people. Another noticeable matter is that there has no GPS tracer system to find the blind person if he falls in some trouble.

2.1 Finding solution

Regarding the existing systems, it will be very good idea to develop such system that will provide a blind stick and helmet including with Ultrasonic sensor and buzzer for the blind people which will give a smart direction and security.

2.2 Related Works: This In the local market, there is more plenty of stick and helmet. But they are not able to help the blind people to move freely.

Ultrasonic Sensor [1]: This cost efficient guidance system is based on an AT89C52 microcontroller and is developed for facilitating visually impaired. Ultrasonic sensors

are used to calculate distance of the obstacles around the user to guide him/her to a safe path. But Output is in the form of vibration and sound commands which the visual impaired can hear through an audio output on right, left side. And this project is more accuracy and more helpful then others

2.3 Challenges

➢ A bit costly than a normal manual helmet and stick.

➢ Need to recharge the battery for working.

CHAPTER 3

METHODOLOGY

3.0 Methodology

This project has been developed for absolute blind people. It has been clear that this hardware will help the people who are blind for their daily purposes. In this project we has been used Arduino board which is basically also known as microcontroller, it is a physical programmable circuit board and we used it for upload the code from computer to physical circuit board. Than we used breadboard. we used it to test that circuit is ok after that we ensure final circuit design, To measure the distance of an object for this we used ultrasonic sensor, it make noise when its find any obstacle and sound high when the object is near.

For security purpose we used a buzzer for the user, the vibration will increase when the obstacle is near to user. Therefore, we used male to male jumper wires to make a connection between the breadboard and the Arduino board and finally we put the circuit board on our finalized stick.

3.1 User of this Stick and helmet :

As this stick and helmet has been initially made for blind peoples only. For making easy of their lifestyle in real life. So only blind people can use this stick and helmet so that they can reduce the daily problems they are facing in their life when they are outside of the home.

CHAPTER 4

Hardware Requirements

4.0 Used hardware in project

- Arduino UNO
- Stick and helmet
- Bread Board
- The Ultrasonic Sensor
- The Buzzer
- Connecting Wires

4.0.1 Arduino UNO

Arduino is an open source computer hardware and software company, project and user community that has been planned and manufactured for building any kind of prototype of any device that can sense and control objects in the physical and digital world. Arduino board designs uses a diversity microprocessors and microcontrollers. This board is equipped with sets of digital and analog input/output (I/O) pins. The boards feature is serial communications interfaces, including Universal Serial Bus (USB) on some models, which are also used for loading programs from personal computers.

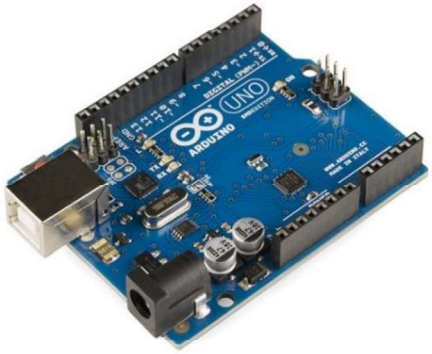

Figure 4.0.1: Arduino UNO

In this project we have to connect our all the components in Arduino board so that they can sense from the environment and can give the data to the board, so that the buzzer can response in the time when there is any obstacle in front of it.

4.0.2 Stick and elmet:

For this project we use stick and helmet .Common stick for blind people is not suitable. Sometime they suffer a lot. For this purpose we designed a smart blind stick and adding also a smart helmet. Those will detect obstacle and give a sound with vibration to the user

Figure 4.0.2: Stick and Helmet

4.0.3 Bread Board

A breadboard is a solder less device for prototype with electronics and test circuit designs. Most electronic components in electronic can be interconnected by inserting their leads or terminals into the holes and then making connections through wires where appropriate. The metal strips are laid out as shown below. Note that the top and bottom rows of holes are connected horizontally and split in the middle. The remaining holes are connected vertically.

