A MINI PROJECT REPORT

ON

Ultrasonic Blind-stick for the Visually flawed

Submitted in partial fulfillment of the requirement

forthe award of the degree of

BACHELOR OF TECHNOLOGY

IN

COMPUTER SCIENCE AND ENGINEERING

(DATA SCIENCE)

BY

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Counselling Code : VBIT

VIGNANA BHARATHI Institute of Technology

(A UGC Autonomous Institution, Approved by AICTE, Accredited by NBA & NAAC-A Grade, Affiliated to JNTUH)

VIGNANA BHARATHI INSTITUTE OF TECHNOLOGY

(A UGC Autonomous Institution, Approved by AICTE, Affiliated to JNTUH, Accredited by NBA & NAAC) Aushapur (V), Ghatkesar (M), Medchal(dist)

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DEPARTMENT
OF
COMPUTER SCIENCE & ENGINEERING
(DATA SCIENCE)

CERTIFICATE

This is to certify that the major project titled "Ultrasonic Blind-stick for the Visually flawed" submitted by K.Samvedya (21P61A6791), R.Jatin(21P61A6777), G. Murali(21P61A6769) in B.Tech IV-I semester Computer Science & Engineering(DataScience) is a record of the Bonafide work carried out by them.

The results embodied in this report have not been submitted to any other University forthe award of any degree.

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DECLARATION

We, ***K. Samvedya, R. Jatin, G. Murali,*** bearing hall ticket numbers **21P61A6791, 21P61A6777, 21P61A6769** hear by declare that the minor project report entitled "**Ultrasonic Blind-stick for the Visually flawed**" under the guidance of **Mr.Ch. Sathyanarayana**, Department of Computer Science & Engineering (Data Science), **Vignana Bharathi Institute of Technology, Hyderabad,** have submitted to Jawaharlal Nehru Technological University Hyderabad, Kukatpally, in partial fulfilment of the requirements for the award of the degree of Bachelor of Technologyin Computer Science and Engineering(Data science).

This is a record of Bonafide work carried out by us and the results embodied in this project have not been reproduced or copied from any source. The results embodied inthis project report have not been submitted to any other university or institute for theaward of any other degree or diploma.

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ABSTRACT

Blindness is the lack of Smart vision caused due to physiological or neurological factors resulting in visual disability. Blindness can be temporary, or permanent andpartial or complete blindness causes a person to become dependent on others for help. In today's world even the disabled people want to be independent and do not wantto seek help from others. Smart Blind Stick is an innovative device, which is an initiative to help blind people to resolve the problems faced by them in their daily life. Smart Blind Stick is a system device which incorporates several features namely- obstacle detection, navigation, panic button and moisture detector. The main objective of the device is to help blind people to walk with complete relief and self-dependency. The blind stick is integrated with three ultrasonic sensors, panic switch,navigation switch, and Bluetooth and soil moisture detector along with Arduino UNO. The Smart Blind Stick automatically detects the obstacle in front of the person by using sensors present in the systems, it also incorporates moisture detection at its bottomto detect the moisture of the soil or ground so that the person will be aware if it's feasible to walk on that ground.

Key Words:

Arduino, micro controller, vibration-feedback, ultrasonic sensor, obstacle detection.

DEPARTMENT OF

COMPUTER SCIENCE AND ENGINEERING

(Data Science)

VISION

To be recognized as a Center of Excellence in Data Science to meet the ever-growing needs of Industry and Society.

MISSION

- To empower students with innovative and cognitive skills to gain expertise in the field of Data science.
- To Inculcate the seeds of knowledge by providing an industry conducive environment toenable students to excel in the field of Data Science.
- To provide an appropriate ambience to nurture young Data Science professionals.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

PEO 1: Domain Knowledge: Develop a broad academic and practical literacy in computer science, statistics, and optimization, with relevance in data science.

PEO 2: Professional Employment: Employed in industry government and entrepreneurial endeavors to have a successful professional career.

PEO 3: Higher Degrees: Pursue higher education in the domain of data analytics or research.

PEO 4: Engineering Citizenship: Contribute to society and human well-being by applying ethical principles.

PEO 5: Lifelong Learning: Pursue lifelong learning in generating innovation engineering research-based solution using the latest innovation tolls and technologies.

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Engineering graduates will be able to:

1. **Engineering Knowledge**: Apply knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem Analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for public health and safety, and the cultural, and environmental considerations.
4. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
6. **Engineer and society**: Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues, and the consequent responsibilities relevant to professional engineering practice.
7. **Environment and sustainability**: Understand the impact of professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice.
9. **Individual and teamwork:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective Presentations, and give and receive clear instructions.

11. **Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary Environments.

12. **Life-long learning**: Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES (PSOs)

PSO1: Understand fundamental concepts in statistics, mathematics and computer Science to gain an understanding and working knowledge of various tools for analysis.

PSO2: Represent the knowledge, predicate logic and then transform the real-life information into visually appealing data using suitable tools.

PSO3: Get Expertise in different aspects and appropriate models of Data Science and use large data sets to cater to the growing demand for data scientists and engineers in industry.

Course Outcomes (COs)

CO1 - Identify the problem by applying acquired knowledge from surveys of technical publications

CO2 - Analyze and categorize identified problems to formulate and find the best solution after considering risks.

CO3 - Choose efficient tools for designing projects.

CO4 - Build the project through effective teamwork by using recent technologies.

CO5 - Elaborate and test the completed task and compile the project report.

Correlation Levels

Substantial/ High	3
Moderate/ Medium	2

CO – PSO Correlation Matrix

COs	PSOs		
	PSO1	PSO2	PSO3
CO1	2	2	3
CO2	3	2	2
CO3	2	3	
CO4	2	2	3
CO5		2	2
CO	1.8	2.2	2

CO – PO Correlation Matrix

COs	POs											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	2	2			3	2	2	2	3
CO2	2	3	3	3	2			3	3	3	3	2
CO3	3	2	2	2	3			3	2	2	2	2
CO4	2	33	3	2	2			3	3	3	3	2
CO5	2	32	2	2	3			3	2	2	2	2
CO	2.4	2.4	2.4	2.2	2.4			3	2.4	2.4	2.4	2.2

Project Outcomes (PROs)

1. **Real-time Interactive Art Installation:** Create an interactive art installation where users' facial movements and gestures are tracked in real-time using OpenCV. Users can see their movements translated into vibrant brush strokes on a virtual canvas, allowing them to create dynamic paintings with their gestures and expressions.
2. **Educational Tool for Gesture Recognition:** Develop an educational tool that uses facial and object movement detection to teach students about computer vision concepts. Users can see how their facial expressions and hand movements are interpreted by the system and translated into visual representations on a virtual canvas, helping them understand the underlying principles of gesture recognition algorithms.
3. **Therapeutic Painting Application:** Design a therapeutic painting application that utilizes facial movement detection to assist individuals with motor disabilities in expressing themselves through art. By tracking subtle facial gestures and translating them into brushes

strokes on a virtual canvas, users can engage in creative expression and improve their motor skills in a supportive digital environment.

4. **Virtual Collaborative Art Platform:** Build a virtual collaborative art platform where multiple users can paint together on a shared canvas using their facial movements and object interactions. OpenCV is used to detect and track users' faces and gestures, allowing them to contribute to the artwork in real-time from different locations. The platform fosters creativity and collaboration among users, regardless of physical distance.

5. **Interactive Advertising Display:** Create an interactive advertising display that captures the attention of passers by responding to their facial expressions and movements. OpenCV is employed to detect faces and analyze expressions, triggering visual effects and animations on a virtual canvas that correspond to users' actions. The innovative advertising solution engages audiences in a personalized and immersive experience, increasing brand engagement and customer interaction.

