SMART WALKING STICK FOR VISUALLY IMPAIRED PEOPLE

A Project submitted in partial fulfillment of the requirements for the

Award of Degree of

Bachelor of Science in Electrical and Electronic Engineering

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December 2018

CERTIFICATION

This is to certify that this project entitled "**Smart Walking Stick for Visually ImpairedPeople**" is done by the following students under my direct supervisionand this work hasbeen carried out by them in the laboratories of the Department of Electrical and Electronic Engineering under the Faculty of Engineering of Daffodil International University in partial fulfillment of the requirements for the degree of Bachelor of Science in Electrical and Electronic Engineering. The presentation of the work was held on Demember 2018.

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DECLARATION

The project and thesis entitled **"Smart Walking Stick for Visually Impaired People"** submitted by Name: **Muhammad Nazmul Alam**, ID: **151-33-2303**, Name: **Abdulla AlMamun**, ID: **151-33-2583** Session: Spring 2015 has been accepted as satisfactory in partialfulfillment of the requirements for the degree of **Bachelor of Science in Electrical andElectronic Engineering** on December 2018.

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LIST OF ABBREVIATIONS

CD	Chromatic Dispersion
EMI	Immune to Electromagnetic Interference
FBG	Fiber Bragg Gratings
FWHM	Full Width at Half Maximum
GVD	Group Velocity Dispersion
LED	Light Emitting Diodes
MD	Material Dispersion
NLSE	Nonlinear Schrödinger Equation
PMD	Polarization Mode Dispersion
PUA	Piecewise Uniform Approach
RMS	Root Mean Square
SSMF	Standard Single Mode Fiber
TFBG	Tilted Fiber Bragg Gratings
UV	Ultraviolet
WD	Wave-guide Dispersion
WDM	Wavelength Division Multiplexed

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ABSTRACT

The smart walking stick based on ultrasonic sensors and Arduino for visually impaired people. There are approximately 37 million people across the globe who are blind according to the World Health Organization. People with visual disabilities are often dependent on external assistance which can be provided by humans, trained dogs, or special electronic devices as support systems for decision making. Thus, we were motivated to develop a smart white cane to overcome these limitations. We accomplished this goal by adding ultrasonic sensors at specific positions to the cane that provided information about the environment to the user by activating the buzzer sound. We proposed low cost and light weight system designed with microcontroller that processes signal and alerts the visually impaired person over any obstacle, water or dark areas through beeping sounds. The system consists of obstacle and moisture detection sensors for receiving, processing and sending signals to the alarm system which finally alerts the user for prompt action. The system was designed, programmed using C language and tested for accuracy and checked by the visually impaired person. Our device can detect obstacles within the distance of about 25cm and 10cm from the user. This paper describes the working of a Blind Stick based on a microcontroller ATmega328 (Arduino Uno). Most monitoring systems that are in use in the present world works in disconnected mode yet our framework is planned with the end goal that a patient can be checked remotely progressively. Shrewd stick for visually impaired man is a machine that can pursue a way. The way can be unmistakable like a dark line on a white surface (or the other way around) or it very well may be undetectable like an attractive field. Detecting a line and moving the robot to remain on course, while always redressing incorrectly moves utilizing criticism component frames a basic yet compelling shut circle framework. As a software engineer you inspire a chance to 'educate' the robot how to pursue the line consequently giving it a human-like property of reacting to improvements.

CHAPTER 1

INTRODUCTION

1.1 Introduction

Vision is the most vital piece of human physiology as 83% of data individual gets from the earth is by means of sight. The 2011 measurements by the World Health Organization (WHO) evaluates that there are 285 billion individuals in world with visual debilitation, 39 billion of which are visually impaired and 246 with low vision. The conventional and most seasoned portability helps for individuals with visual debilitations are the strolling stick (additionally called white stick or stick) and guide hounds. The most critical disadvantages of these guides are essential aptitudes and preparing stage, scope of movement and next to no data passed on. With the quick advances of current innovation, both in equipment and programming front can possibly give shrewd route abilities. As of late there has been a ton of Electronic Travel Aids (ETA) structured and conceived to enable the oblivious in regards to explore freely and securely. Additionally top of the line innovative arrangements have been acquainted as of late with help dazzle people explore freely. While such frameworks are appropriate for outside route, because of the requirement for observable pathway access to satellites, regardless they require extra parts to enhance the goals and nearness discovery to avert impact of the visually impaired people with different articles and subsequently subject his/her life to risk. Anyway in contrast with different innovations many visually impaired direction frameworks use ultrasound as a result of its invulnerability to the ecological clamor. Another motivation behind why ultrasonic is well known is that the innovation is moderately economical, and furthermore ultrasound producers and locators are little enough to be conveyed without the requirement for complex hardware. The venture depends on a hypothetical model and a framework idea to give a shrewd electronic guide to daze individuals. Aside

from the regular route frameworks, dazzle help frameworks can be given another element of RF-ID to recognize the sitting territory in office and RF module utilized for discover the stick alongside devoted hindrance identification hardware fuse ultrasonic sensor, profundity estimating hardware estimates the profundity if there should be an occurrence of managing the stairs and on stick vibration hardware to illuminate the snag caution. These distinctive units are examined to execute the plan of a "savvy stick".