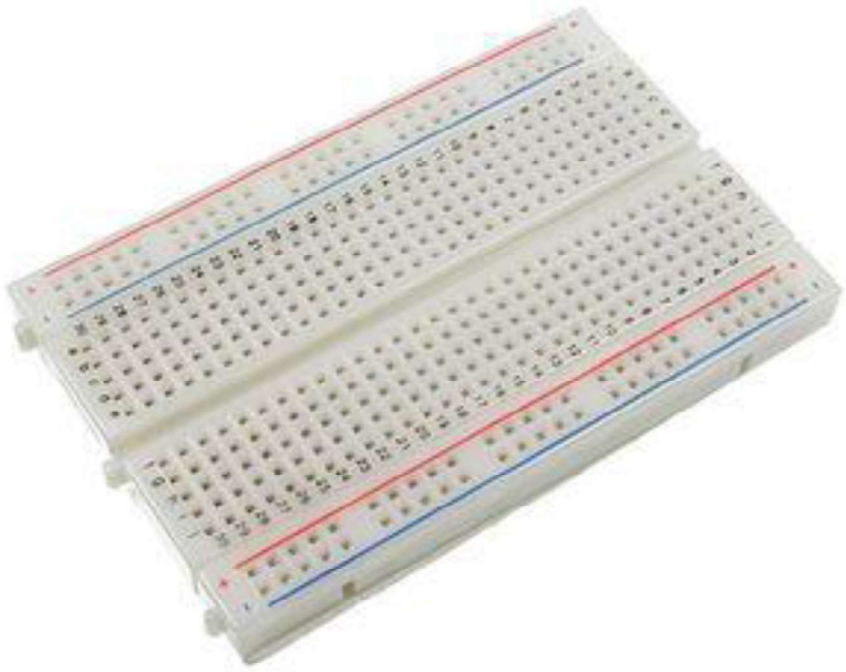

Figure 4.0.3: Bread Board

4.0.4 The Ultrasonic Sensor (HC-SR04)

An Ultrasonic sensor is a device that can measure the distance to objects by using sound waves. It measures distance by sending out a sound wave at a specific frequency and then listening for that sound wave to bounce back. By recording the elapsed time between the sound wave being generated and the sound wave bouncing back, it is possible to calculate the distance between the sonar sensor and the object for helping the user

Figure 4.0.4: Ultrasonic sensor

There are four pins in HC-SR04 sensor. One is Ground(GND), second one is Echo, third one is Trigger(trig), and the last one is the power(VCC).

Here this is one of the most important component for detecting the obstacle. Using this sensor, the Arduino board will get the data about the distance of any object and then it will take the necessary steps against the data.

4.0.5 The Buzzer

A buzzer is an audio signaling device which may be mechanical, electromechanical. Typical uses of buzzers and beepers include alarm devices, timers, and confirmation of user input such as a mouse click or keystroke.

Figure 4.0.5: Buzzer

When the buzzer gets any kind of signal from the Arduino board then it buzz and give notification to the user about the obstacle.

4.0.6 The Battery

9 volt battery, is a common form of battery. That was introduce for early transistor radios.it has a rectangular prism shape with rounded edges and a polarized snap connector on top. This type is commonly used in talkies, watches and smoke detectors

Figure 4.0.6 Battery

CHAPTER 5

MODEL OF THE PROJECT

It will be helpful to select a specific model for our project. We selected Waterfall model for our project. We choose waterfall model because the requirements and conditions are mostly matching with this model.

5.0 Waterfall model

In waterfall model there are various types of steps to complete the project.

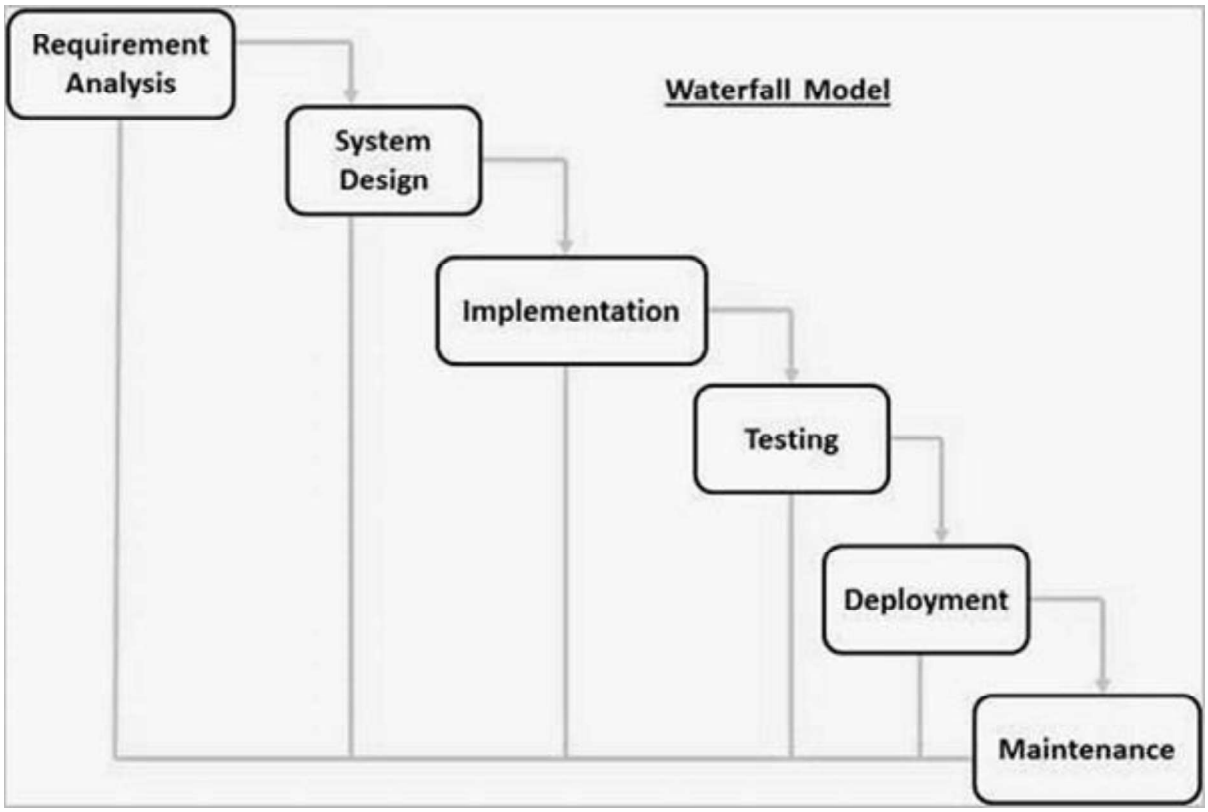

Figure 5.1.1: Waterfall Model

These are the 6 sequential phase to follow the waterfall model. Which are-

5.1Requirement analysis

First of all, we find out the requirements of our project and we gather it to analyze it perfect for this hardware based project or not? As per the rules of waterfall model.