PRO – PSO Correlation Matrix

PROs	PSOs		
	PSO1	PSO2	PSO3
PRO1	2	2	3
PRO2	2	3	2
PRO3	3	2	3
PRO4	2	2	2
PRO5	3	3	3
PRO	2.4	2.4	2.6

PRO – PO Correlation Matrix

PROs	POs											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
PRO1	2	3	3	3	2			3	2	3	2	2
PRO2	2	2	3	2	3			2	3	3	2	3
PRO3	3	2	3	3	2			3	3	2	3	3
PRO4	3	3	2	3	3			2	3	2	2	2
PRO5	2	2	3	2	2			2	2	3	3	2
PRO	2.4	2.4	2.6	2.6	2.4			2.4	2.6	2.6	2.4	2.4

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CHAPTER 1

1. INTRODUCTION

Blindness is a very common disability among people throughout the globe. About 90% of the world's population, which are visually impaired, live in developing countries. They need help to walk and do the essential work of daily life. Smart BlindStick is a fully automated as well as manually operated, easy to maintain, cheap and comfortable to use device. It is an innovative device designed for visually disabled people for refined navigation and advanced obstacle detection. In the device, we propose advanced blind stick that allows visually challenged people to navigate with relief using advanced technology. The blind stick is integrated with three ultrasonic sensors, panic switch, navigation switch, and Bluetooth and soil moisture detector along with Arduino UNO. The three ultrasonic sensors are used to detect obstacles ahead using ultrasonic waves. On sensing obstacles, the sensor passes the data to the person through the microphone device. The navigation process is implemented by smart stick for the blind. The technologies used for the device include embedded C language for programming and coding, Atmega328 microcontroller is used which is a low power CMOS microcontroller voice communication Bluetooth to connect phone with the device and to interface with device. It is not an effortless task for a blind personto use the device with complete accuracy as it requires necessary training to help theuser understand the information and to react to it in real time.

1.1 Existing System

The Design of a Stick Prototype for People with Visual Impairment Using Ultrasonic Esp8266 is discussed below. The views of blind people are one of the subjects addressed to receive feedback/appraisal from users. Three users were given the task of rating the prototype, as well as trying it out and responding to the statements made. Based on the findings, it can be inferred that ultrasonic sensor sticks have proven to be extremely beneficial to blind people. Therefore prototype has reduced the risk of blind people getting into accidents in difficult road structures with many obstacles, as well as when crossing the street. Since a large gap between the stick and the sensor can result in constant censorship of objects recognized around the stick, the design of the blind stickis made more flexible on the stick section, which is something to consider. The stick works by creating an Android-based mobile application that links the stick to the phoneand performs a variety of tasks, including making phone calls to pre-determined numbers and determining the location. The stick is distinguished by its low price and simple nature. When the wireless sensor detects an object or obstacle in its environment, it serves as an input or input to the esp8266 processor. The audio jack connected to theheadphones then emits sound. The lack of essential skills and preparation, as well as thelimited range of motion and knowledge transmitted, are among the most seriousshortcomings of these aids. Electronic assistive devices are intended to solve issues likethese, some electronics modules and sensors to adjust the cane. A buzzer, ultrasonic sensors, and a water sensor are all included. The blind person walking with an electronic stick.

DISADVANTAGES OF EXISTING SYSTEM:

1) The battery must be charged.

2) If the stick is not charged, it will not work.

1.2 Proposed System:

The Atmega328 is a low-power CMOS 8-bit microcontroller. It is based on enhancedRISC architecture. It is used in Arduino UNO board. Ultrasonic sensor is a non- contact distance measurement device which works on the basic principle of emittingultrasonic waves which is reflected by the object calculating the distance basedon time and speed. The device has three ultrasonic sensors which are present on the front, left and right side of the device. The supply voltage given is 5 volts at GlobalCurrent Consumption 15 mA. The Ultrasonic Frequency 40k Hz Maximal Range 200m Minimal Range 0.1 m.

ADVANTAGES OF THE PROPOSED SYSTEM:

1) Gadget will operate to help all the blind people in the world to make themeasier to walk everywhere they want. And the navigation system helps them with voice command.

2) It will detect the obstacle coming on the way of blind people.

3) The most important feature will be panic button on the gadget, whenever the blind person stuck or in emergency, his location will be sent to the predefine person.

4) The gadget will be portable and can be use in other blind sticks also. 5. And the moisture detector easily detects the soil moisture and will give command to the blind person.

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1.3 Aim and Objective:

The main aim of the Smart Blind Stick is to help blind people to walk with complete relief and self-dependency. It incorporates several features such asobstacle detection, navigation, and detectors to assist blind individuals in their daily lives.

The main objective is to help blind people walk with complete ease and self-reliance, to enhance their mobility and quality of life.

1.4 Scope:

The Smart Blind Stick project aims to develop a portable device that enhancesthe mobility and independence of blind individuals. The device will incorporate features such as obstacle detection, navigation, and potentially additional functionalities like voice assistance and environmental information. The scopeof the project will encompass hardware development, software engineering, user interface design, and rigorous testing to ensure the device's reliability andeffectiveness. By focusing on these key areas, the Smart Blind Stick can provide a valuable tool for blind people to navigate their surroundings with greater confidence and autonomy.

CHAPTER 2

2. Literature Survey

Title**: Smart blind walking stick using PIC16F676:**

Blind stick is an innovative device designed for blind people for better navigation. RF module is integrated with ultrasonic sensors in the device. Thedevice uses ultrasonic sensors to detect obstacles present using ultrasonic waves. On sensing the obstacles, the sensor passes data to the microcontroller PIC16F676 which then processes the data and calculates the closeness of the object. [4] If the obstacle is not that close the device does nothing. If the obstacle is close the microcontroller sends a signal to rotate the motor which finally is connected to the stick. It also detects and sounds a buzzer if it is lost and alerts the blind. The system also has the feature to help the blind find theirstick if they forget where they kept it. For this purpose, wireless RF based remotes are used. Pressing the remote button sounds like a buzzer through which a blind person can find the stick. Thus, the system incorporates the feature for obstacle detection as well as finding the stick. The device system consists of sensors such as ultrasonic sensors, the feedback system which has a motor interface, microcontroller, control buttons and power circuitry which is batterybased. The system can be designed to take of form of a detachable and portabledevice, which can be unconditionally mounted on any stick.

Keywords: Blindness, Vision impairment, Mobility aid, Obstacle detection

Title**: Smart Microcontroller Based Blind Guidance System**

The system consists of three sensors: front IR sensor, right IR sensor and left IR sensor. All signals are inputs for ADC on a PIC microcontroller 16F877A which can detect any triggered switch and generate vibrations and sound. [5] PIC runs theprogram in its memory when it is turned on as it doesn’t have an operating system.PIC microcontroller is a compact computer on a single integrated circuit which stores a set of instructions which consists of a processor core, memory, and programmable input/output peripherals. Three IR sensors are used to attain details relative to the obstacle categorization. The IR sensors are the mainelectronic components which act as the new eyes for the blind. IR sensors will scanthe area in their range of the IR beam. Any obstacle which lies in the scanning range of the IR beam will be reflected and detected back by the receiver unit in thesensor.

Keywords: Navigation, Vibrations, Sound, Infrared (IR) sensors

Title: Smart Blind Stick Design and Implementation

Blindness is a state of lack of visual perception due to physiological or neurological factors. Imagine that you are walking in an unfamiliar place[1]. One has to ask for guidance to get to the destination. But what if the person is visually impaired. A personmust completely depend on other people to get to the destination. In general, we note that the white cane is the best friend of visually impaired people. But oftentimes that stick isn't helpful. The Blind Stick is developed using many hardware and software applications. An individual with a disability is a member of society and has the same rights and responsibilities as people. But blind people face a large number of problems that are difficult to solve. Blind people are members of society, and their diversity in the world and social situations has been restricted. Blind people's disadvantages should notbe seen as an excuse to shorten their lives; rather, they should be used as motivation to persevere. As a result, anyone with visual impairments requires assistance in the form of replacements for their eye function, specifically the visual function. In addition to thenormal touch sticks, the blind often needs a switch for their sense of sight so that the ultrasonic and sound sensors can be used.

Keywords: Blindness, Vision-impairment, Mobility-aid, Obstacle detection

CHAPTER 3

3. Design

3.1 Hardware Requirements:

1) RPS
2) Arduino UNO
3) Ultrasonic
4) Help Button
5) Bluetooth
6) LCD
7) Mobile

AURDINO UNO:

The most common version of Arduino is the Arduino Uno. Uno board is what most people are talking about when they refer to an Arduino. The Uno is one of the more popular boards in the Arduino family and a great choice for beginners. There are different revisions of Arduino Uno, below detail is the most recent revision (Rev3 or R3).