1.2 Project Objectives

The principal objective is to assist outwardly tested individuals with navigating effortlessly utilizing development innovation. In this innovation controlled world, where individuals endeavor to live
Autonomously, this undertaking proposes a ultrasonic stick for visually impaired individuals to enable them to increase individual freedom. Since this is sparing and not massive, one can make utilization of it effortlessly.

1.3 Scope of Project

The working behind this blind stick is that it is used for special purpose as a sensing device for the blind people. The circuit provides 5V power supply for the circuit and Maintains its output of the power supply at constant level. It is used widely to detect objects using ultrasonic sensor and IR sensor. If any object is present, the ultrasonic sensor detects the object by measuring the distance between the object and the user and sends the data to the Arduino UNO. To determine the distance of an object , calculate the distance between sending the signal and receiving back the signal.

1.4 Report Outline

- **Introduction:** Introduction, Project Objectives, Scope of Project

- **Equipment:** Introduction, Component List (Arduino Pro Mini, Sonar sensor,Buzzer, DC Connector, Connector, Vero board, Soldering Wires), Summary

- **Theoretical Model:** Basic Block Diagram, Circuit Diagram and Explanation,Arduino Circuit, Summary.

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- **Hardware Development:** Writing Programming, Burning the Program, PowerSupply, System of the Flowchart, Summary

- **Result and Dictations:** Introduction, Our Project, Result, Cost Analysis,Discussion, Summary

- **Conclusion and Recommendations:** Conclusion, Advantages, Future Scope

CHAPTER 2

COMPONENTS

2.1 Introduction

To complete this project, many types of research and analyze the digital railway crossing system and their theories had been done. Several of sources were being the reference for this research such as texts book, journals and internet source. From the past research, many methods were achieved to solve the problem of this project and related to the theory.

2.2 Component List

- Arduino pro mini
- Sonar Sensor
- Buzzer
- DC Connector
- Connector
- Vero board
- Soldering Wires

2.2.1 Arduino Pro Mini

In this undertaking, we have utilized a microcontroller to control entire the procedure of a framework that is Arduino por smaller than usual board. As a matter of fact, Arduino is definitely not a minor controller as it has a working framework or boot-loader which keeps running on. [1]
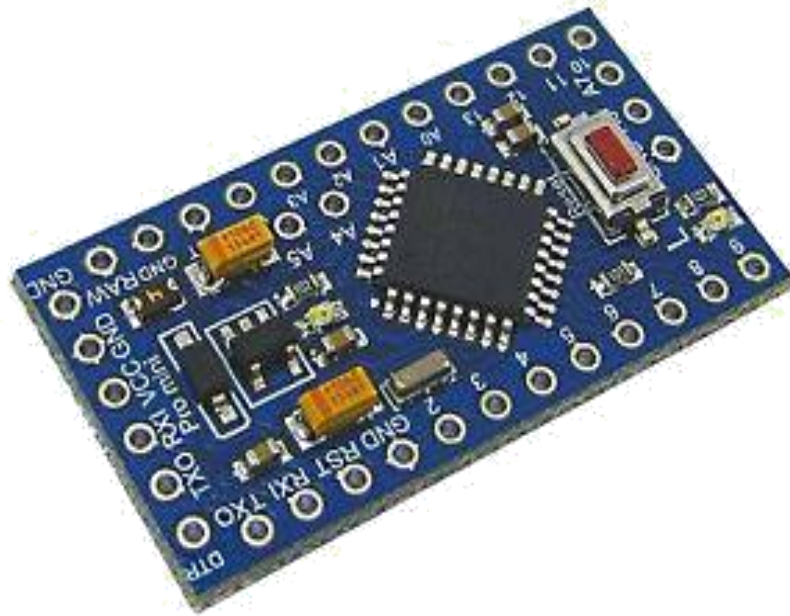
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Figure 2.1 Arduino pro mini

2.2.2 Ultrasonic Sensor

As appeared over the HC-SR04 Ultrasonic (US) sensor is a 4 stick module, whose stick names are Vcc, Trigger, Echo and Ground separately. This sensor is an extremely mainstream sensor utilized in numerous applications where estimating separation or detecting objects are required. The module has two eyes like activities in the front which frames the Ultrasonic transmitter and Receiver. The sensor works with the basic secondary school equation that

Separation = Speed × Time

The Ultrasonic transmitter transmits a ultrasonic wave, this wave goes in air and when it gets protested by any material it gets reflected back toward the sensor this reflected wave is seen by the Ultrasonic recipient module as appeared in the image beneath

HC-SR04 remove sensor is ordinarily utilized with both microcontroller and chip stages like Arduino, ARM, PIC, Raspberry Pie and so on. The accompanying aide is all around since it must be pursued independent of the kind of computational gadget utilized.

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Power the Sensor utilizing a controlled +5V through the Vcc advertisement Ground pins of the sensor. The current devoured by the sensor is under 15mA and subsequently can be straightforwardly fueled by the on board 5V pins (If accessible). The Trigger and the Echo pins are both I/O pins and thus they can be associated with I/O pins of the microcontroller. To begin the estimation, the trigger stick must be made high for 10uS and afterward killed. This activity will trigger a ultrasonic wave at recurrence of 40Hz from the transmitter and the beneficiary will trust that the wave will return. When the wave is returned after it getting reflected by any article the Echo stick goes high for a specific measure of time which will be equivalent to the time taken for the wave to return back to the sensor.