System design

In 1st step we have to develop a design and we find the requirement and analyzed on requirements. In system design we draw architecture part of our following project. Because of this design will help for specifying hardware we can easily understand what to do next.

Implementation

From the basic design we need to divided into some part the project into some units. The each and every unit we tested and find the limitation. We also checked each unit's functionality.

Testing

In this phase we checked the non-functionality and integration the units to move on the next phase.

Deployment

In previous phases we checked all the things including function and non-function. So this is the time to distribute the device among our selected user.

Maintenance

User can make issue about our device, that's why we need to update day by day as per demand of user and distribute the updated version.

5.2 Why waterfall model

- ✓ Requirements are almost clear and fixed.
- ✓ Technology is familiar and easy to complete.
- ✓ Definition of project is almost fixed.

5.3 Advantages

There are a lot of advantages of this model for this reason we choose this model. Some of the key points are:

- ✓ The project is so simple so easy to understand that how user will be use it.
- ✓ All the stages working has been defined clearly, that which stage is working with which specifying problem.
- ✓ All the phases and processes are done once in a time so there are no unexpected requirements on phases.
- ✓ If there any new requirements or tasks come out, it is easy to arrange the tasks.

5.4 Disadvantage

- It is very difficult to measure the correct things of all the phases.
- It is not a good model for complex project.
- For long and ongoing project it is consider as poor model.

5.5 why we choose waterfall model though it has some limitation?

- ❖ Though it has some limitation like measure phases and longtime ongoing. We also found the solution of this problems which are:
- ❖ We clearly documented our requirements on each and every step.

- ❖ We will update the device day by day to go long and ongoing.

5.6 why other model is not suitable for this project?

We choose waterfall model instead of other models. Here are elaboration of other models that why we hasn't been picked those models:

Spiral model:

This model is so complex every processes has more complexity. The project will go to the finish line it is unknown to know until complete the project. It requires a large number of intermediate stage.

Agile model:

It has more risks on sustainability and maintainability of project. This model has been suitable for small project but for big project it is better to avoid this model. This model has been depending on user interaction, if user is not clear than it can be out off the track at any time.

V-model:

V-model is highly risk and uncertainty model. Once we found any problem on testing than we need to go back of previous steps and we have to check all the functionality. Although this model is so rigid and less flexible.

Iterative model:

In this model we need more resources. At the end of the project it is very hard to determine that what the actual risks is. It is not suitable for big projects. Highly skilled risk analyzer required to analyze on risks.

CHAPTER 6
SYSTEM ANALYSIS

6.0 Project Functionality

- Find obstacle and then Bell rings and change direction
- Navigate the user
- Vibration when obstacle are close

6.1 Design requirement

- Ultrasonic sensor
- Buzzer
- Vibrator

6.2 System Development

Ultrasonic sensor Circuit Diagram

In the blind man stick, there have an ultrasonic sensor to detect obstacle. This sensor can sense the object in front of the user. This sensor mainly works with sound wave. It takes off a wave which goes and comes back when gets any obstacle in front of it. Then the sensor calculates the distance between the user and the object. In this project we have set the minimum distance 50cm from the device. When it get any obstacle neat 50cm it will be sound and vibrate.