The Arduino Uno is a microcontroller board based on the ATmega328. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analoginputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSPheader, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power itwith an AC-to-DC adapter or battery to get started.

Features

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 (ATmega328) of which 0.5 K
SRAM	:	2 KB (ATmega328)
EEPROM	:	1 KB (ATmega328)
Clock Speed	:	16 MHz
Length	:	68.6 mm
Width	:	53.4 mm

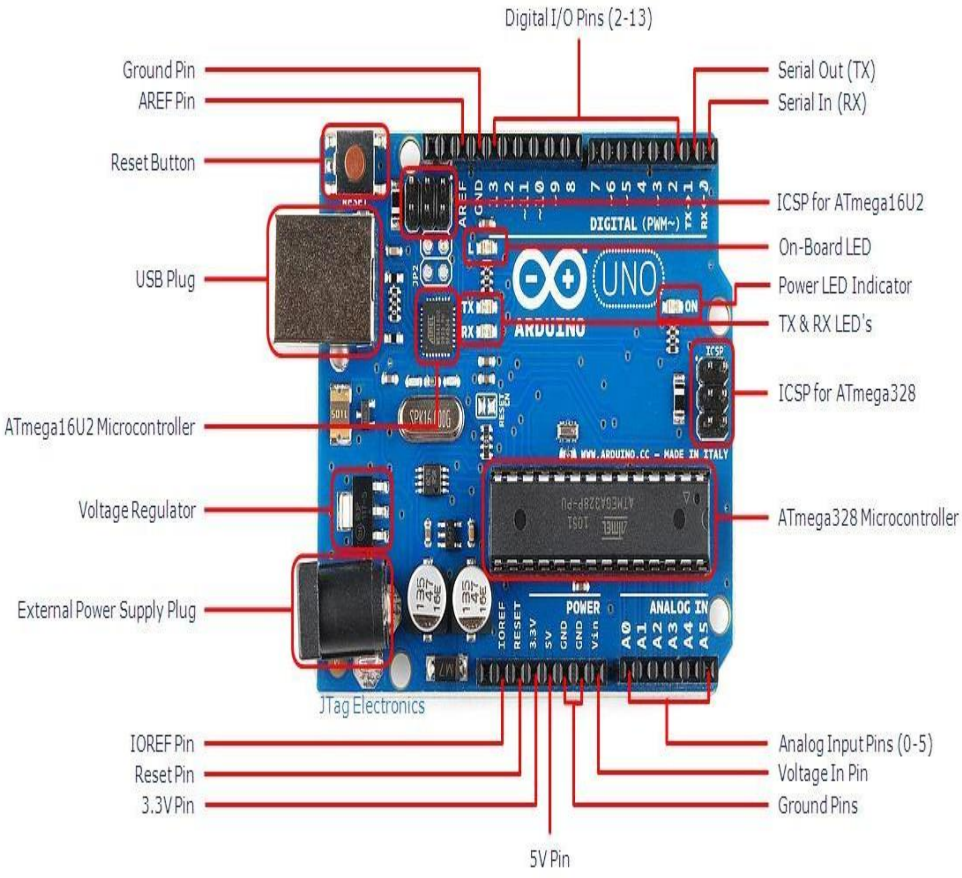

Fig 3.1.1: Arduino Uno Board

USB Plug & External Power Supply Plug

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. The power source is selected automatically. The USB connection is also how you will load code onto your Arduino board. 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 thanfive 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 to12 volts.

Voltage Regulator

The voltage regulator 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 whatit's for. The voltage regulator does exactly what it says – it controls the amountof 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.

Power Pins

Voltage In Pin – 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 otherregulated power source). You can supply voltage through the pin, or, if supplying voltage via the power jack, access it through pin.

5V Pin – Pin outputs a regulated 5V from the regulator on the board. The boardcan be supplied with power either from the DC power jack (7 – 12V), the USBconnector (5V), or the VIN pin of the board (7-12V). Supplying voltage via the5V or 3.3V pins bypasses the regulator, and can damage your board. It's not recommended.3.3V Pin – A 3.3 volt supply generated by the on-board regulator. Maximum current draw is 50 mA.

Ground Pins

There are several GND pins on the Arduino, any of which can be used to ground your circuit.

IOREF Pin

IOREF pin on the Arduino board provides the voltage reference with which the microcontroller operates. A properly configured shield can read the IOREF pinvoltage and select the appropriate power source or enable voltage translators on the outputs for working with the 5V or 3.3V.

Input and Output Pins

Each of the 14 digital pins on the Uno can be used as an input or output. They operate at 5 volts. These pins can be used for both digital input (like telling if abutton is pushed) and digital output (like powering an LED). Each pin can provide or receive a maximum of 40 mA and has an internal pull-up resistor (disconnected by default) of 20-5k Ohms. In addition, some pins have specialized functions.

Serial Out (TX) & Serial In (RX)

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

Pins 2 and 3 can be configured to trigger an interrupt on a low value, a risingor falling edge, or a change in value.

PWM – You may have noticed the tilde (~) next to some of the digital pins (3, 5, 6, 9, 10, and 11). These pins act as normal digital pins, but can also be used for something called Pulse-Width Modulation (PWM). Think of these pins as being able to simulate analog output (like fading an LED in and out). SPI – Pins 10 (SS), 11 (MOSI), 12 (MISO), 13 (SCK). SPI stands for Serial

Peripheral Interface. These pins support SPI communication using the SPI library.

Analog Input Pins – Labeled A0 through A5, each of which provide 10 bits ofresolution (i.e. 1024 different values). These pins can read the signal from an analog sensor (like a temperature sensor) and convert it into a digital value thatwe can read. 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 (Stands forAnalog Reference. Most of the time you can leave above pin alone).

Additionally, some pins have specialized functionality:

TWI – Pins A4 or SDA pin and A5 or SCL pin. Support TWI communication using the Wire

Reset Pin

Bring the line LOW to reset the microcontroller. Typically used to add a resetbutton to shields which block the one on the board.

LED Indicators

Power LED Indicator – Just beneath and to the right of the word "UNO" on your circuit board, there's a tiny LED next to the word 'ON'. The LED shouldlight up whenever you plug your Arduino into a power source. If the light doesn't turn on, there's a good chance something is wrong. Time to re-check your circuit!

On-Board LED – There is a built-in LED connected to digital pin 13. When thepin is HIGH value, the LED is on, when the pin is LOW, it's off. This is usefulto quickly check if the board has no problem as some boards has a pre-loaded simple blinking LED program in it.

TX & RX LEDs – 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 on to the board).

Reset Button

Pushing the reset button temporarily connect the reset pin to ground and restartany 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.

ULTRASONIC SENSOR:

Ultrasonic sensor is a non-contact distance measurement device which works onthe basic principle of emitting ultrasonic waves which is reflected by the object calculating the distance based on time and speed. In the device there arethree ultrasonic sensors which are present on the front, left and right side of the device. The supply voltage given is 5 volts at Global Current Consumption 15mA. The Ultrasonic Frequency 40k Hz Maximal Range 200m Minimal Range 0.1m

BLUETOOTH:

Bluetooth is used to form network between personal computers .It is a wirelesstechnology standard used for forming personal area network. The IEEE standard defined for Bluetooth is IEEE 802.15. The network formed works in defined range and is used for exchanging data over short distances using short wavelengths. For SmartBlind stick we use Bluetooth to interface the android device with the smart stick.

ANDROID DEVICE:

Android Device will support the application for Navigation by using theapplication of Google Maps which is interfaced with the device. Android Device works on Android Operating System which is a modified version of Linux Kernel and other open-source software.

LIQUID CRYSTAL DISPLAY:

Fig 3.1.2: 16x2 LCD display

LCD (Liquid Crystal Display) Shown in fig 3.1.2. is an electronic display module. A16x2 LCD display is a very basic module and is very commonly used in differenttypes of devices and circuits. These modules are preferred over seven segmentsand other multi segment LEDs.