The measure of time amid which the Echo stick remains high is estimated by the MCU/MPU as it gives the data about the time taken for the wave to return back to the Sensor. Utilizing this data the separation is estimated as clarified in the above heading.

Figure: 2.2 • Sonar Sensor

2.2.3 Buzzer

Piezoelectric Sounders/Buzzers are sound segments arranged by joining a piezoelectric vibration plate in a plastic case (resonator).

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Piezoelectric sounders are sound segments which produce sound appropriate for use as information signals (counting multi-tone, tune, etc) without inherent wavering circuits.

This trademark enables them to be utilized in a wide scope of utilizations. They come as the SMD type, which is ideal for little, high-thickness mounting and the stick type, which can be utilized for general purposes.

Piezoelectric signals are sound segments which create a monotone utilizing an implicit swaying circuit.

Figure: 2.3 Buzzers

2.2.4 DC Connector

A DC connector (or DC plug, for one basic sort of connector) is an electrical connector for providing direct flow (DC) control. Contrasted with local AC control fittings and attachments, DC connectors have a lot increasingly standard sorts that are not tradable. The measurements and game plan of DC connectors can be forestalled inadvertent interconnection of inconsistent sources and loads. Types change from

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little coaxial connectors used to control compact electronic gadgets from AC connectors, to connectors utilized for car extras and for battery packs inconvenient hardware.

Figure: 2.4 DC Connector

2.2.5 Connector

A connector is an electro-mechanical gadget for joining electrical circuits as an interface utilizing a mechanical gathering. Connectors comprise of fittings (male-finished) and jacks (female-finished). The association might be brief, concerning compact hardware, require a device for gathering and evacuation, or fill in as a changeless electrical joint between two wires or gadgets. A connector can be utilized to successfully unite divergent connectors.
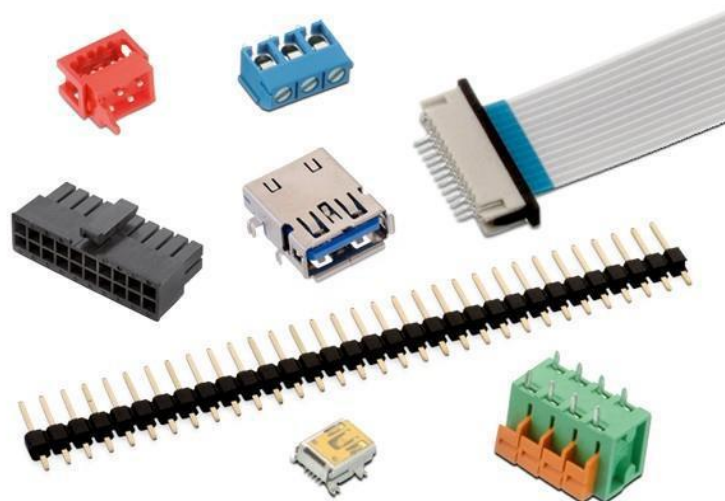

Fig: 2.5 Connector

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2.2.6 Vero board

Vero board is a brand of stripboard, a pre-molded circuit board material of copper strips on a securing board. Which is the ordinary name for a comprehensively used kind of equipment prototyping board portrayed by a 0.1-inch standard system of holes, with wide parallel strips in copper cladding running one way the separation transversely more than one side of the board? It is normally moreover known by the name of the primary thing Vero board, which is a trademark, of British association Vero Technologies Ltd and Canadian association Pixel Print Ltd. In using the board, breaks are made in the tracks, generally around holes, to detach the strips into various electrical centers. With a thought, it is possible to break between holes to think about portions that have two stick pushes only a solitary position isolated, for instance, twin segment headers for IDCs.
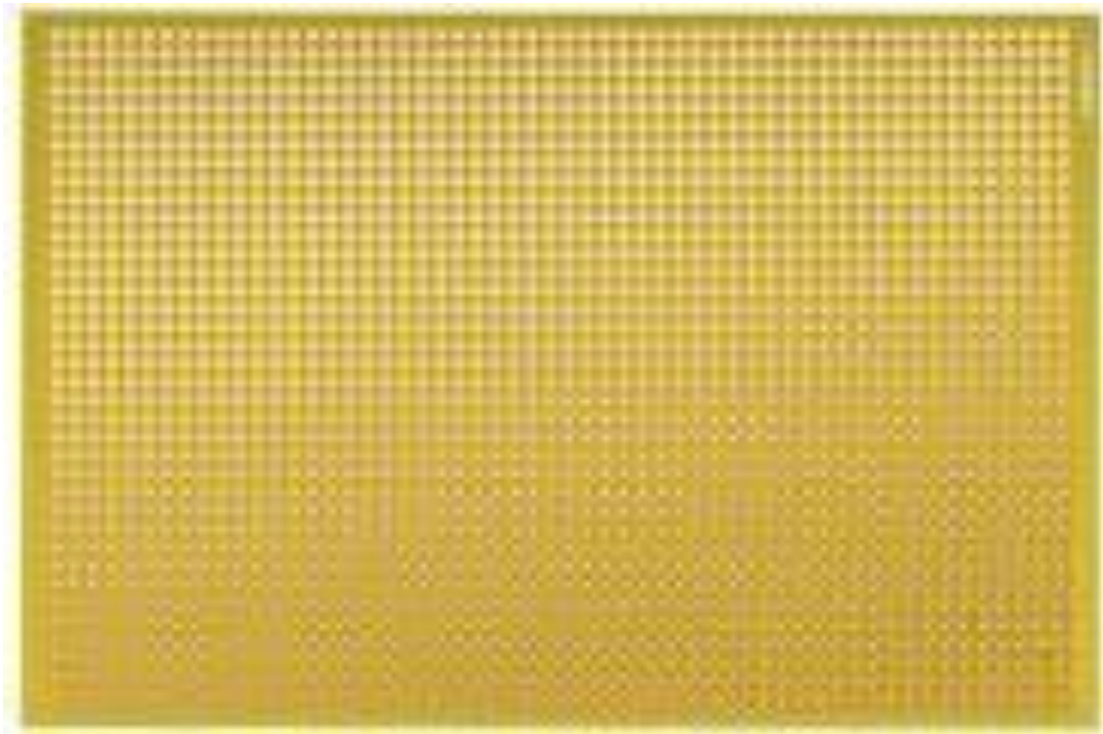