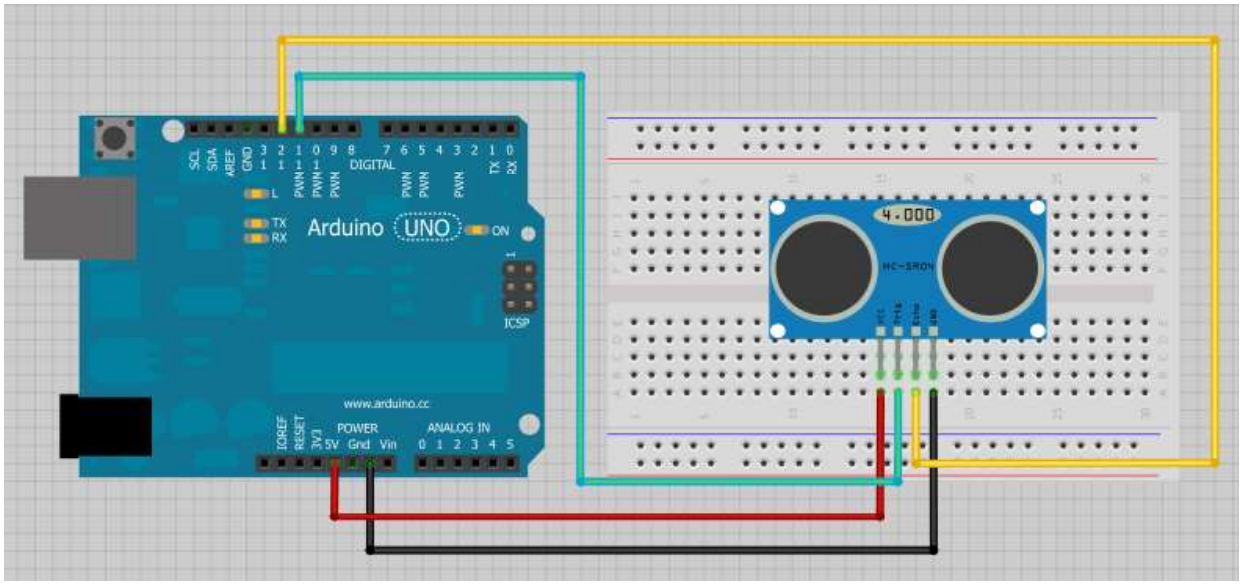

Figure 6.2.1: Circuit diagram of Ultrasonic Sensor with Arduino UNO

Buzzer

After getting the obstacle detection positive output from ultrasonic sensor, then the Buzzer will ring and the blind man will be noticed about the obstacle in front it and he will change the direction path.

The buzzer Is connected with the Arduino through the bread board and jumper wires. When the Ultrasonic sensor identifies any obstacle in front of it and send message to the Arduino board then the board send that message to the buzzer too. After getting the notification the buzzer starts buzzing.

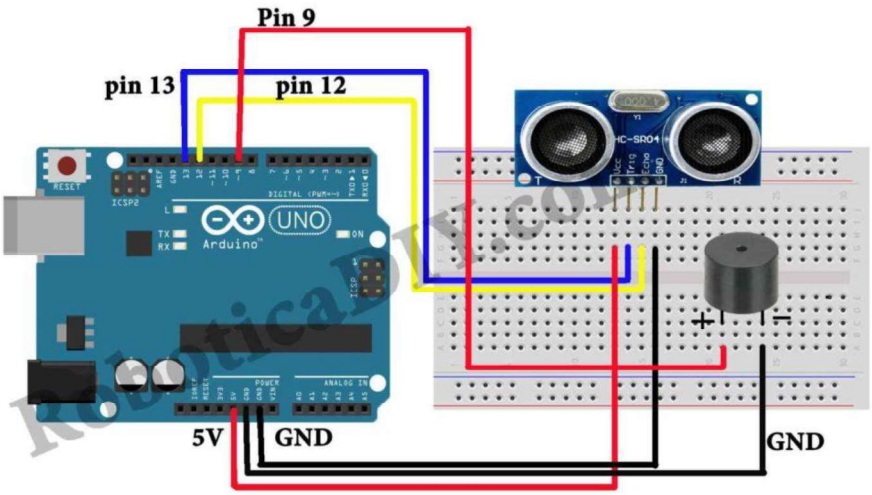

Figure 6.2.2: Circuit diagram of Buzzer with Arduino UNO

Vibration Motor

When the buzzer will start then also the vibrator motor will start. If the obstacle is closer to the user then it will be vibrate high speed. If the obstacle is far away from the user among the range then the vibrator will vibrate slowly