16x2 LCD

A 16x2 LCD means it displays 16 characters per line and there are 2 lines. By LCD each character is displayed in 5x7 pixel matrix. The LCD contains two registers, that are Command and Data. The command register stores the command instructions which are given to the LCD. A command is an instruction which is given to LCD to do a predefined task like initializing it, clearing its screen, setting the cursor position, controlling display etc. The data register stores the data displayed on the LCD. The data is in the form of ASCII value of the character displayed on the LCD.The most used Character based LCDs are based on Hitachi'sHD44780 controller or other which are compatible with HD44580.

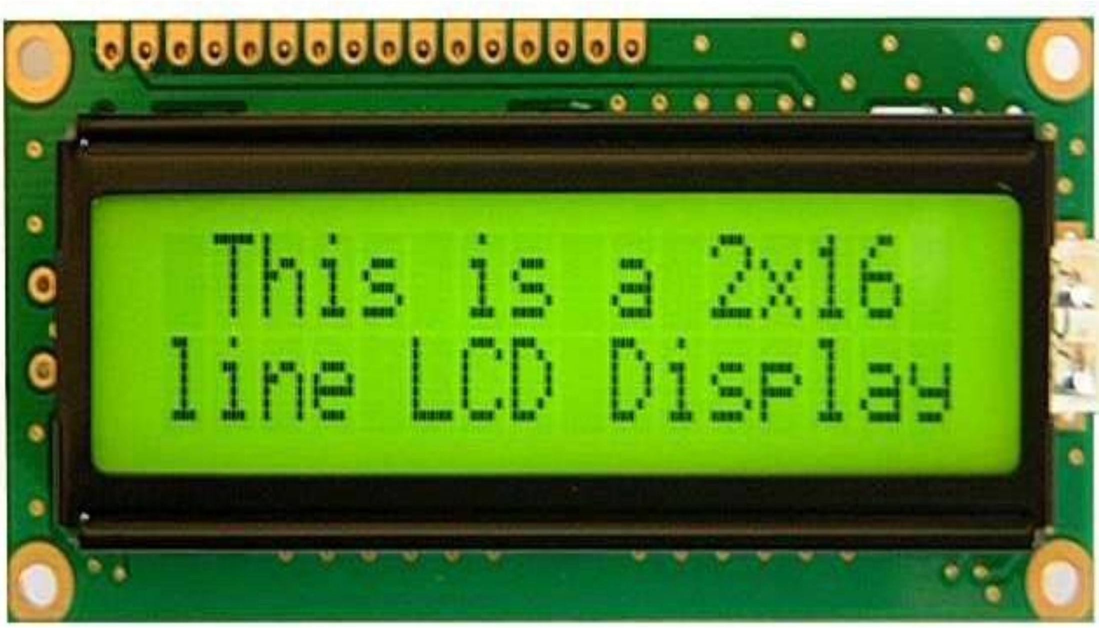

Fig 3.1.3: 2x16 line LCD display.

Pin Description of LCD

Most LCDs with 1 controller has 14 Pins and LCDs with 2 controller has 16 Pins(two pins are extra in both for back-light LED connections). Pin description is shown in the table below.

Pin Number	Symbol	Function
1	Vss	Ground Terminal
2	Vcc	Positive Supply
3	Vdd	Contrast adjustment
4	RS	Register Select; 0→Instruction Register, 1→Data Register
5	R/W	Read/write Signal; 1→Read, 0→ Write
6	E	Enable; Falling edge
7	DB0	Bi-directional data bus, data transfer is performed once,thru DB0 to DB7, in the case of interface data length is 8-bits; and twice, through DB4 to DB7 in the case of interface data length is 4-bits. Upper four bits first then lower four bits.
8	DB1	
9	DB2	
10	DB3	
11	DB4	
12	DB5	
13	DB6	
14	DB7	
15	LED-(K)	Back light LED cathode terminal
16	LED+(A)	Back Light LED anode terminal

Fig 3.1.4:Pin Configuration table for a 16X2 LCD character display

Data/Signals/Execution of LCD

LCD accepts two types of signals, one is data, and another is control. These signals are recognized by the LCD module from status of the RS pin. Now datacan be read also from the LCD display, by pulling the R/W pin high. As soon asthe E pin is pulsed, LCD display reads data at the falling edge of the pulse and executes it, same for the case of transmission.

LCD display takes a time of 39-43µS to place a character or execute acommand. Except for clearing display and to seek cursor to home position it takes 1.53ms to 1.64ms. Any attempt to send any data before this interval maylead to failure to read data or execution of the current data in some devices. Some devices compensate the speed by storing the incoming data to some temporary registers.

Commands and Instruction set

Only the instruction register (IR) and the data register (DR) of the LCD can becontrolled by the MCU. Before starting the internal operation of the LCD, control information is temporarily stored into these registers to allow interfacing with various MCUs, which operate at different speeds, or various peripheral control devices. The internal operation of the LCD is determined by signals sent from the MCU. These signals, which include register selection signal (RS), read/write signal (R/W), and the data bus (DB0 to DB7), make upthe LCD instructions.

There are four categories of instructions that:

- Designate LCD functions, such as display format, data length, etc.
- Set internal RAM addresses
- Perform data transfer with internal RAM
- Perform miscellaneous functions

Although looking at the table you can make your own commands and test them.Below is a brief list of useful commands which are used frequently while working on the LCD.

Command	Code										Description	Execution Time
	RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0		
Clear Display	0	0	0	0	0	0	0	0	0	1	Clears the display and returns the cursor to the home position (address 0).	82μs~1.64ms
Return Home	0	0	0	0	0	0	0	0	1	*	Returns the cursor to the home position (address 0). Also returns a shifted display to the home position. DD RAM contents remain unchanged.	40μs~1.64ms
Entry Mode Set	0	0	0	0	0	0	0	1	I/D	S	Sets the cursor move direction and enables/disables the display.	40μs
Display ON/OFF Control	0	0	0	0	0	0	1	D	C	B	Turns the display ON/OFF (D), or the cursor ON/OFF (C), and blink of the character at the cursor position (B).	40μs
Cursor & Display Shift	0	0	0	0	0	1	S/C	R/L	*	*	Moves the cursor and shifts the display without changing the DD RAM contents.	40μs
Function Set	0	0	0	0	1	DL	N$	F	*	#	Sets the data width (DL), the number of lines in the display (L), and the character font (F).	40μs
Set CG RAM Address	0	0	0	1	A_{CG}						Sets the CG RAM address. CG RAM data can be read or altered after making this setting.	40μs
Set DD RAM Address	0	0	1	A_{DD}							Sets the DD RAM address. Data may be written or read after making this setting.	40μs
Read Busy Flag & Address	0	1	BF	AC							Reads the BUSY flag (BF) indicating that an internal operation is being performed and reads the address counter contents.	1μs
Write Data to CG or DD RAM	1	0	Write Data								Writes data into DD RAM or CG RAM.	46μs
Read Data from CG or DD RAM	1	1	Read Data								Reads data from DD RAM or CG RAM.	46μs
	I/D = 1: Increment I/D = 0: Decrement S = 1: Accompanies display shift. S/C= 1: Display shift S/C = 0: cursor move R/L= 1: Shift to the right. R/L= 0: Shift to the left. DL = 1: 8 bits DL = 0: 4 bits N = 1: 2 lines N = 0: 1 line F = 1: 5x10 dots F = 0: 5 x 7 dots BF = 1: Busy BF = 0: Can accept data *# Set to 1 on 24x4 modules* *$ With KS0072 is Address Mode.*										DD RAM: Display data RAM CG RAM: Character generator RAM A_{CG}: CG RAM Address A_{DD}: DD RAM Address Corresponds to cursor address. AC: Address counter Used for both DD and CG RAM address.	Execution times are typical. If transfers are timed by software and the busy flag is not used, add 10% to the above times.

