A

Major Project Report

"Smart Shoes"

Submitted

In partial fulfilment

For the award of the Degree of

BACHELOR OF TECHNOLOGY

In

COMPUTER ENGINEERING

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Submitted To:

Er. Pradeep Jha

Associate Professor &

Head of Department

Computer Science & Engineering

Submitted By:

Abhishek Pratap Singh(16EAYCS005)

Disha Chhabra (16EAYCS027)

Manish Chandak (16EAYCS045)

Department of Computer Science &Engineering
Arya College of Engineering & Research Centre, Jaipur
Rajasthan Technical University, Kota

ARYA COLLEGE OF ENGINEERING & RESEARCH CENTRE
SP-40, RIICO Industrial Area, Jaipur (Raj)-302022

Department of Computer Science & Engineering

Certificate

*This is to certify that the work, which is being presented in the project entitled "**Smart Shoes**" submitted by **Abhishek Pratap Singh, Disha Chhabra and Manish Chandak** students of fourth year(VIIISem) B.Tech. in Computer Science & Engineering in partial fulfilment for the award of degree of Bachelor of Technology is a record of student's work carried out and found satisfactory for submission.*

Internal Examiner **External Examiner**

Head of Department **Principal**

Candidate's Declaration

We hereby declare that the work, which is being presented in the Major Project entitled "**Smart Shoes"** in partial fulfillment for the award of Degree of "Bachelor of Technology" in Computer Science and Engineering and submitted to the **Department of Computer Science & Engineering,** Arya College of Engineering & Research Centre, affiliated to Rajasthan Technical University is a record of our own work carried out under the Guidance of **Er. Gaurav Kumar Soni,** Assistant Professor, Department of Computer Science & Engineering.

(Candidate Signature)

Abhishek Pratap Singh

Roll No.: 16EAYCS005

Disha Chhabra

Roll No.: 16EAYCS027

Manish Chandak

Roll No.: 16EAYCS045

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Abhishek Pratap Singh(16EAYCS005)

Disha Chhabra(16EAYCS027)

Manish Chandak(16EAYCS045)

ABSTRACT

Our project would revolve around coming up with a smart shoe prototype that could pair with smartphones using Bluetooth and help provide navigational information through vibrational units placed all around the shoe. In essence, these shoes could give indications about when to take a turn and where to take a turn.

All this information would be relayed through 4 vibrational units located in the front, back, left and right segments of the shoe representing the 4 directions that one could go in. There would be a microcontroller connected to a Bluetooth transmits receiver that would send signals to the vibrational units based on information received.

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INTRODUCTION

INTRODUCTION CHAPTER 1

1.1 Introduction

Blindness, low vision, visual impairment and vision loss have dramatic impacts on individuals experiencing such disabilities. These carry with them physiological, psychological, social, and economic outcomes, hence impacting the quality of life and depriving such individuals from performing many of the Activities of Daily Living (ADL), the most crucial of which is navigation and mobility.

Blindness is a qualitative term that describes the clinical condition whereby individuals have no light perception as a result of total vision loss. Blindness also refers to those who have so little vision that they have to rely predominantly on other senses as vision substitution skills. On the other hand, visual impairments are a qualitative term used when the condition of vision loss is characterized by a loss of visual functions at the organ level, such as the loss of visual acuity or the loss of visual field.

This project presents a prototype model and a system concept to provide a smart electronic aid for blind people. This system is intended to provide overall measures object detection, and send information related to blind people. The system consists of microcontroller, ultrasonic sensor, and a vibratory circuit. This project aims at the development of an Electronic Travelling Aid (ETA) kit to help the blind people to find obstacle free path. This ETA is fixed to the shoe. When the object is detected near to the shoe alerts them with the help of vibratory circuit and also in advancement with help of speakers or head phones that is voice command with the help of android application. Here the power supply is main criteria the shoe is integrated with self-power generation unit such that there is no power backup problem.

1.2 Problem statement

Artificial Vision is the most important part of human physiology as 83% of information human being gets from the environment is via sight. The statistics by the World Health Organization (WHO) in 2014 estimates that there are 285 billion people in world with visual impairment, 39 billion of people which are blind and 246 with low vision. The oldest and traditional mobility aids for persons with visual impairments are the walking cane (also called white cane or stick) and guide dogs. The drawbacks of these aids are range of motion and very little Information conveyed. With the rapid advances of modern technology, both in hardware and software front have brought potential to provide intelligent navigation capabilities. Recently there has been a lot of Electronic Travel Aids (ETA) designed and devised to help the blind people to navigate safely and independently. Also, high-end technological solutions have been introduced recently to help blind persons navigate independently.

The IR sensor and buzzer will not give accurate result to the blind people, this is the main drawback of previous project, in previous project IR sensor are the object detecting sensor, the problem associated with these reasons and less efficiency and loss the accuracy to detect object and one more problem is it will not provide clean information to blind people.

1.3 Solution to the problem

With the rapid advances of modern technology, both in hardware and software front have brought potential to provide intelligent navigation capabilities. Recently there has been a lot of Electronic Travel Aids (ETA) designed and devised to help the blind people to navigate safely and independently. Also, high-end technological solutions have been introduced recently to help blind persons navigate independently. In this project, an effort has been made to improve the quality of the system to be more helpful for the blind people. In this project, the system is having been made as a part of the blind person’s shoe. and in this project, we are using ultra sonic sensor and speaker which provide more accuracy of object detection and given clean information to blind people respectively.

1.4 Proposed system

This project presents a prototype model and a system concept to provide a smart electronic aid for blind people. This system is intended to provide overall measures object detection, human detection, and real-time Assistance system consist of microcontroller, ultrasonic sensor and vibratory circuit. This project aims at the development of an Electronic Travelling Aid (ETA) kit to help the blind people to find obstacle free path. This ETA is fixed to the shoe. When the object is detected near to the shoe and if any person coming in front it alerts them with the help of vibratory circuit and also in advancement with help of speakers or head phones that is voice command with the help of android application. Here the power supply is main criteria the shoe is integrated with self-power generation unit such that there is no power backup problem

1.5 Methodology

This project presents a prototype model and a system concept to provide a smart electronic aid for blind people. This system is intended to provide overall measures object detection, and real-time Assistance via Global Positioning System. The system consists of microcontroller, ultrasonic sensor and vibratory circuit and Bluetooth unit. This project aims at the development of an Electronic.

Travelling Aid (ETA) kit to help the blind people to find obstacle free path. This ETA is fixed to the shoe. When the object is detected near to the shoe and if any person coming in front it alerts them with the help of vibratory circuit and also in advancement with help of speakers or head phones that is voice command. Here the power supply is main criteria the shoe is integrated with self-power generation unit such that there is no power backup problem.

CHAPTER 2
CIRCUIT DESCRIPTION

CIRCUIT DESCRIPTION CHAPTER 2

The project mainly consists of many important electronic components, and has the PIC Microcontroller. These main components are explained in brief followed by their internal working of the used components in the forthcoming sections. The circuit diagram consists of the following:

- Microcontroller ARDUINO UNO.
- Zigbee module interface.
- Vibration unit.
- GSM.
- Voice storage & voice reply.
- Ultrasonic distance measurement module.
- Gyroscope interface.

Arduino is an open-source electronics platform based on easy-to-use hardware and software. Arduino boards are able to read inputs - light on a sensor, a finger on a button, or a Twitter message - and turn it into an output - activating a motor, turning on an LED, publishing something online. You can tell your board what to do by sending a set of instructions to the microcontroller on the board.