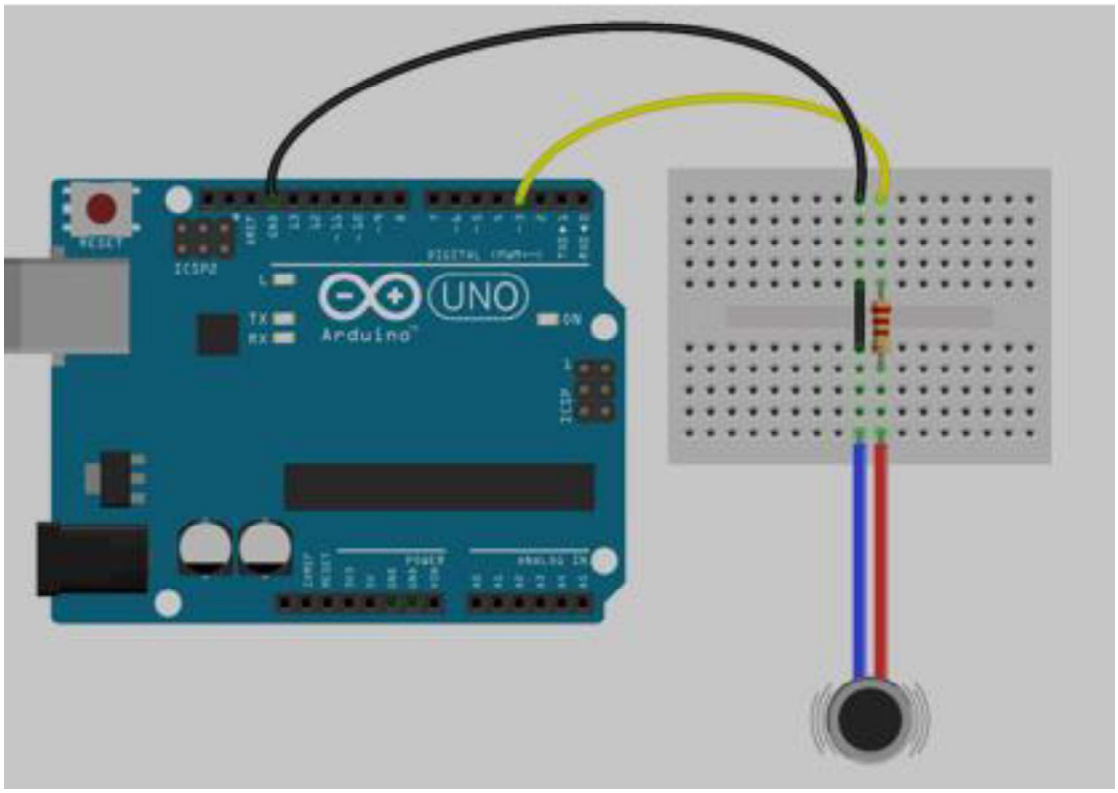

Figure 6.2.3: Circuit diagram of Vibration Motor with Arduino UNO

CHAPTER 7

DESIGN REQUIREMENT

7.0 Activity Diagram

Activity diagram is basically a flowchart or UML which describes all the activity that happens in the system by a flow. We can know the idea about the whole process that how it works and how does it make us benefited. The flowchart diagram of this system has been given below.

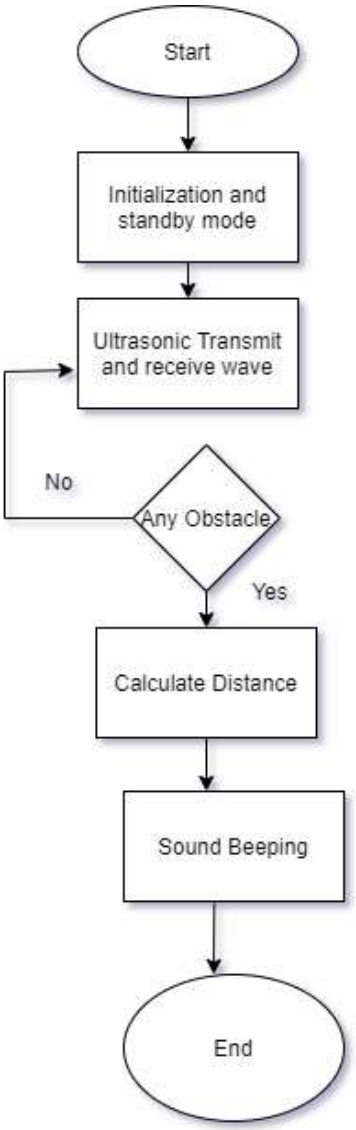

Figure 7.0.1: Entire System Activity

7.1 Use case Diagram

The use case diagram shows the activities between two actuators who are related with the system here.