Fig 3.1.5:Showing various LCD Command Description

List of Commands

S.NO	Command	HEX	DEC
1	Function Set: 8-bit, 1 Line, 5x7 Dots	0x30	48
2	Function Set: 8-bit, 2 Line, 5x7 Dots	0x38	56
3	Function Set: 4-bit, 1 Line, 5x7 Dots	0x20	32
4	Function Set: 4-bit, 2 Line, 5x7 Dots	0x28	40
5	Entry Mode	0x06	6
6	Display off Cursor off (clearing display without clearing DDRAM content)	0x08	8
7	Display on Cursor on	0x0E	14
8	Display on Cursor off	0x0C	12
9	Display on Cursor blinking	0x0F	15
10	Shift entire display left	0x18	24
12	Shift entire display right	0x1C	30
13	Move cursor left by one character	0x10	16
14	Move cursor right by one character	0x14	20
15	Clear Display (also clear DDRAM content)	0x01	1
16	Set DDRAM address or coursor position on display	0x80+add*	128+add*
17	Set CGRAM address or set pointer to CGRAM location	0x40+add**	64+add**

Fig 3.1.6:Frequently Used Commands and Instructions for LCD

Liquid crystal displays interfacing with Controller

The LCD standard requires 3 control lines and 8 I/O lines for the data bus

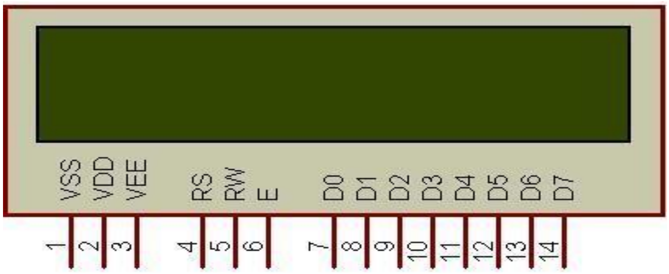

Fig 3.1.7:Pins of LCD

- **8 data pins D7:D0**

Bi-directional data/command pins

Alphanumeric characters are sent in ASCII format.

- **RS: Register Select**

RS = 0 -> Command Register is selectedRS = 1 -> Data Register is selected

- **R/W: Read or Write**

1 -> Write,

2 -> Read

- **E: Enable (Latch data)**

Used to latch the data present on the data pins. A high-to-low edge is neededto latch

GPS:

The Global Positioning System (GPS) is a space-based navigation system thatprovides location and time information in all weather conditions, anywhere onor near the Earth where there is an unobstructed line of sight to four or more GPS satellites. The system provides critical capabilities to military, civil, and commercial users around the world. The United States government created thesystem maintains it and makes it freely accessible to anyone with a GPS receiver.

GSM:

GSM SIM900 GSM Module is the module that supports communication in 900MHz band. from India and most of the mobile network providers in this country operate in the 900 MHz band. If you are from another country, you must check the mobile network band in your area. Most United Statesmobile networks operate in 850 MHz bands (the band is either 850 MHz or 1900 MHz). Canada operates primarily in 1900 MHz band.

Fig 3.1.8: Quectel M95 GNSS module contains built-in antenna and provides GPS, GLONASS, and BeiDou positioning capabilities.

3.2 Software Requirements:

ARDUINO SOFTWARE

Arduino IDE Software. You can get different versions of Arduino IDE from theDownload page on the Arduino Official website. You must select your software,which is compatible with your operating system (Windows, IOS, or Linux). After your file download is complete, unzip the file.

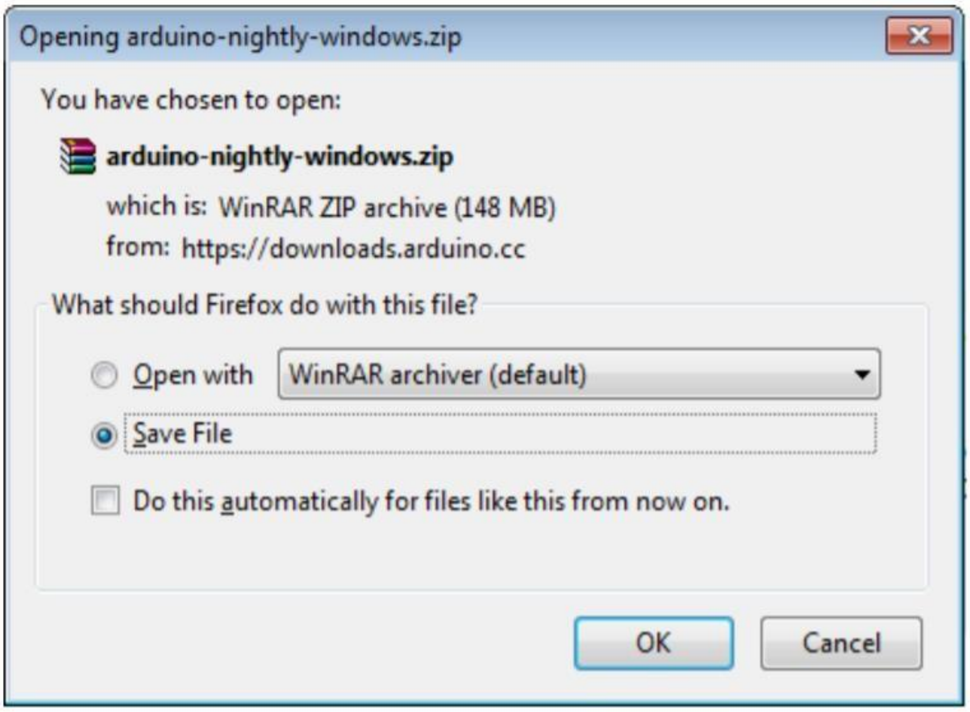

Fig 3.2.1:Dialog box to choose an action for a ZIP file

Launch Arduino IDE. After your Arduino IDE software is downloaded, you need to unzip the folder. Inside the folder, you can find the application icon with an infinity label (application.exe). Doubleclick the icon to start the IDE.

Open your first project. Once the software starts, you have two options:

- Create a new project.
- Open an existing project example.