There are many other microcontrollers and microcontroller platforms available for physical computing. Parallax Basic Stamp, Netmedia's BX-24, Phidgets, MIT's Handyboard, and many others offer similar functionality. All of these tools take the messy details of microcontroller programming and wrap it up in an easy-to-use package. Arduino also simplifies the process of working with microcontrollers.

2.1 Advantages of Arduino Uno

- **Inexpensive -** Arduino boards are relatively inexpensive compared to other microcontroller platforms. The least expensive version of the Arduino module can be assembled by hand, and even the pre-assembled Arduino modules cost less than $50
- **Cross-platform** - The Arduino Software (IDE) runs on Windows, Macintosh OSX, and Linux operating systems. Most microcontroller systems are limited to Windows.

- **Simple, clear programming environment** - The Arduino Software (IDE) is easy-to-use for beginners, yet flexible enough for advanced users to take advantage of as well. For teachers, it's conveniently based on the Processing programming environment, so students learning to program in that environment will be familiar with how the Arduino IDE works.
- **Open source and extensible software** - The Arduino software is published as open source tools, available for extension by experienced programmers. The language can be expanded through C++ libraries, and people wanting to understand the technical details can make the leap from Arduino to the AVR C programming language on which it's based. Similarly, you can add AVR-C code directly into your Arduino programs if you want to.
- **Open source and extensible hardware** - The plans of the Arduino boards are published under a Creative Commons license, so experienced circuit designers can make their own version of the module, extending it and improving it. Even relatively inexperienced users can build the breadboard version of the module in order to understand how it works and save money.

2.2 What's on The Board?

There are many varieties of Arduino boards that can be used for different purposes. Some boards look a bit different from the one below, but most Arduinos have the majority of these components in common: different from the one below, but most Arduinos have the majority of these components in common:

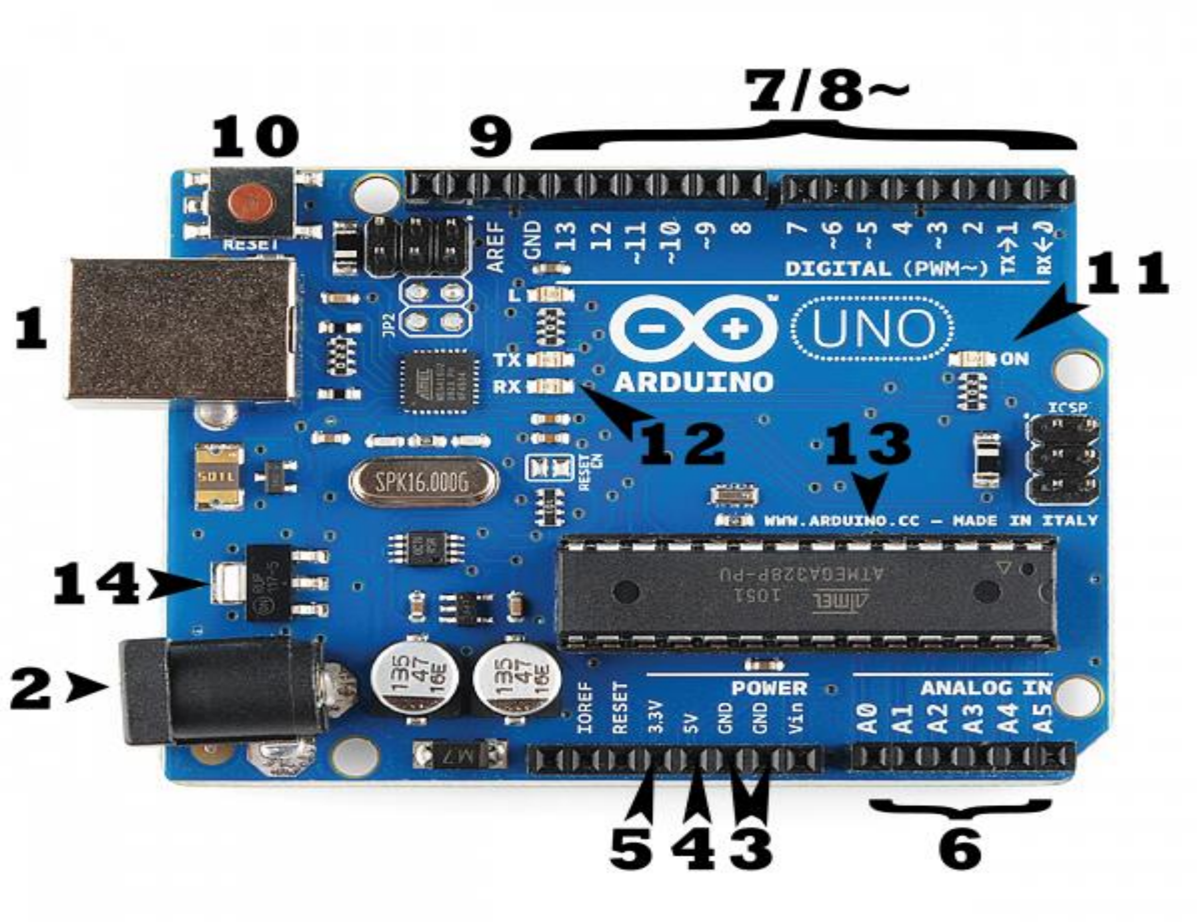

Fig: 2.1 Arduino uno

2.2.1 Power (USB / Barrel Jack)

Every Arduino board needs a way to be connected to a power source. The Arduino UNO can be powered from a USB cable coming from your computer or a wall power supply that is terminated in a barrel jack. In the picture above the USB connection is labeled **(1)** and the barrel jack is labeled **(2)**. The USB connection is also how you will load code onto your Arduino board.

2.2.2 Pins (5V, 3.3V, GND, Analog, Digital, PWM, AREF)

The pins on your Arduino are the places where you connect wires to construct a circuit (probably in conjuction with a breadboard and some wire. They usually have black plastic 'headers' that allow you to just plug a wire right into the board. The Arduino has several different kinds of pins, each of which is labeled on the board and used for different functions.

- GND (3): Short for 'Ground'. There are several GND pins on the Arduino, any of which can be used to ground your circuit.
- 5V (4) & 3.3V (5): As you might guess, the 5V pin supplies 5 volts of power, and the 3.3V pin supplies 3.3 volts of power. Most of the simple components used with the Arduino run happily off of 5 or 3.3 volts.
- Analog (6): The area of pins under the 'Analog In' label (A0 through A5 on the UNO) are Analog In pins. These pins can read the signal from an analog sensor (like a temperature sensor) and convert it into a digital value that we can read.
- Digital (7): Across from the analog pins are the digital pins (0 through 13 on the UNO). These pins can be used for both digital input (like telling if a button is pushed) and digital output (like powering an LED).
- PWM (8): You may have noticed the tilde (~) next to some of the digital pins (3, 5, 6, 9, 10, and 11 on the UNO). These pins act as normal digital pins, but can also be used for something called Pulse-Width Modulation (PWM). We have a tutorial on PWM, but for now, think of these pins as being able to simulate analog output (like fading an LED in and out).
- AREF (9): Stands for Analog Reference. Most of the time you can leave this pin alone. It is sometimes used to set an external reference voltage (between 0 and 5 Volts) as the upper limit for the analog input pins.