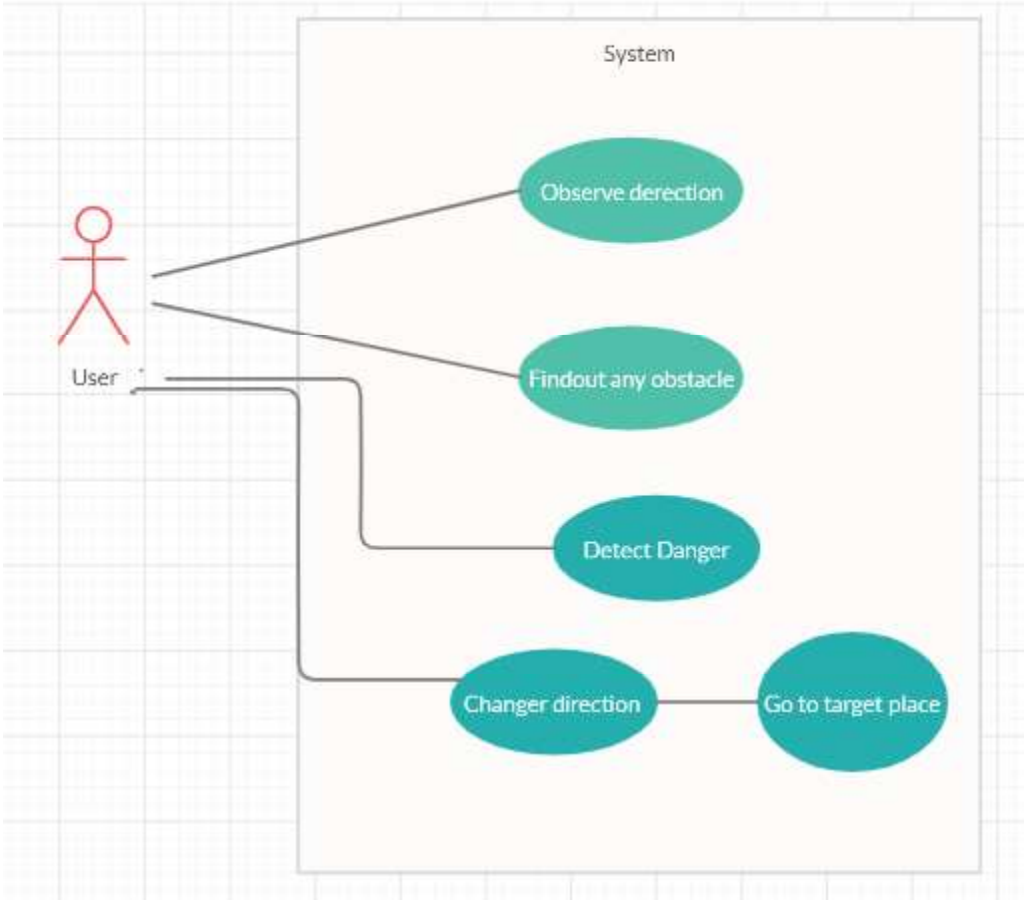

Figure 7.1.1 Use case diagram

CHAPTER 8

IMPLEMENTATION & TESTING

8.0 Implementation

In this part, we have discussed about how we have implemented our system. Although we have explained it before again and again. According to the design diagram, we have implemented all the components using Arduino UNO, Ultrasonic sensor, Buzzer and the vibration motor.

8.1 Code

```
const int trigPin = 8;
const int echoPin = 9;
const int buzzer = 10;
const int ledPin = 12;
const int motor =7;
// defines variables
long duration;
int distance;
int safetyDistance;
void setup() {
pinMode(trigPin, OUTPUT); // Sets the trigPin as an Output
pinMode(echoPin, INPUT); // Sets the echoPin as an Input
pinMode(buzzer, OUTPUT);
pinMode(ledPin, OUTPUT);
pinMode(motor, OUTPUT);
Serial.begin(9600); // Starts the serial communication
}
void loop() {
// Clears the trigPin
digitalWrite(trigPin, LOW);
```

```
delayMicroseconds(2);
// Sets the trigPin on HIGH state for 10 micro seconds
digitalWrite(trigPin, HIGH);
delayMicroseconds(10);
digitalWrite(trigPin, LOW);
// Reads the echoPin, returns the sound wave travel time in microseconds
duration = pulseIn(echoPin, HIGH);
// Calculating the distance
distance = (duration / 2) * 0.0343;
safetyDistance = distance;
if (safetyDistance <= 50){
digitalWrite(buzzer, HIGH);
digitalWrite(ledPin, HIGH);
digitalWrite(motor, HIGH);
}
else{
digitalWrite(buzzer, LOW);
digitalWrite(ledPin, LOW);
digitalWrite(motor, LOW);
}
// Prints the distance on the Serial Monitor
Serial.print("Distance: ");
Serial.println(distance);
}
```

8.2 Implementation of power supply:

Without battery it cannot work.so we connect the battery with the other circuits successfully. It is 9 volt battery. It is long lusting

Figure 8.2.1 Implementation of power supply

Test result: We were testing Battery for 100 times, it gives us 100% accuracy.

8.3 Implementation Of Ultrasonic Sonar Sensor:

Figure 8.3.1 Implementation of Ultrasonic sonar system of Helmet

Figure 8.3.2 Implementation of Ultrasonic sonar system of Stick

The ultrasonic sensor of the stick and helmet is connected with the arduino.it works when the distance of the user and the obstacle is less than or equal 50 cm.

Test result: We were testing the ultrasonic sensor of the helmet and the stick carefully. it gives us 91%accuracy.

8.4 Implementation Of Buzzer:

We connect the buzzer with the ardunio and the ultrasonic sonar sensor. When the ultrasonic sensor detect some obstacle then the buzzer gives sound that there are some obstacle infront of it