Figure: 2.6 Vero Board

2.4.7 Soldering Wires

Weld is fundamentally a metal wire with a "low" softening point, where low for our motivations implies low enough to be dissolved with a binding iron. For gadgets, it is customarily a blend of tin and lead. At the point when the fastening wire chilled an

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electrical association will lead. This is getting a decent mechanical association between the wires. The fibers of each wire ought to be turned together, carry on more like a solitary element. The initial step is to set up the wires at that point tinning the wears, by join the wires and weld graft together.

Figure: 2.7 Soldering Wires

2.3 Summary

The chapter describes some important equipment that related to the project. Describes of all equipment like Arduino, Microcontroller (Atmega328), Heartbeat Sensor, LCD, Connector, Vero board, that works properly use for show data read related this project.

CHAPTER 3

THEORETICAL MODEL

3.1 Basic Block Diagram

In this Arduino, Heartbeat sensor and LCD interfacing, Arduino Pro Mini is used to
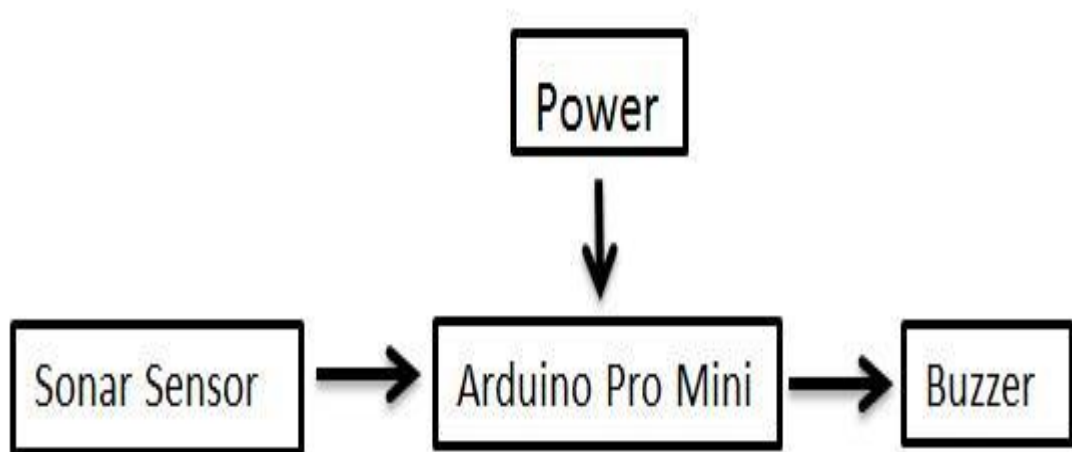

Figure: 3.1 Basic Block Diagram

Control the entire procedure. A Sonar sensor is utilized for detecting condition which gives a flag on each 10mV change at its yield stick. You can without much of a stretch check it with a voltmeter by interfacing Vcc at stick 1 and Ground at stick 3 and yield voltage at stick 2 of the Heartbeat sensor. For a precedent, if the yield voltage of the sonarsensor is 250m volt that implies the Heartbeat sensor is run a Buzzer working .

Arduino peruses yield voltage of sonar sensor by utilizing. After Arduino sends these flag to the LCD buzzer.