2.2.3 Reset Button

Just like the original Nintendo, the Arduino has a reset button (10). Pushing it will temporarily connect the reset pin to ground and restart any code that is loaded on the Arduino. This can be very useful if your code doesn't repeat, but you want to test it multiple times. Unlike the original Nintendo however, blowing on the Arduino doesn't usually fix any problems.

2.2.4 TX RX LEDs

TX is short for transmit; RX is short for receive. These markings appear quite a bit in electronics to indicate the pins responsible for serial communication. In our case, there are two places on the Arduino UNO where TX and RX appear – once by digital pins 0 and 1, and a second time next to the TX and RX indicator LEDs (12). These LEDs will give us some nice visual indications whenever our Arduino is receiving or transmitting data (like when we're loading a new program onto the board).

2.2.5 Main IC

The black thing with all the metal legs is an IC, or Integrated Circuit (13). Think of it as the brains of our Arduino. The main IC on the Arduino is slightly different from board type to board type, but is usually from the ATmega line of IC's from the ATMEL company. This can be important, as you may need to know the IC type (along with your board type) before loading up a new program from the Arduino software. This information can usually be found in writing on the top side of the IC. If you want to know more about the difference between various IC's, reading the datasheets is often a good idea.

2.2.6 Voltage Regulator

The voltage regulator (14) is not actually something you can (or should) interact with on the Arduino. But it is potentially useful to know that it is there and what it's for. The voltage regulator does exactly what it says -- it controls the amount of voltage that is let into the Arduino board. Think of it as a kind of gatekeeper; it will turn away an extra voltage that might harm the circuit. Of course, it has its limits, so don't hook up your Arduino to anything greater than 20 volts.

2.3 What is Zigbee?

Zigbee is a wireless communication module which use IEEE 802.15.4 standard. 802.15.4 is a IEEE standard for low power applications of radio frequency. It used in many products now a days for wireless communication functionality. It can be used as a transmitter and receiver both. It used serial communication to send and receive data. It has two series, series1 and series 2. Series 1 is comparatively easy to use and it is recommended for beginners. Series 1 zigbee module cannot work in mesh network. Mean it cannot talk to more than one zigbees buddies.

2.3.1 How zigbee technology works?

It uses serial port to send and receive data. So, it means it can be easily interface with Arduino Uno R3, any type of microcontroller and computer. Because they all support serial communication and they all have serial port to send and receive data. It can also communicate with other Zigbee to form a mesh. Zigbee can also be used to make a local area network. It has many applications. But some of the famous applications of Zigbee is given below.

2.3.2 Applications of Zigbee:

Some of the famous applications are given below:

- Wireless communication
- wirelessly controlled robot
- remote monitoring system
- Wireless home automation system
- wireless temperature sensor.

Zigbee alone can’t do anything. You have to interface it with some intelligent device like microcontrollers, Arduino and computer. These devices will tell it what to do or what no to do through already fed program inside microcontrollers and Arduino Uno R3. These digital devices are no such intelligent. But you can make them intelligent by writing few lines of instructions

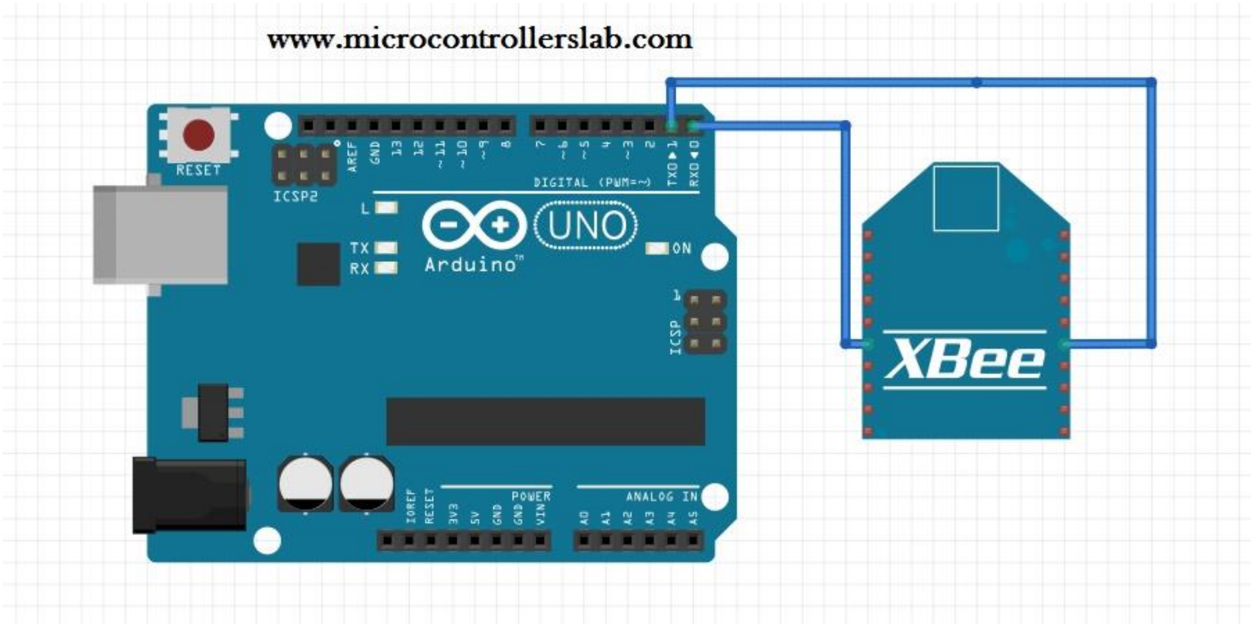

Fig: 2.2 Interface Zigbee with Arduino

2.3.3 Zigbee interfacing with Arduino

Figure above shows connection diagram of module with Arduino. Remember. Your module should have regulated 5 volt and 3.3 volt. If you use Adafruit XBee Adapter it has both voltage level. Otherwise you have to use separate power supply. In above circuit. TX and RX pin of zigbee and Arduino are connected to each other. Arduino will send some instruction to zigbee and according to these instruction zigbee respond. Similary zigbee receive intructions from other zigbee to which it have address. After receiving instructions or data from other zigbee. It sends data to arduino through serial pins as shown in connection. Similarly, another module can be connected with one more Arduino or computer.

2.4 Vibration Sensor

The vibration sensor is used for testing the impact force. It has high vibration detection sensitivity and the environmental of sound signal suppression, which has strong ability to engage in interference.

2.5 GSM

GSM stands for Global System for Mobile Communications, originally Groupe Special Mobile. It is a standard developed by the European Telecommunications Standards Institute (ETSI).It was created to describe the protocols for second-generation (2G) digital cellular networks used by mobile phones and is now the default global standard for mobile communications – with over 90% market share, operating in over 219 countries and territories. A GSM module or a GPRS module is a chip or circuit that will be used to establish communication between a mobile device or a computing machine and a GSM or GPRS system. The modem (modulator-demodulator) is a critical part here.
These modules consist of a GSM module or GPRS modem powered by a power supply circuit and communication interfaces (like RS-232, USB 2.0, and others) for computer. A GSM modem can be a dedicated modem device with a serial, USB or Bluetooth connection, or it can be a mobile phone that provides GSM modem capabilities.