To create a new project, select File --> New

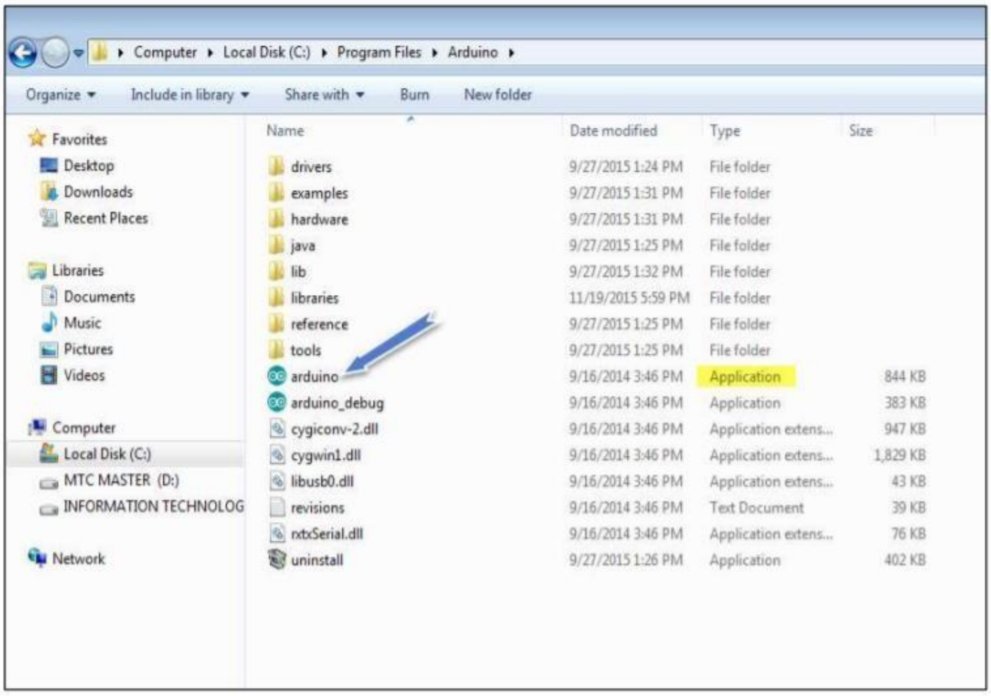

Fig 3.2.2: contents of the Arduino installation directory

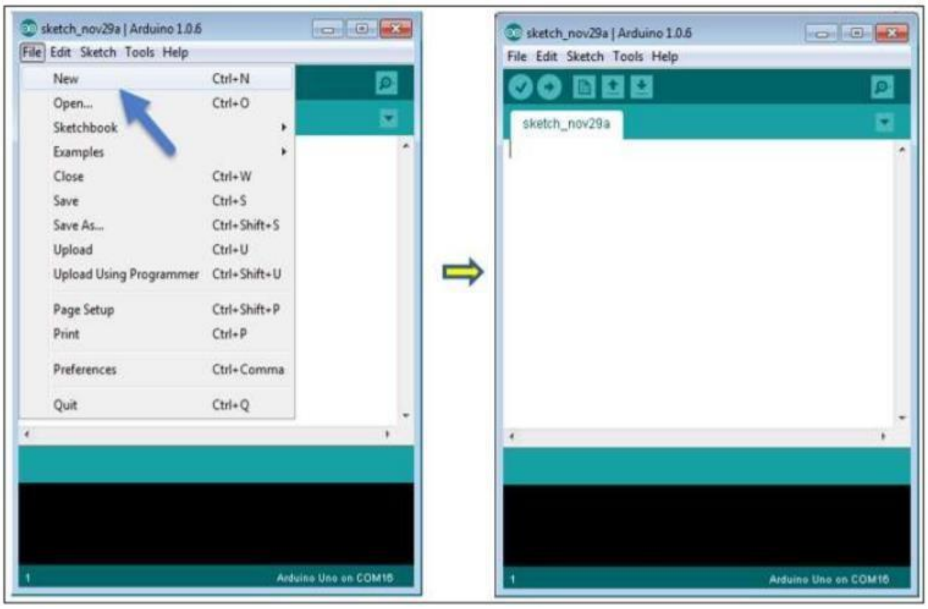

Fig 3.2.3: process of creating a new sketch in the Arduino IDE

Here, We selected just one of the examples with the name Blink. It turns the LED on and off with some time delay. You can select any other example fromthe list

Select your serial port. Select the serial device of the Arduino board. Go to Tools -> Serial Port menu. This is likely to be COM3 or higher (COM1 and COM2 are usually reserved for hardware serial ports). To find out, you can disconnect your Arduino board and re-open the menu, the entry that disappearsshould be of the Arduino board. Reconnect the board and select that serial port.

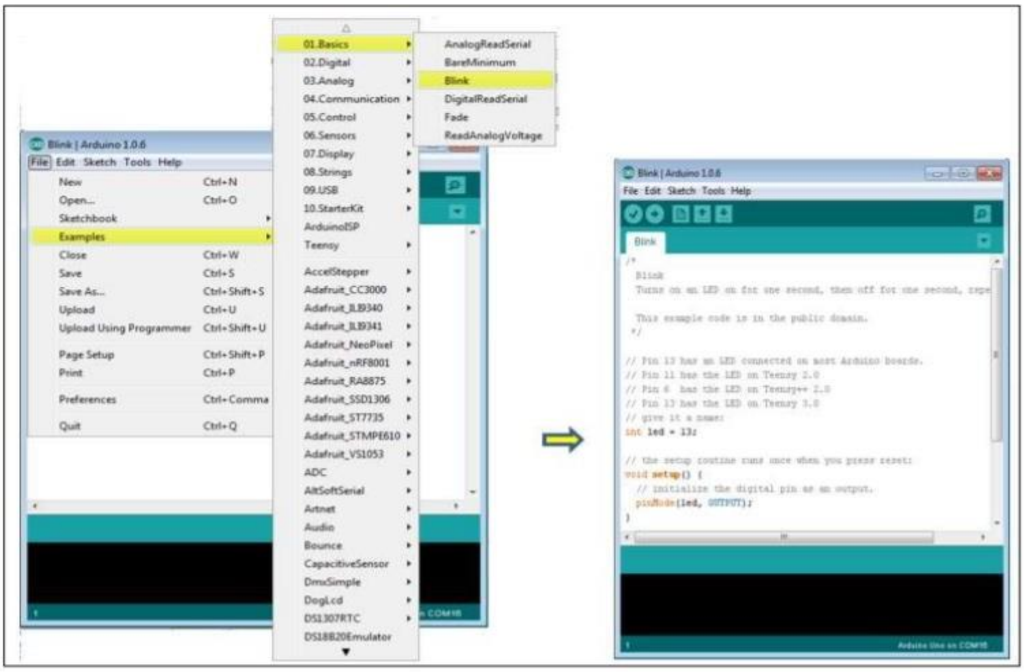

Fig 3.2.4: process of opening the Blink example sketch in the Arduino IDE

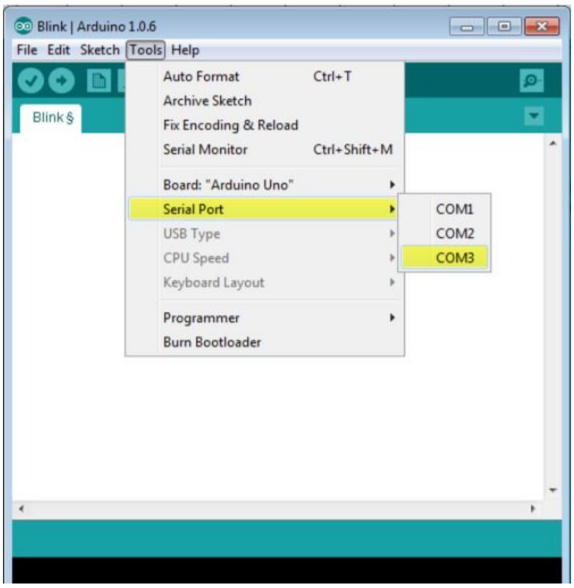

Fig 3.2.5: The Arduino IDE's Tools menu, highlighting the Serial Port selection with COM3 selected

Before explaining how we can upload our program to the board, we must demonstratethe function of each symbol appearing in the Arduino IDE toolbar.

A- Used to check if there is any compilation error.

B- Used to upload a program to the Arduino board.

C- Shortcut used to create a new sketch.

D- Used to directly open one of the example sketch.

E- Used to save your sketch.

F- Serial monitor used to receive serial data from the board and send the serialdata to the board.

Now, simply click the "Upload" button in the environment.

Wait a few seconds; you will see the RX and TX LEDs on the board, flashing. If theupload is successful, the message "Done uploading" will appear in the status bar.

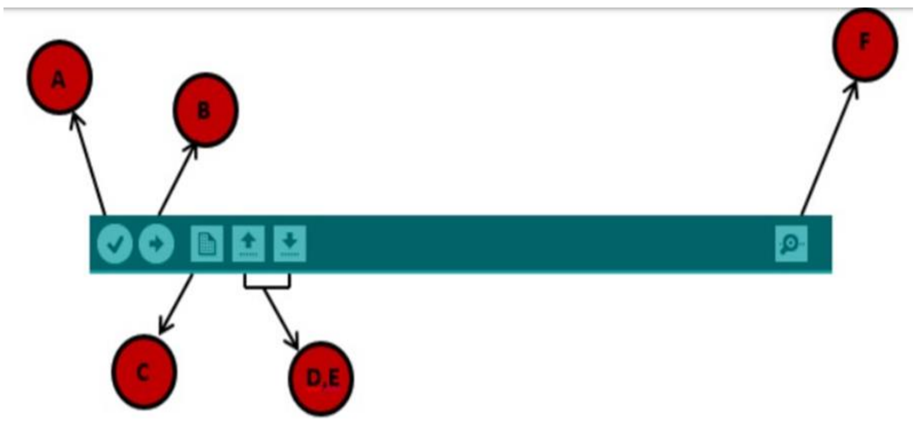

Fig 3.2.6:Flowchart or diagram with several nodes (A, B, C, D, E, F)

In the following chapter, we will study in depth, the Arduino program structureand we will learn more new terminologies used in the Arduino world. The Arduino software is open-source. The source code for the Java environment isreleased under the GPL and the C/C++ microcontroller libraries are under the LGPL. Sketch: The first new terminology is the Arduino program called “sketch”. Structure Arduino programs can be divided in three main parts: Structure, Values (variables and constants), and Functions. we will learn aboutthe Arduino software program, step by step, and how we can write the programwithout any syntax or compilation error. Let us start with the Structure.Software structure consist of two main functions:

- Setup( ) function
- Loop( ) function

Data types in C refers to an extensive system used for declaring variables or functions of different types. The type of a variable determines how much spaceit occupies in the storage and how the bit pattern stored is interpreted. The following table provides all the data types that you will use during Arduino programming.