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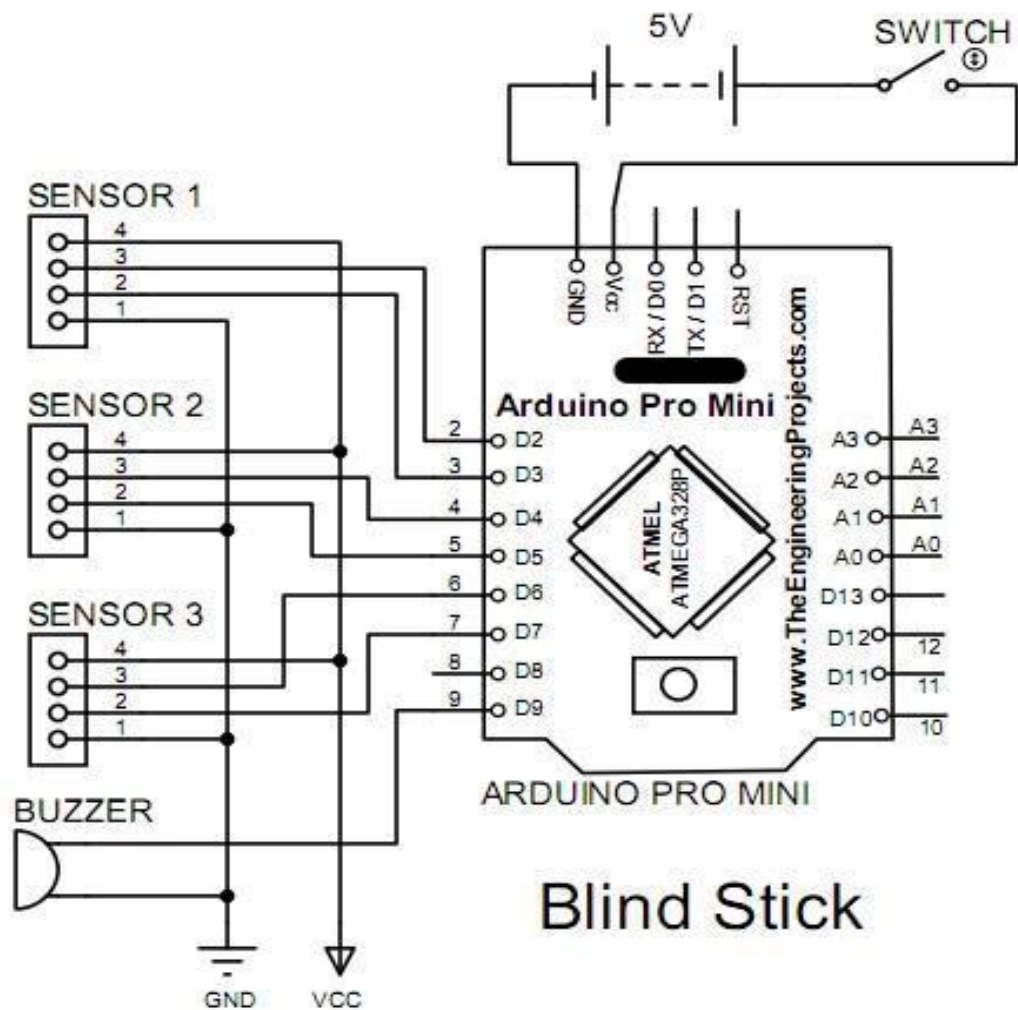
3.2 Circuit Diagram and Explanation

Figure: 3.2 Arduino Circuit Unit.

Circuit diagram for Blind Stick using Arduino, Sonar sensor, is shown in the above Distance. Make the connections carefully as shown in the schematic. Data pins of sensor are connected to Arduino digital pin number 2, 3, 4, 5, 6, 7 An Buzzer is also connected to Digital Pin 9 of Arduino.

3.3 Arduino Circuit

Arduino Pro Mini circuit was build and the main components for the main circuit for this Arduino are required in order to operate the Arduino Pro mini. In this circuit, the Arduino is connected to the Sonar sensor, Buzzer and power supply for a wake up the Arduino.

Figure 3.3 Arduino Pro mini Circuit Atmega328

3.4 Summary

In this chapter has discussed block diagram, circuit diagram, Advantage and Disadvantage of this project. It has also explained the operating system of the project.

CHAPTER 4

HARDWARE DEVELOPMENT

4.1 Writing and Burning Programming into the Arduino

4.1.1 Writing Programming

There are several C compilers on the market for the Atmega328 microcontroller. These compilers have many similar features and they can all be used to develop C based high-level programs for Atmega328 microcontroller some of the C compilers used most often in commercial, industrial and educational.
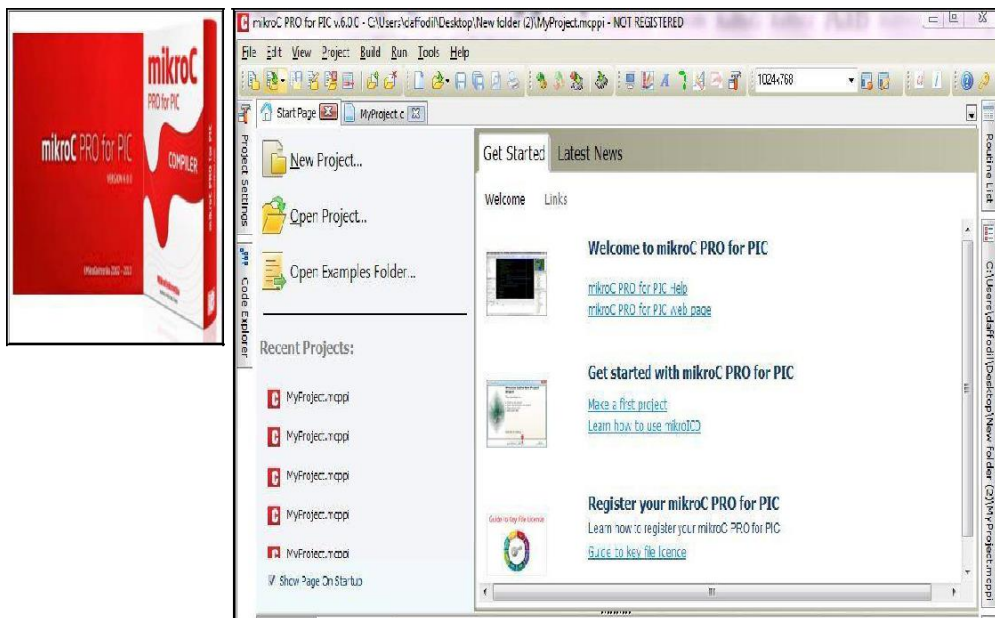
Figure 4.1: Mikro C software