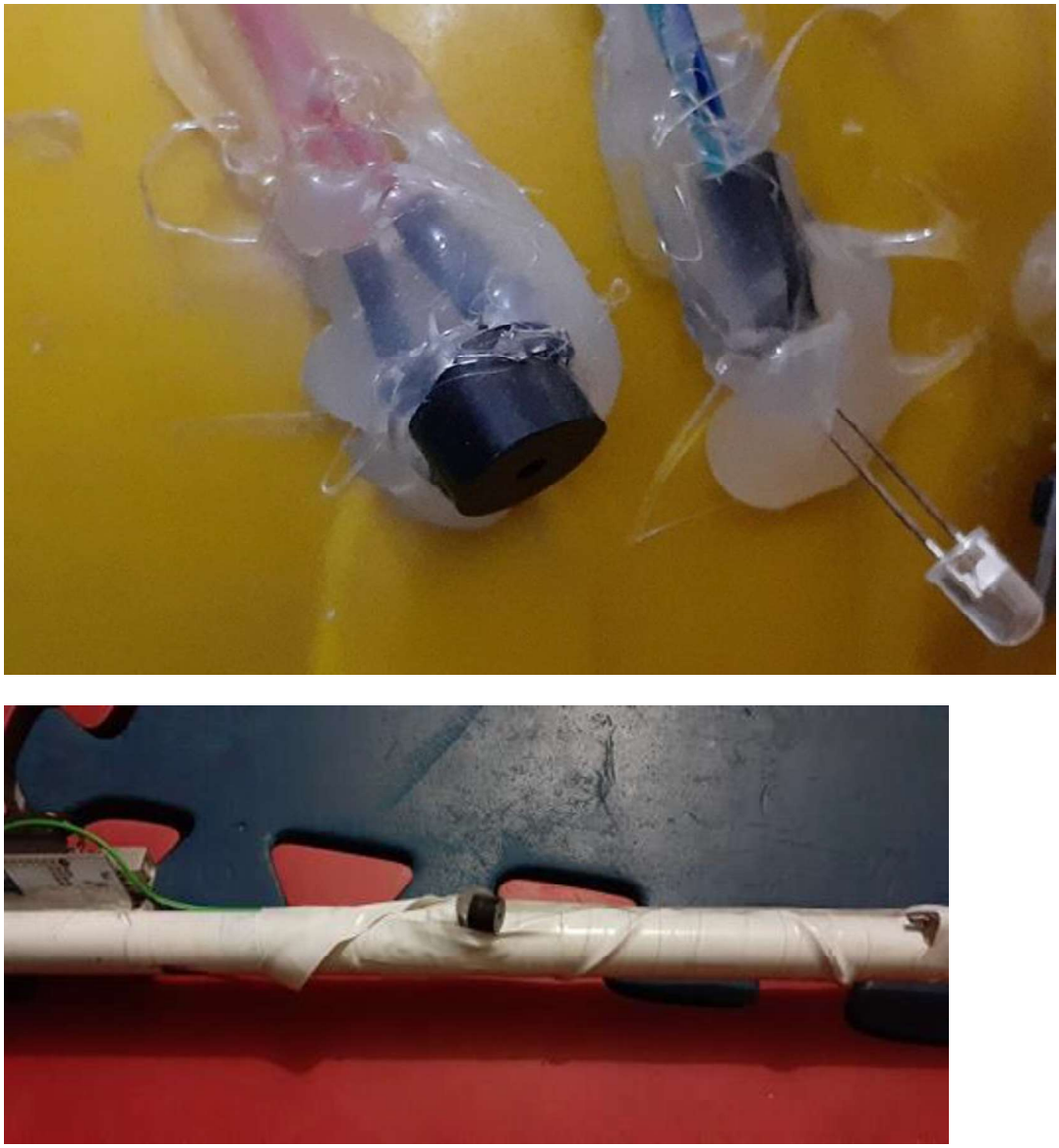

Figure 8.4.1Implementation of buzzer system of stick and helmet

Test result: We were testing the buzzer with ultrasonic sensor of the helmet and the stick carefully. it gives us 90%accuracy

8.5 Implementation Of Vibrator:

For the helmet we also develop the vibration system. When the obstacle is closer of the user than the vibration will vibrate highly.so that the user can easily understand that the obstacle is very close.

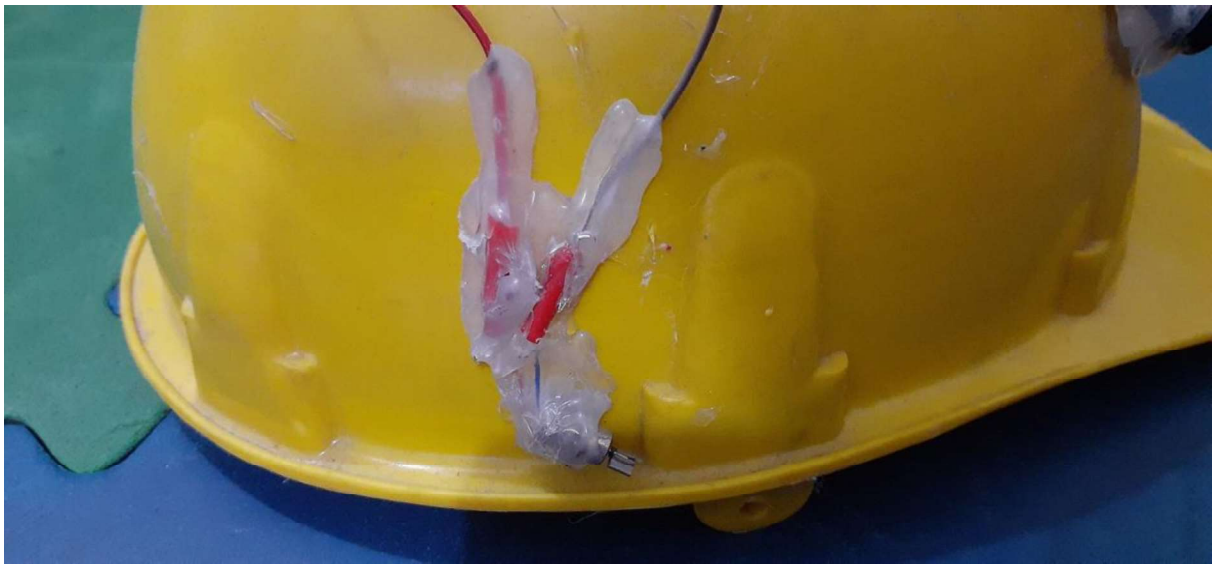

Figure 8.5.1 Implementation Of vibrator of stick and helmet

Test result: We were testing the vibration motor with 100 times, it gives us 95 %accuracy