2.6 Features of GSM Module:

- Improved spectrum efficiency
- International roaming
- Compatibility with integrated services digital network (ISDN)
- Support for new services.
- SIM phonebook management
- Fixed dialing number (FDN)
- Real time clock with alarm management
- High-quality speech

- Uses encryption to make phone calls more secure
- Short message service (SMS)
- LCD Module

LCD Module is an integral part of the project which is used in all the four modules for the display of information. LCD is 16X2 types. This is interfaced in 4-bit mode. The four data lines are connected to PORTE E0-E3 pins, E4 and E5 lines are connected to RS and EN pins of LCD.

2.7 LEDs

As many as four LEDs have been provided on the Controller board. They can be used for several kinds of indications.

2.8 Power Supply

Input the controller board is given by 12V dc adaptor. This 12V is used to drive the relays. A regulator IC 7805 is used to regulate voltage to +5V which is needed for powering the controller and other device used on the board.

2.9 Ultrasonic Module

An ultrasonic sensor is an electronic device that measures the distance of a target object by emitting ultrasonic sound waves, and converts the reflected sound into an electrical signal. Ultrasonic waves travel faster than the speed of audible sound (i.e. the sound that humans can hear). Ultrasonic sensors have two main components: the transmitter (which emits the sound using piezoelectric crystals) and the receiver (which encounters the sound after it has travelled to and from the target).

In order to calculate the distance between the sensor and the object, the sensor measures the time it takes between the emission of the sound by the transmitter to its contact with the receiver. The formula for this calculation is $D = \frac{1}{2} T \times C$ (where D is the distance, T is the time, and C is the speed of sound ~ 343 meters/second).

Figure 2.3: Ultrasonic Sensor

Ultrasonic sensors are used primarily as proximity sensors. They can be found in automobile self-parking technology and anti-collision safety systems. Ultrasonic sensors are also used in robotic obstacle detection systems, as well as manufacturing technology. In comparison to infrared (IR) sensors in proximity sensing applications, ultrasonic sensors are not as susceptible to interference of smoke, gas, and other airborne particles (though the physical components are still affected by variables such as heat).

Ultrasonic sensors are also used as level sensors to detect, monitor, and regulate liquid levels in closed containers (such as vats in chemical factories). Most notably, ultrasonic technology has enabled the medical industry to produce images of internal organs, identify tumors, and ensure the health of babies in the womb.

2.10 How does Ultrasonic sensor work?

Ultrasonic sensors work by emitting sound waves at a frequency too high for humans to hear. They then wait for the sound to be reflected back, calculating distance based on the time required. This is similar to how radar measures the time it takes a radio wave to return after hitting an object.

While some sensors use a separate sound emitter and receiver, it’s also possible to combine these into one package device, having an ultrasonic element alternate between emitting and receiving signals. This type of sensor can be manufactured in a smaller package than with separate elements, which is convenient for applications where size is at a premium.

While radar and ultrasonic sensors can be used for some of the same purposes, sound-based sensors are readily available—they can be had for just a couple dollars in some cases—and in certain situations, they may detect objects more effectively than radar.

For instance, while radar, or even light-based sensors, have a difficult time correctly processing clear plastic, ultrasonic sensors have no problem with this. In fact, they're unaffected by the colour of the material they are sensing.

On the other hand, if an object is made out of a material that absorbs sound or is shaped in such a way that it reflects the sound waves away from the receiver, readings will be unreliable.

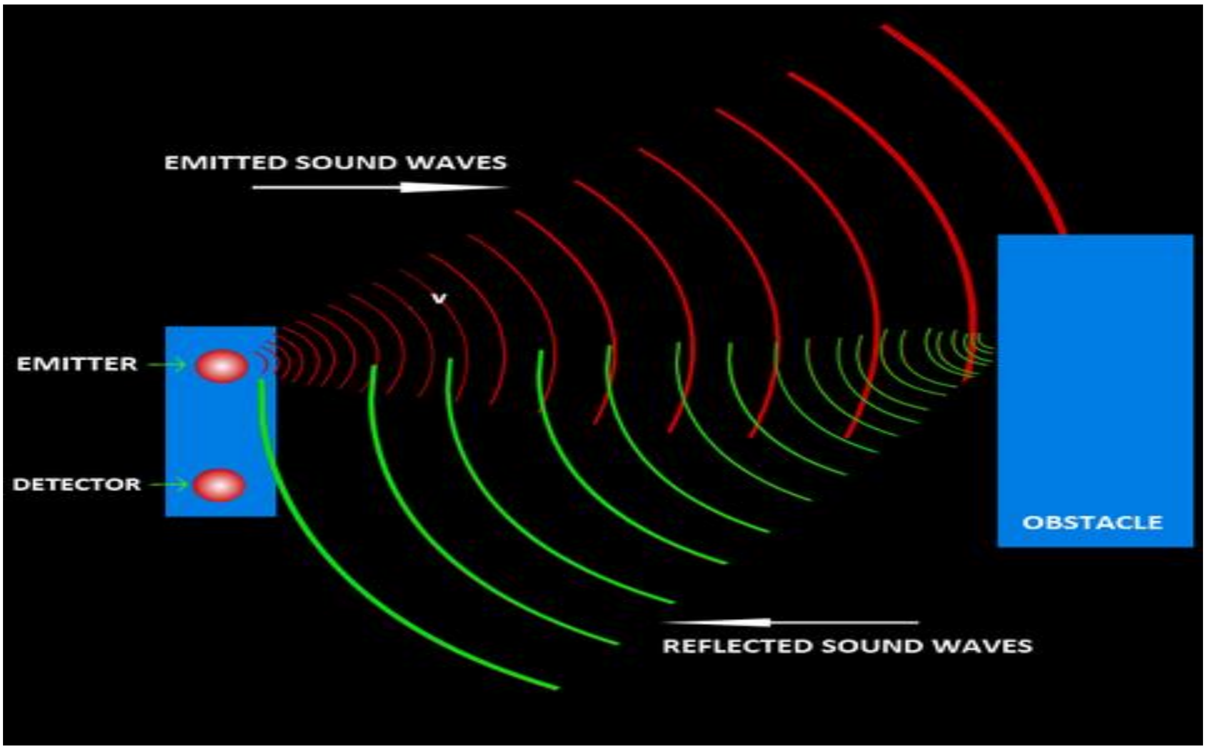

Fig 2.4 Ultrasonic sensor diagram.

CHAPTER 3
COMPONENT REQUIREMENT

3.1 Hardware requirements

3.1.1 Arduino UNO

The Arduino Uno is a microcontroller board based on the ATmega328 (datasheet). It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with an AC-to-DC adapter or battery to get started. The Uno differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it features the Atmega8U2 programmed as a USB-to-serial converter.

Figure 3.1: ARDUINO UNO Board

"Uno" means one in Italian and is named to mark the upcoming release of Arduino 1.0. The Uno and version 1.0 will be the reference versions of Arduno, moving forward. The Uno is the latest in a series of USB Arduino boards, and the reference model for the Arduino platform; for a comparison with previous versions, see the index of Arduino boards.

The Arduino Uno can be powered via the USB connection or with an external power supply. The power source is selected automatically.

External (non-USB) power can come either from an AC-to-DC adapter (wall-wart) or battery. The adapter can be connected by plugging a 2.1mm center-positive plug into the board's power jack. Leads from a battery can be inserted in the Gnd and VIN pin headers of the POWER connector.

The board can operate on an external supply of 6 to 20 volts. If supplied with less than 7V, however, the 5V pin may supply less than five volts and the board may be unstable. If using more than 12V, the voltage regulator may overheat and damage the board. The recommended range is s7 to 12 volts.