Atmega328 microcontroller applications are – Mikro C, CCS, an Atmega328. This project is used by mikro C. The popular and powerful mikro C is easy to learn and comes with the high resources. Mikro C is a built-in simulator and an in-circuit debugger. The program is compiled by a compiler Mikro C. After the conversion process, a hexadecimal code is generated. The mikro C for writing programming shown in figure 4.1
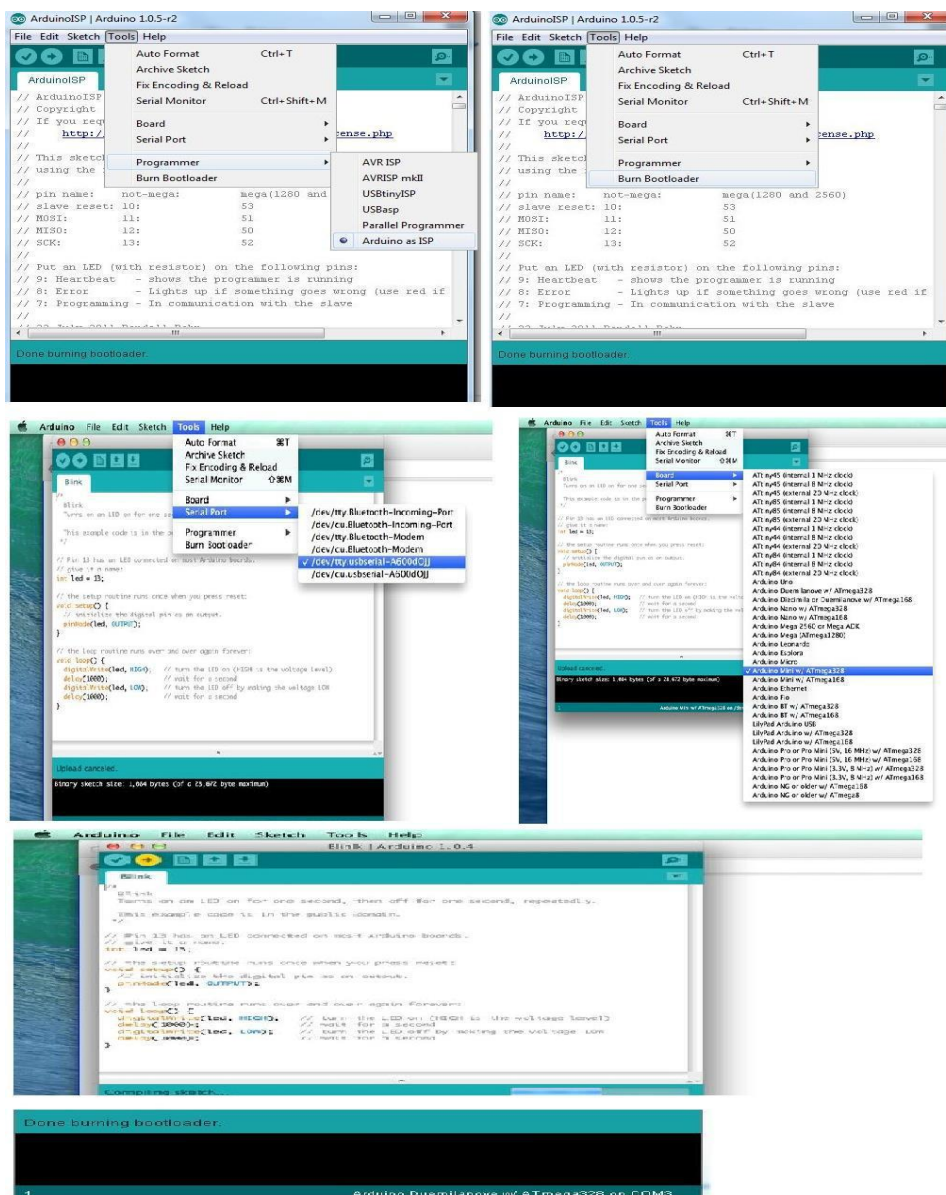
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4.1.2 Burning the Program

Figure 4.2: Burning Boot Loader Process

Connect the all circuit connection now open the Arduino software and select Tools->Board ->Ardunio Pro or Pro Mini (5V, 16MHZ) / ATmega328. If we select the Arduino pro we can see the selected board in the bottom of the software as shown in the above image.