8.6 Full implementation :

Then here is the final output of the helmet and the stick:

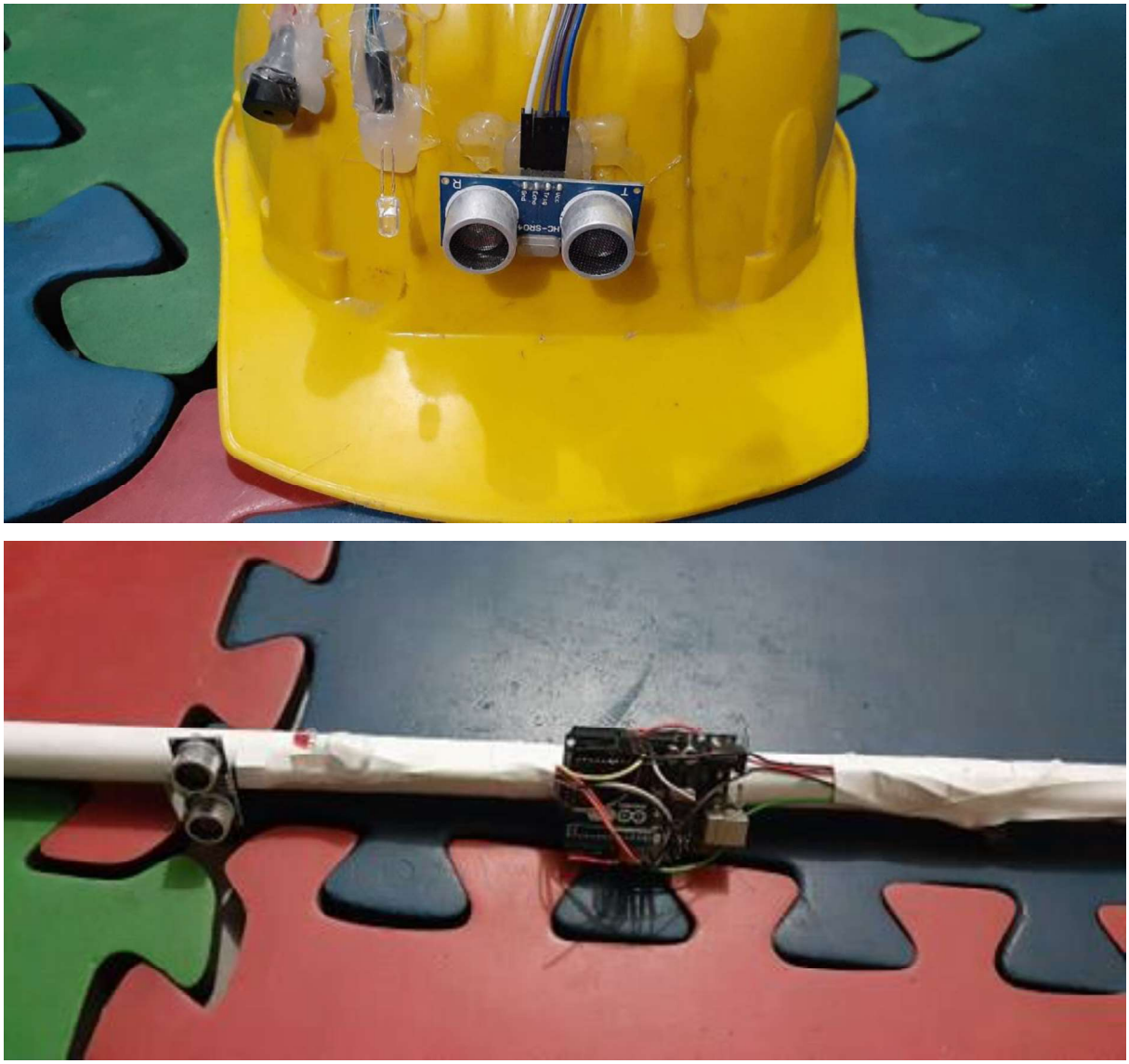

Figure 8.6.1 Full implementation of stick and helmet

CHAPTER 9

CONCLUSION AND FUTURE PLAN

9.0 Conclusion

This paper helps the people who are visually impaired. So that they can move easily with the surround. This paper presents the development of the stick and the helmet is like assistant of the user for movement safely. It deceit the obstacle and warn the user through the beep sound and also with vibration. The intensity of the sound is increase when the obstacle is close to the user. Moreover, there are also some disadvantage such as there is no GPS system. The main purpose of the project is help the blind people in travelling from one place to another place. In future we will develop smarter with adding new feature.

9.1 Scope for Further Development

Everything is changeable in this earth. In future for solving all limitations and to developed our project, we will include some new features which are given below.

- Using GPS system for tracking the user.
- Develop with notification system when user in danger
- Adding Solar sensor instead of battery
- Adding image processing system so that it can understand so that what obstacle in front of the user
- Adding wireless headphone for better life style

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