The power pins are as follows:

- VIN The input voltage to the Arduino board when it's using an external power source (as opposed to 5 volts from the USB connection or other regulated power source). You can supply voltage through this pin, or, if supplying voltage via the power jack, access it through this pin.
- 5V the regulated power supply used to power the microcontroller and other components on the board. This can come either from VIN via an on-board regulator, or be supplied by USB or another regulated 5V supply.
- 3V3 A 3.3-volt supply generated by the on-board regulator. Maximum current draw is 50 mA.
- GND. Ground pins.

The Atmega328 has 32 KB of flash memory for storing code (of which 0,5 KB is used for the boot loader); It has also 2 KB of SRAM and 1 KB of EEPROM (which can be read and written with the EEPROM library).

The Arduino Uno has a number of facilities for communicating with a computer, another Arduino, or other microcontrollers. The ATmega328 provides UART TTL (5V) serial communication, which is available on digital pins 0 (RX) and 1 (TX). An ATmega8U2 on the board channels this serial communication over USB and appears as a virtual com port to software on the computer. The '8U2 firmware uses the standard USB COM drivers, and no external driver is needed. However, on Windows, an *.inf file is required.

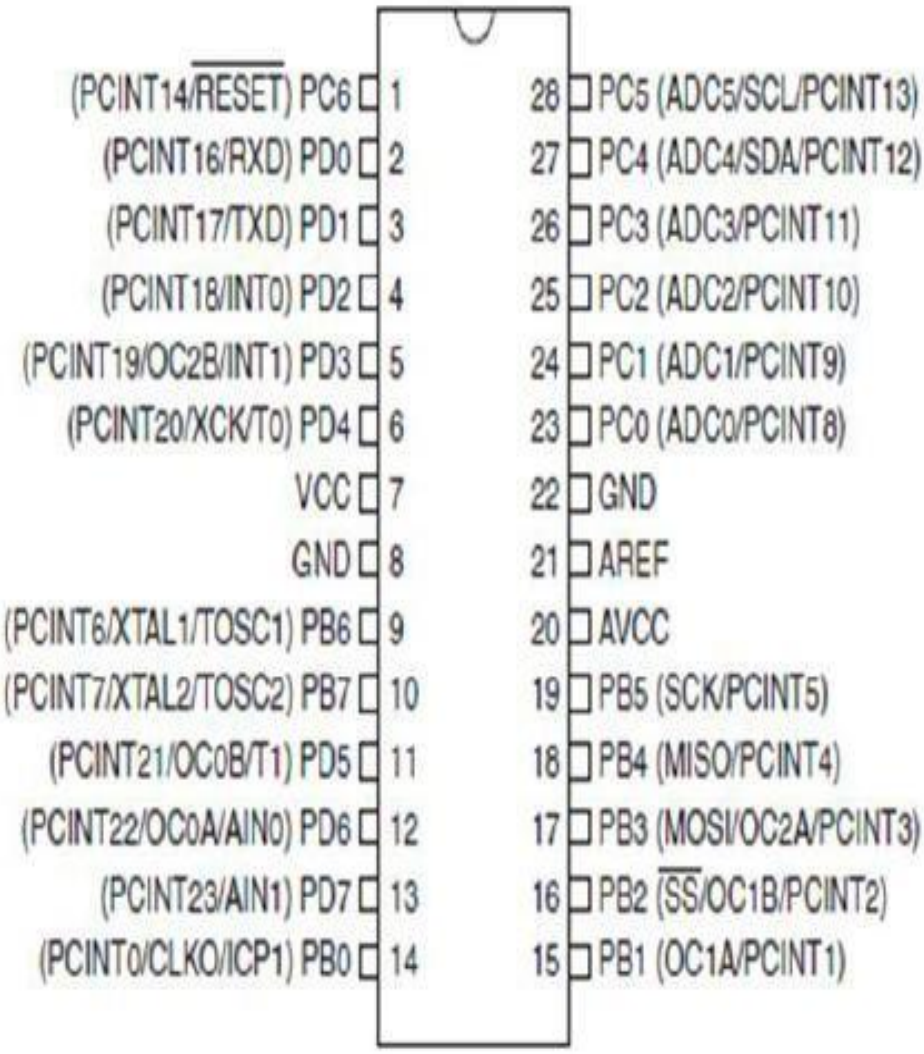

Figure 3.2: ARDUINO UNO PIN Diagram

Rather than requiring a physical press of the reset button before an upload, the Arduino Uno is designed in a way that allows it to be reset by software running on a connected computer. One of the hardware flow control lines (DTR) of the ATmega8U2 is connected to the reset line of the ATmega328 via a 100 nano farad capacitor. When this line is asserted (taken low), the reset line drops long enough to reset the chip. The Arduino software uses this capability to allow you to upload code by simply pressing the upload button in the Arduino environment. This means that the boot loader can have a shorter timeout, as the lowering of DTR can be well-coordinated with the start of the upload.

This setup has other implications. When the Uno is connected to either a computer running Mac OS X or Linux, it resets each time a connection is made to it from software (via USB). For the following half-second or so, the boot loader is running on the Uno. While it is programmed to ignore malformed data (i.e. anything besides an upload of new code), it will intercept the first few bytes of data sent to the board after a connection is opened. If a sketch running on the board receives one-time configuration or other data when it first starts, make sure that the software with which it communicates waits a second after opening the connection and before sending this data.

The Uno contains a trace that can be cut to disable the auto-reset. The pads on either side of the trace can be soldered together to re-enable it. It's labeled "RESET-EN". You may also be able to disable the auto-reset by connecting a 110-ohm resistor from 5V to the reset line; see this forum thread for details.

3.1.2 Power

The Arduino Uno can be powered via the USB connection or with an external power supply. The power source is selected automatically. External (non-USB) power can come either from an AC-to-DC adapter (wall-wart) or battery. The adapter can be connected by plugging a 2.1mm center-positive plug into the board's power jack. Leads from a battery can be inserted in the Gnd and VIN pin headers of the POWER connector. The board can operate on an external supply of 6 to 20 volts. If supplied with less than 7V, however, the 5V pin may supply less than five volts and the board may be unstable.

If using more than 12V, the voltage regulator may overheat and damage the board. The recommended range is 7 to 12 volts. The power pins are as follows: VIN. The input voltage to the Arduino board when it's using an external power source (as opposed to 5 volts from the USB connection or other regulated power source). You can supply voltage through this pin, or, if supplying voltage via the power jack, access it through this pin. +5V.This pin outputs a regulated 5V from the regulator on the board. The board can be supplied with power either from the DC power jack (7 - 12V), the USB connector (5V), or the VIN pin of the board (7-12V).

Supplying voltage via the 5V or 3.3V pins bypasses the regulator, and can damage your board. We don't advise it 3V3. A 3.3-volt supply generated by the on-board regulator. Maximum current draw is 50 mA. GND. Ground pins.

3.1.3 AVR Architecture

Microcontroller ATmega328 Operating Voltage 5V Input Voltage (recommended) 7-12V Input Voltage (limits) 6-20V Digital I/O Pins 14 (of which 6 provide PWM output) Analog Input Pins 6 DC Current per I/O Pin 40 mA DC Current for 3.3V Pin 50 mA Flash Memory 32 KB of which 0.5 KB used by boot loader SRAM 2 KB EEPROM 1 KB Clock Speed 16 MHz

The 16-bit dsPIC30F Digital Signal Controller (DSC) is Microchip’s newest and most advanced processor family. The dsPIC30F is an advanced 16-bit processor that offers true DSP capability with the fundamental real-time control capabilities of a microcontroller.