And open the coding we want to program and click the upload button. Now we can see that program uploading into pro mini. We can see the Tx and Rx Led in Arduino Uno board blinking while program uploading. After uploading of the code. Now remove all connection and give power supply to the pro mini. Our code works perfectly on Arduino mini.

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4.2 Power Supply

A battery holder is somewhere around one compartments or loads for holding a battery. For dry cells, the holder ought to similarly achieve the battery terminals. For wet cells, joins are consistently connected with the battery terminals, as is found in vehicles or emergency lighting equipment.

Figure: 4.3: Power Supply

A battery holder is either a plastic case with the condition of the cabin molded as a compartment or, or an alternate plastic holder that is mounted with screws, eyelets, stick, twofold sided tape, or distinctive methods. Battery holders may have a cover to hold and anchor the batteries. Twisted spring wire or level tabs that press against the battery terminals are the two most ordinary systems for making the electrical relationship inside a holder. Outside relationship on battery holders are commonly made by contacts with pins, surface mount feet, tie hauls, or wire leads. [7]
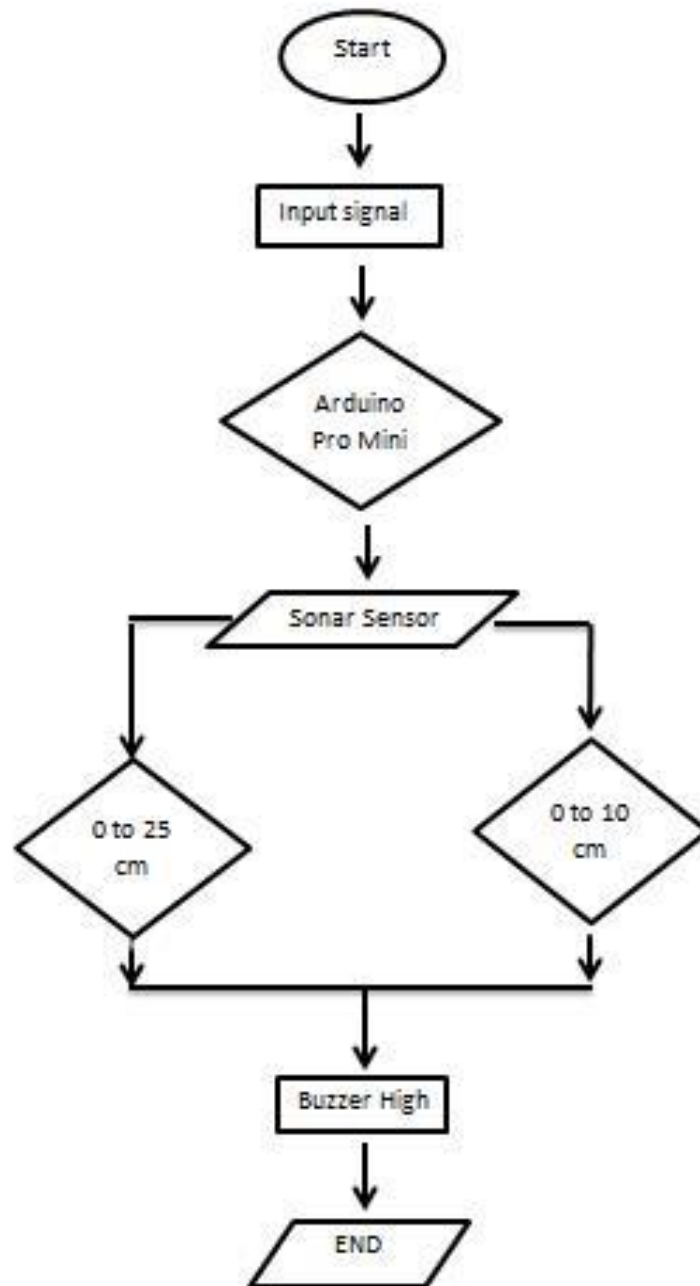
4.3 System of the Flowchart

Figure: 4.4 System of the Flowchart

4.5 Summary

In this chapter has discussed Writing and burning program. Also discussed power supply and Flowchart system It has also explained about these topics of the project.

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CHAPTER 5

RESULTS AND DISCUSSIONS

5.1 Introduction

This chapter will present all the results and calculations and relevant discussions.

5.2 Our Project

After connecting all equipment according to the circuit we had created the body structure following to the other experimental example from the internet. After preparing the body structure and connection of the circuit we prepared a logic program with the help of C++ program by Arduino. Our project picture is given below:

Fig. 5.1 Our Project Picture

After complete the program, we uploaded the program to the Microcontroller. Then we interface the software and hardware part. After completing the entire program and

body with the interface we had tried to experiment it is it work or not. We saw that our project working perfectly. [10]

5.3 Result

Figure: 5.2 Full Project picture.

This project name Heartbeat Monitoring using Arduino mini, Heartbeat Sensor, and LCD. The project measured heartbeat and give the output displaying the value on the LCD screen.