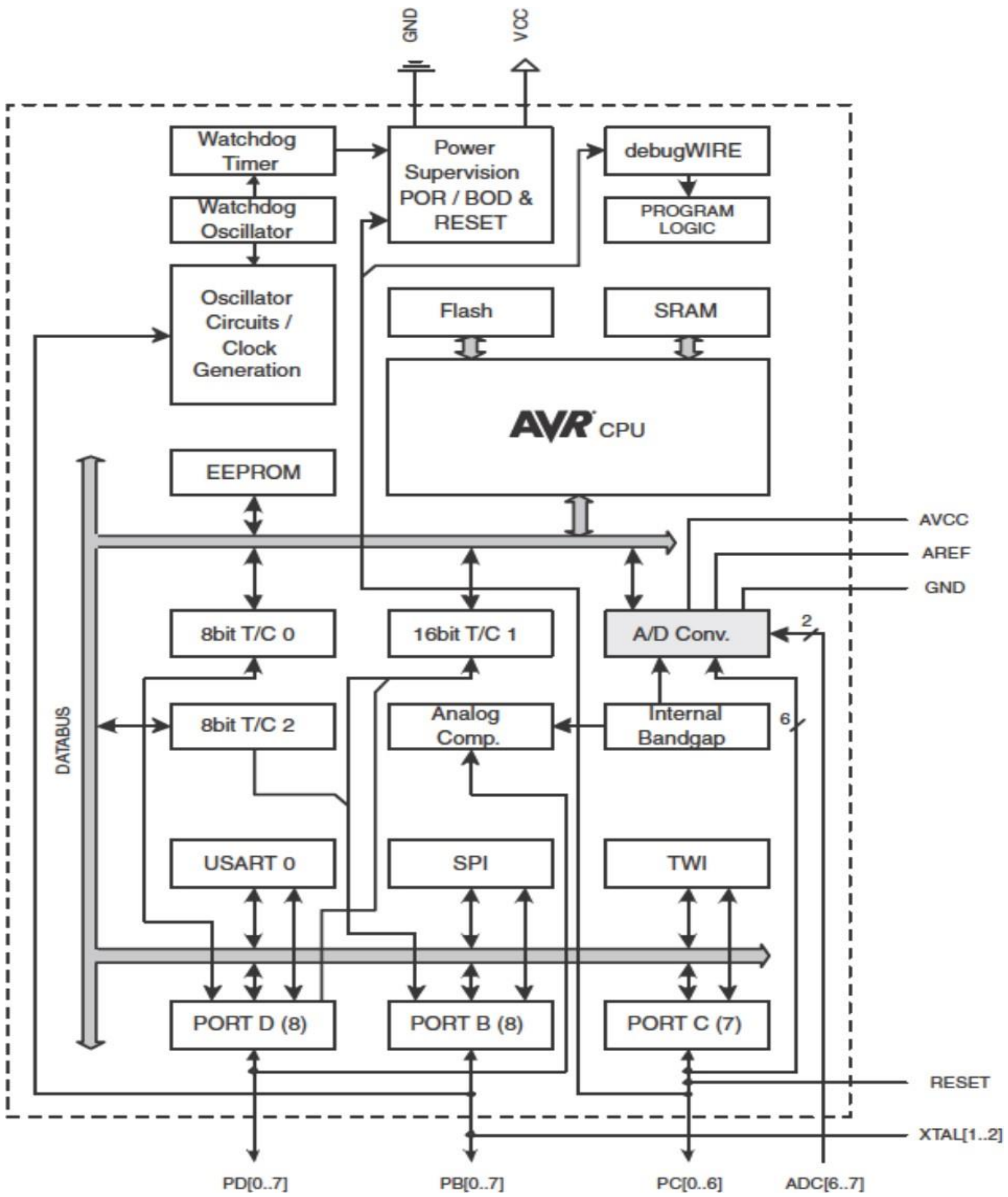

Figure 3.3: AVR Architecture

3.1.4 Memory

The ATmega328 has 32 KB (with 0.5 KB used for the boot loader). It also has 2 KB of SRAM and 1 KB of EEPROM (which can be read and written with the EEPROM library).

3.1.5 Input and Output

Each of the 14 digital pins on the Uno can be used as an input or output, using pin Mode, digital Write, and digital Read functions. They operate at 5 volts. Each pin can provide or receive a maximum of 40 mA and has an internal pull-up resistor (disconnected by default) of 20-50 ohms. In addition, some pins have specialized functions:

Serial: 0 (RX) and 1 (TX). Used to receive (RX) and transmit (TX) TTL serial data. These pins are connected to the corresponding pins of the ATmega8U2 USB-to-TTL Serial chip.

- External Interrupts: 2 and 3. These pins can be configured to trigger an interrupt on a low value, a rising or falling edge, or a change in value. See the attach Interrupt function for details.
- PWM: 3, 5, 6, 9, 10, and 11. Provide 8-bit PWM output with the analog Write function.

SPI: 10 (SS), 11 (MOSI), 12 (MISO), 13 (SCK). These pins support SPI communication using the SPI library.

LED: 13. There is a built-in LED connected to digital pin 13. When the pin is HIGH value, the LED is on, when the pin is LOW, it's off.

The Uno has 6 analog inputs, labeled A0 through A5, each of which provide 10 bits of resolution (that is 1024 different values). By default, they measure from ground to 5 volts, though is it possible to change the upper end of their range using the AREF pin and the analog Reference function. Additionally, some pins have specialized functionality:

TWI: A4 or SDA pin and A5 or SCL pin. Support TWI communication using the Wire library.

There are a couple of other pins on the board: AREF. Reference voltage for the analog inputs. Used with analog Reference, Reset.

Bring this line LOW to reset the microcontroller. Typically used to add a reset button to shields which block the one on the board. See also the mapping between Arduino pins and ATmega328 ports. The mapping for the Atmega8, 168, and 328 is identical.

3.1.6 Communication

The Arduino Uno has a number of facilities for communicating with a computer, another Arduino, or other microcontrollers. The ATmega328 provides UART TTL (5V) serial communication, which is available on digital pins 0 (RX) and 1 (TX). An ATmega16U2 on the board channels this serial communication over USB and appears as a virtual com port to software on the computer. The '16U2 firmware uses the standard USB COM drivers, and no external driver is needed. However, on Windows, an .info file is required. The Arduino software includes a serial monitor which allows simple textual data to be sent to and from the Arduino board. The RX and TX LEDs on the board will flash when data is being transmitted via the USB-to-serial chip and USB connection to the computer (but not for serial communication on pins 0 and 1). A Software Serial library allows for serial communication on any of the Uno's digital pins. The ATmega328 also supports I2C (TWI) and SPI communication. The Arduino software includes a Wire library to simplify use of the I2C bus; see the documentation for details. For SPI communication, use the SPI library.

3.1.7 Programming

The Arduino Uno can be programmed with the Arduino software (download). Select "Arduino Uno from the Tools > Board menu (according to the microcontroller on your board). For details, see the reference and tutorials. The ATmega328 on the Arduino Uno comes pre burned with a boot loader that allows you to upload new code to it without the use of an external hardware programmer. It communicates using the original STK500 protocol (reference, C header files). You can also bypass the boot loader and program the microcontroller through the ICSP (In-Circuit Serial Programming) header; see these instructions for details. The ATmega16U2 (or 8U2 in the rev1 and rev2 boards) firmware source code is available. The ATmega16U2/8U2 is loaded with a DFU boot loader, which can be activated by. On Rev1 boards: connecting the solder jumper on the back of the board (near the map of Italy) and then resetting the 8U2.On Rev2 or later boards: there is a resistor that pulling the 8U2/16U2 HWB line to ground, making it easier to put into DFU mode. You can then use Atmel's FLIP software (Windows) or the DFU programmer (Mac OS X and Linux) to load a new firmware. Or you can use the ISP header with an external programmer (overwriting the DFU boot loader). See this user-contributed tutorial for more information.

3.1.8 USB Over current Protection

The Arduino Uno has a resettable poly fuse that protects your computer's USB ports from shorts and over current. Although most computers provide their own internal protection, the fuse provides an extra layer of protection. If more than 500 mA is applied to the USB port, the fuse will automatically break the connection until the short or overload is removed.

3.1.9 Physical Characteristics

The maximum length and width of the Uno PCB are 2.7 and 2.1 inches respectively, with the USB connector and power jack extending beyond the former dimension. Four screw holes allow the board to be attached to a surface or case. Note that the distance between digital pins 7 and 8 is 160 mil (0.16"), not an even multiple of the 100-mil spacing of the other pins.

3.1.10 Overview

The main theme of the Proteus 8 release is integration. Development has therefore been focused on taking the various discrete parts of an electronic design and coupling them together to achieve a better workflow. In order to achieve this, three major architectural changes were necessary; a unified application framework, a common database and a live net list.

3.1.11 Common Database & Live Net listing

The common database and live net listing features provide system wide access to the properties of the parts and the connectivity between them. Features like pin swap, gate swap and annotation are both automatic and bi-directional between schematic and PCB and connectivity changes on the schematic can be automatically reflected in any other module (BOM, Design Explorer, ARES). These features also lay the foundation for a number of development projects such as design snippets which we plan to bring forth during the lifetime of Proteus 8. Proteus 8 stores the design (DSN), layout (LYT) and common database in a single project file (PDSPRJ).

3.2 ARDUINO IDE SOFTWARE

3.2.1 Reading a Potentiometer (analog input)

A potentiometer is a simple knob that provides a variable resistance, which we can read into the Arduino board as an analog value. In this example, that value controls the rate at which an LED blinks.

We connect three wires to the Arduino board. The first goes to ground from one of the outer pins of the potentiometer. The second goes from 5 volts to the other outer pin of the potentiometer. The third goes from analog input 2 to the middle pin of the potentiometer.

By turning the shaft of the potentiometer, we change the amount of resistance on either side of the wiper which is connected to the center pin of the potentiometer. This changes the relative "closeness" of that pin to 5 volts and ground, giving us a different analog input. When the shaft is turned all the way in one direction, there are 0 volts going to the pin, and we read 0. When the shaft is turned all the way in the other direction, there are 5 volts going to the pin and we read 1023. In between, analog Read returns a number between 0 and 1023 that is proportional to the amount of voltage being applied to the pin.

Examples

Analog Read to LED

```
* Turns on and off a light emitting diode (LED) connected to digital
* pin 13. The amount of time the LED will be on and off depends on
* The value obtained by analog Read (). In the easiest case we connect
* A potentiometer to analog pin 2.
int potPin = 2;                          // select the input pin for the potentiometer
int ledPin = 13;                         // select the pin for the LED
int val = 0;                             // variable to store the value coming from the
sensor
void setup()
{
pinMode(ledPin, OUTPUT);                 // declare the ledPin as an OUTPUT
```

```
}
void loop() {
val = analogRead(potPin);          // read the value from the sensor
digitalWrite(ledPin, HIGH);        // turn the ledPin on
delay(val);                        // stop the program for some time
digitalWrite(ledPin, LOW);         // turn the led Pin off
delay(val);                        // stop the program for some time
}
```