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5.5 Cost Analysis

Table 5.1: Cost Analysis

Serial	Components	Price in (BDT)
01	Arduino Pro Mini	350/-
02	Sonar sensor	800/-
03	Connecting wire	100/-
04	Power supply	150/-
05	Vero board	50/-
06	Wire connector	100/-
07	Buzzer	20/-
08	Battery box	120/-
09	White Wood Board	250/-
10	Glue Gun Stick	50/-
11	Reel Connector	50/-
12	Charging Port	30/-
13	Others	300/-
	Total Cost	**2330/-**

5.5 Discussion

Above is the very straightforward schematic. The circuit board's Enable and Register

Select is associated with the Control Port. The Control Port is an open gatherer/open deplete yield. There is a not many which don't. The circuit is progressively compact for a more extensive scope of PCs, some of which may have no inward draw up resistors. We can utilize a seat control supply set to 5v or use anon board +5 controllers. Keep in mind a couple of de-coupling capacitors, particularly in the event that we experience difficulty with the circuit working appropriately

5.6 Summary

In this chapter has discussed the result and discussion. With our project, we became successful to demonstrate with regarding the objectives of the project. At last, completing this chapter the project is ready to use.

CHAPTER 6

CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusion

Every one of the investigations which had been evaluated demonstrate that, there are various systems for making a ultrasonic visually impaired strolling stick for visually impaired individuals. The upside of the framework lies in the way that it can turn out to be a minimal effort answer for many visually impaired individual around the world. The shrewd white stick is an essentially practical item and advantageous to bear like some other strolling stick. This could likewise be viewed as an unrefined method for giving the visually impaired a feeling of vision. It is essential that outwardly debilitated individuals gain admittance to a proficient and agreeable article so as to carry on with their every day life Comfortably. In a creating nation like Bangladesh, there is a requirement for a financially savvy arrangement so the vast majority of the general population can have a successful item. It merits referencing now that the point of this investigation which is the structure and execution of a savvy strolling stick for the visually impaired has been completely accomplished. The Smart Stick goes about as an essential stage for the coming age of all the more supporting gadgets to help the outwardly disabled to explore securely both indoor and open air. It is powerful and reasonable. It prompts great outcomes in recognizing the hindrances on the way of the client in a scope of three meters. This framework offers a minimal effort, dependable, versatile, low power utilization and hearty answer for route with evident short reaction time. Despite the fact that the framework is hard-set up with sensors and

different segments, it's light in weight. Further parts of this framework can be enhanced by means of remote availability between the framework segments, in this way, expanding the scope of the ultrasonic sensor and actualizing an innovation for deciding the speed of moving toward obstructions. While growing such an engaging

arrangement, outwardly weakened and daze individuals in every creating nation were over our needs. The gadget built in this work is just fit for identifying hindrances and dampness. Gaps can't be distinguished utilizing this gadget nor the idea of hindrance. In this manner, a superior gadget can be developed utilizing ultrasonic sensors, arduino Uno and different gadgets that utilize sound directions to caution the client of what is in his way of development. A vibrator may likewise be included for usability and accommodation. Later on, further alterations to upgrade the execution of the framework will be included. These include: A worldwide situating technique to discover the situation of' the client utilizing the GPS, and GSM modules to impart the area to a relative or guardian. It ought to likewise suit wide shifting grasps for adaptable taking care of.

6.2 Advantages

• The system can be used both indoor and outdoor navigation.

• Blind person's location can be tracked whenever needed which will ensure additional safety.

• Detects obstacles and alerts the blind person through vibration alert and speech output.

6.3 Disadvantages

• The framework created here is a moderate spending plan navigational guide for outwardly disabled individuals

• Minimization in cost prompts pay in execution

6.4 Future Scope

The framework can be enhanced with genuine GPS MODULE utilized in vehicles and we can give a vibrator to the incompletely hard of hearing individual. It very well may be additionally improved by utilizing VLSI innovation to structure the PCB unit. This makes the framework further progressively conservative. A divider following capacity can likewise be included so the client can walk straight along a passageway in an indoor situation.

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APPENDIX

```
// Programa: Blind Stick

(MMI) int trigPin1=2;

int echoPin1=3;

int trigPin2=4;

int echoPin2=5;

int trigPin3=6;

int echoPin3=7;


int buz1=9;


void setup() {

pinMode(buz1, OUTPUT);

pinMode(trigPin1, OUTPUT);

pinMode(echoPin1, INPUT);

pinMode(trigPin2, OUTPUT);

pinMode(echoPin2, INPUT);

pinMode(trigPin3, OUTPUT);

pinMode(echoPin3, INPUT);


}

void loop() {

digitalWrite(trigPin1, LOW);

digitalWrite(echoPin1, HIGH);

distance1 = (duration1 / 2) * 0.0343;

digitalWrite(trigPin2, LOW);

digitalWrite(echoPin2, HIGH);

distance1 = (duration1 / 2) * 0.0343;
```

```
digitalWrite(trigPin3, LOW);
digitalWrite(echoPin3, HIGH);
distance1 = (duration1 / 2) * 0.0343;

 if (distance1<25 || distance2<20  )
  { digitalWrite(buz1,HIGH);}
 delay(100);
    digitalWrite(buz1,LOW);
  if (distance3>10 )
  { digitalWrite(buz2,HIGH);}
  }
```