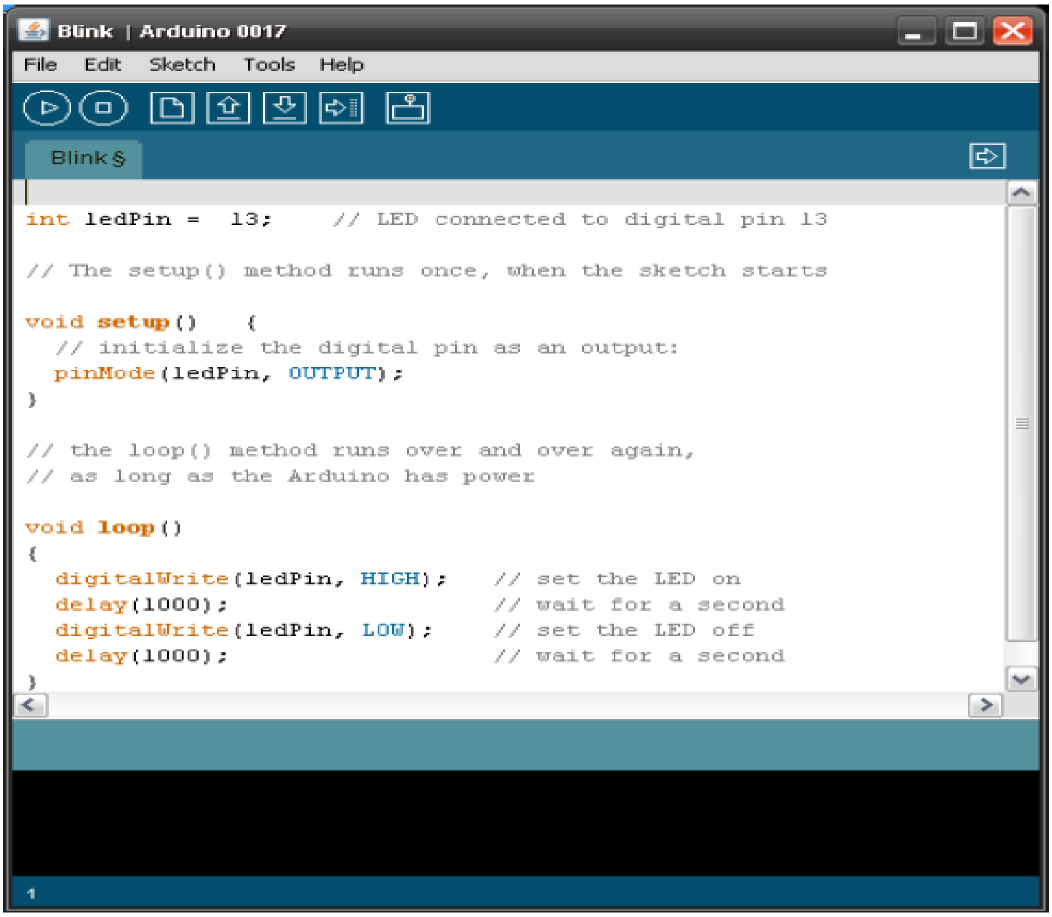

Figure 3.4: Program Developed Snapshot

CHAPTER 4
SYSTEM DESIGN AND IMPLEMENTATION

4.1 Hardware design

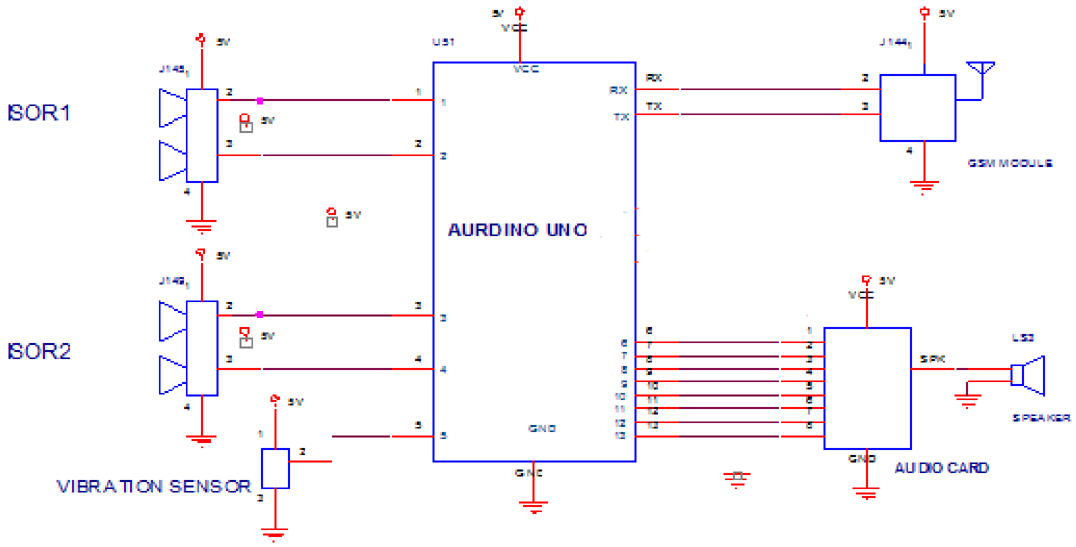

Figure 4.1: Circuit Diagram

This project is intended to be developed as tool or aid that will help blind people in moving or travelling. The dependency on others is reduced and these people can become more self-element.

The project is built around ARDUINO UNO controller. The project has features to detect obstacles using ultrasonic module. These sensors are mounted on the shoes of the blind person. The person is alerted and will information on the surroundings.

Zigbee module will inform the tracking person about the movement of the person who is wearing the shoe. Vibration is used to alert the blind person if there are any obstacles in his path.

Gyro sensor is used to detect whether the person is able to balance when he is waling.
Inc case he is losing the balance the person is alerted.

The project mainly consists of many important electronic components, and has the PIC Microcontroller. These main components are explained in brief followed by their internal working of the used components in the forthcoming sections. The circuit diagram consists of the following:

- Microcontroller ARDUINO UNO.
- Zigbee module interface.
- Vibration unit.
- GSM.

- Voice storage & voice reply.
- Ultrasonic distance measurement module.
- Gyroscope interface.
- Power supply.

Input the controller board is given by 12V dc adaptor. This 12V is used to drive the relays. A regulator IC 7805 is used to regulate voltage to +5V which are needed for powering the controller and other device used on the board.

4.1.1 Flow chart

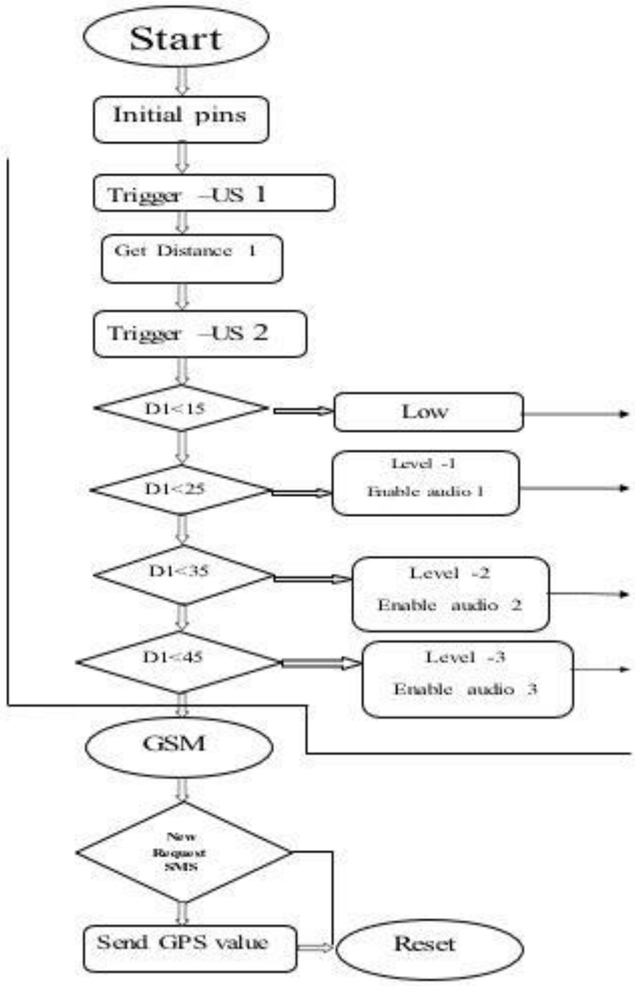

Figure 4.2: System flow diagram

4.2 Pin details

- Pin number A0 = connected to straight audio card.
- Pin number A1 = connected to straight audio card.
- Pin number A2 = connected to straight audio card.
- Pin number A3 = connected to straight audio card.
- Pin number A4 = connected to straight audio card.
- Pin number A5 = connected to left audio card.
- Pin number 0 = connected to left audio card.
- Pin number 1 = connected to left audio card.
- Pin number 2 = connected to power to the vibratory sensor.
- Pin number 3 = connected to output to the vibratory sensor.
- Pin number 4 = connected to trigger to the ultrasonic sensor.
- Pin number 5 = connected to echo to the ultrasonic sensor.
- Pin number 6 = connected to trigger to the ultrasonic sensor.
- Pin number 7 = connected to echo to the ultrasonic sensor.
- Pin number 8 = connected to Tx to the GSM.
- Pin number 9 = connected to Rx to the GSM.
- Pin number 10 = connected to Tx to the GSM.

CHAPTER 5
ADVANTAGES AND LIMITATIONS

ADVANTAGES AND LIMITATIONS CHAPTER 5

- Low design time.
- Low production cost.
- This system is applicable for both the indoor and outdoor environment.
- It is dynamic system.
- Less space.
- Low power consumption.

CHAPTER 6
CONCLUSION AND FUTURE ENHANCEMENT

CONCLUSION AND FUTURE ENHANCEMENT CHAPTER 6

6.1 CONCLUSION

We would like to conclude that the proposed system completed successfully. as we stated earlier in a problem statement, the previous problem like a less information conveyed, poor efficiency of IR sensor and dependency on stick are overcome and successfully implemented with efficiency of object detection and with a clear information to a blind people for their guidelines.

Hence, it can be concluded that this project is able to play a great contribution to the state of the art and will play a great role to assist the blinds to walk easily.

6.2 FUTURE ENHANCEMENT

Future work will be focused on enhancing the performance of the system and reducing the load on the user by adding the camera to guide the blind exactly. Images acquired by using web camera and NI-smart cameras helps in identification of objects as well as scan the entire instances for the presence of number of objects in the path of the blind person. It can also detect the material and shape of the object. Matching percentage has to be nearly all the time correct as there no chance for correction for a blind person if it is to be trusted and reliable one. The principles of mono pulse radar can be utilized for determining long range target objects. The other scope may include a new concept of optimum and safe path detection based on neural networks for a blind person.

CHAPTER 7
REFERENCES

REFERENCES CHAPTER 7

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