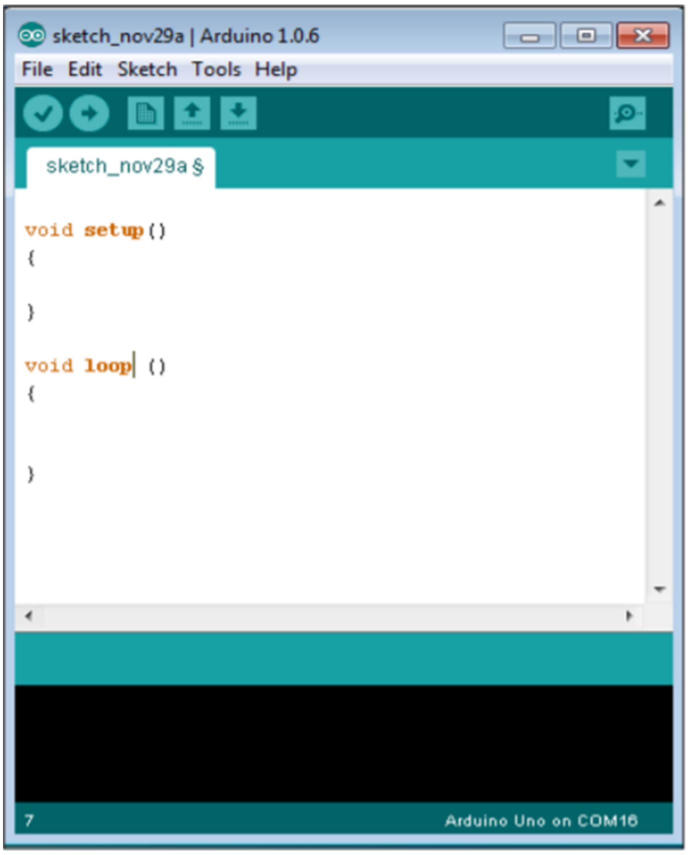

Fig 3.2.7:Arduino IDE with basic structure of an Arduino program with setup() and loop() functions.

3.3 BLOCK DIAGRAM:

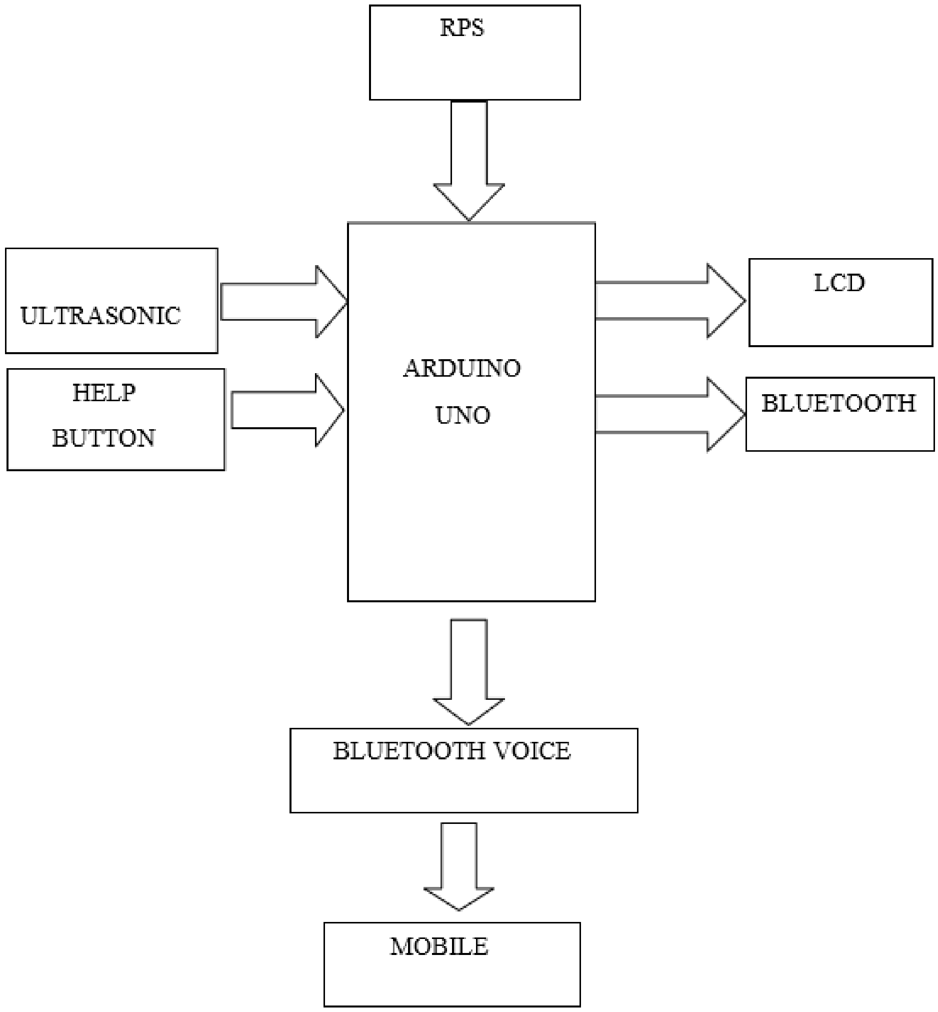

Fig 3.3.1:components and interactions in an Arduino-based system

CHAPTER 4

4.Implementation

```
#include <LiquidCrystal.h>
#define trigger A0
#define echo A1
#define buzzer 8
LiquidCrystal lcd(2,3,4,5,6,7);
float time=0,distance=0;
void setup()
{
Serial.begin(9600);
lcd.begin(16,2);
 pinMode(trigger,OUTPUT);
pinMode(echo,INPUT);
Serial.print("ultrasonic smart blind stick");
lcd.print("Smart blind stick");
lcd.setCursor(0,1);
lcd.print("using Arduino");
pinMode(buzzer,OUTPUT);
delay(3000);
lcd.clear();
}
void loop()
{
lcd.clear();
digitalWrite(trigger,LOW);
delayMicroseconds(2);
 digitalWrite(trigger,HIGH);
delayMicroseconds(10);
digitalWrite(trigger,LOW);
delayMicroseconds(2);
time=pulseIn(echo,HIGH);
distance=time*340/20000;
```

```
lcd.clear();
/*Serial.print("Distance:");
Serial.print(distance);
Serial.println("cm..");*/
lcd.print("Distance:");
lcd.print(distance);
lcd.print("cm");
lcd.setCursor(0,1);
lcd.print("Distance:");
lcd.print(distance/100);
lcd.print("m");
delay(1000); if(distance<60)
{
Serial.print("obstacle detection at distance");
Serial.print(distance);
Serial.print("centimeters");
digitalWrite(buzzer,HIGH);
delay(2000);
digitalWrite(buzzer,LOW);
delay(2000);
}
}
```

CHAPTER 5

5.Results

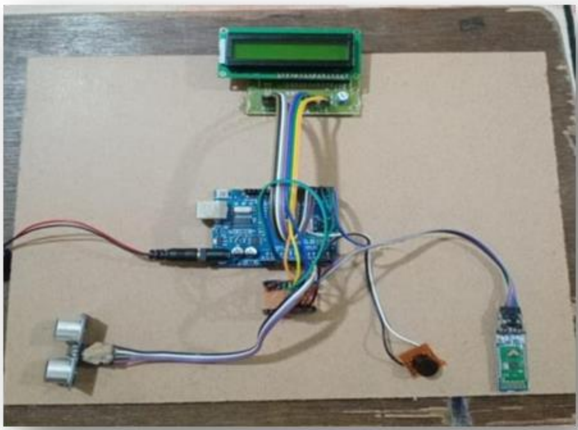

Fig5.1: Arduino microcontroller connected to a 16x2 LCD display

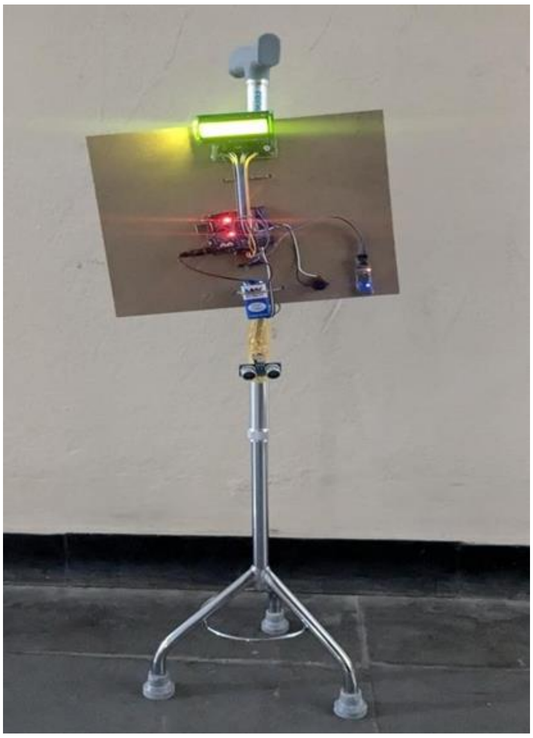

Fig5.2: Ultra sonic blind stick

Fig5.3: App Interface for Obstacle Detection Assistance

CHAPTER 6

6.Testing

6.1SystemTesting

System testing involves evaluating the complete and integrated software product to verify that it meets specified requirements. Here's how you can approach system testing for your project:

- **Functional Testing**:
  - **Distance Measurement**: Verify that the ultrasonic sensor accurately measuresdistances in various scenarios (e.g., different distances, angles).
  - **LCD Display**: Ensure that the distance is correctly displayed on the LCD andupdates at the expected interval.
  - **Buzzer Activation**: Check that the buzzer activates when an obstacle is withinthe specified range (e.g., less than 60 cm).
- **Performance Testing**:
  - Measure response time for distance readings. Ensure the system consistentlyupdates within an acceptable time frame (e.g., less than 1 second).
- **Usability Testing**:
  - Assess the user interface on the LCD to ensure it is clear and informative.
  - Evaluate the physical design of the stick for user comfort and ease of use.
- **Robustness Testing**:
  - Test the system under various conditions (e.g., low light, high noiseenvironments) to ensure reliability.
  - Check how the system behaves if the ultrasonic sensor receives noisy signals orif the sensor is obstructed.

6.2 Software Testing

Software testing focuses on individual components or modules. For your Arduino program, consider these methods:

- **Unit Testing**:
  - Create mock inputs for the distance measurement function to simulate differentecho durations and validate the calculated distances.
  - Test the output to the LCD by simulating various distance values to ensurecorrect display formats.

- **Integration Testing**:
  - Test the interaction between the ultrasonic sensor, LCD, and buzzer. Ensure thata distance reading triggers the correct output on the LCD and activates the buzzerwhen necessary.

6.3 Testing Methods

- **Manual Testing**:
  - Manually operate the device and observe outputs. Measure distances using a ruler to compare with the ultrasonic readings.
  - Check the buzzer activation at various distances and ensure it responds correctly.
- **Automated Testing** (if applicable):
  - For more complex systems, consider using a simulation environment that can automate the process of sending signals to the ultrasonic sensor and reading theoutputs.
- **Boundary Testing**:
  - Test edge cases near the threshold (e.g., distances of 59 cm, 60 cm, and 61 cm) to ensure that the buzzer activates and deactivates correctly.
- **Regression Testing**:
  - After making any changes to the code, re-run tests to ensure that new code changes haven't introduced new bugs or regressions in functionality.

Testing Checklist

1. **Distance Measurement**:
   - Verify distances below, at, and above the threshold.
   - Test the accuracy with known distances.

2. **LCD Output**:
   - Check that the LCD displays the correct format and updates as expected.

3. **Buzzer Response**:
   - Confirm that the buzzer activates and deactivates correctly based on distance readings.

4. **User Experience**:

- Ensure the device is comfortable to hold and easy to use.
- Evaluate the clarity of the LCD display in various lighting conditions.

5. **Environmental Testing**:

- Test performance in different environments (indoor/outdoor, various lighting,and noise levels).

CHAPTER 7

7.CONCLUSION

The smart blind stick is given to a physically impaired person with prior training. The physically impaired person is taught the positions of the buttonspresent in the smart blind stick. The owner should have an Android phone sothat the installed application can be used. As the person is blind, only wired earphones can be used. On switching on the application, the mobile will relate to the smart blind stick to Android through Bluetooth. For navigation, the person can press the navigation button, and itwill help them to reach their destination and will detect the obstacles present atleft, right and front using ultrasonic sensors. Whenever there is obstacle detection, there is a warning given to the blind person by voice command. The blind stick also incorporates the feature of moisture detector order to detectmud and wet soil in the path.The panic switch is also present to callin emergencies. The call will be dialed to the number provided.The Blind Walking Stick has been finally made into prototype that can be usedto guide the blind. It aims to solve the problems faced by the blind people in their daily life. The system also takes measures to ensure their safety. This activity will help all the blind people in the world and will make it easier for them to walk. It was done to help the blind move ahead very well. It helps to facilitate movement ensuring safety

CHAPTER 8

8.FUTURE SCOPE:

The Smart Blind stick is an innovative device designed for blind people for betternavigation so that they can travel wherever they want. The device works on theprinciple of the same time global positioning system (GPS) which is linked with the voice stick for navigation so that person is aware of the current positionand distance from the destination which will be informed to users through voiceinstructions given. Linking to Aadhar Card s so that the government can help physically disabled better. GSM attached can help in future of any immediatelycasualty help. GPS can have to find the shortest path and longest path according to Google/Bing Map based on Realtime coordination. Video recording once alarm gets triggered. Connecting to more devices. Provision to have direct helpfrom police when in crisis.

CHAPTER 9

9.REFERENCES

[1] Niranjana S., Hareshaa S. K., Irene Z. B., and J. Anand, “Smart Monitoring System for Asthma Patients”, International Journal of Electronics and Communication Engineering, Vol. 7, Issue 5, pp. 5-9, May 2020.

[2] Nowak, Michal, et al. "Characteristics of refractive errors in a population of adults in the central region of Poland." International journal of environmental research and public health 15.1 (2018): 90.

[3] G. Gayathri, M. Vishnupriya, R. Nandhini and M. Banupriya “Smart Walking Stick for Visually Impaired. “International Journal of Engineering and Navigation.” International Journal of Latest Research in Engineering and Technology, vol. 2, number 5, 45-50, 2016.

[4] Jose, G. George, M.R. Nair, M. J. Shilpa and M. B. Mathai “Voice Enabled Smart Walking Stick for Visually Impaired.” International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering, vol. 5, pp. 80-85, 2016.

[5] M.H. Mahmud, R. Saha, and S. Islam, “Smart Walking Stick – An Electronic Approach to Assist Visually Disabled Persons”, International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering, Vol. 5, pp. 80-85, 2016.

[6] C.S. Kher, Y.A. Dab Hade, S.K Kadam., S.D. Dhamdhere and A.V. Deshpande “An Intelligent Walking Stick for the Blind.” International Journal of Engineering Research and General Science, vol. 3, number 1, pp. 1057- 1062, 2015.

[7] B.G. Roopashree, B.S. Patil and B.R. Shruthi “Smart Electronic Stick for Visually Impaired.” International Journal of Innovative Research in Science, Engineering and Technology, vol. 4, number 7, pp. 6389-6395, 2015.

[8] E. J. Chukwuma and G. M. Onegite “Design and Implementation of Microcontroller Based Mobility Aid for Visually Impaired People.” International Journal of Science and Research. Vol. 5, issue 6, pp. 680-686, 2015.

[9] C. S. Kher, Y.A. Dab Hade, S.K. Kadam, S.D. Dhamdhere, and A. V. Deshpande, “Intelligent Walking Stick for the Blind”, International Journal of Engineering Research and General Science, Vol. 3, No. 1, pp. 1057-1062, 2015.

CHAPTER 10

Ultrasonic Blind-stick for the Visually flawed

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Abstract:

Physiological or neurological conditions leading to blindness affect one's vision and thereby the visual acuity of an individuals. The duration and level of blindness can be temporary, partial, or permanent. Thus, it often renders individuals unable to perform daily tasks on their own and requires them to depend on others for support. However, people today want to live in independent socities. The "Smart Blind Stick" is the device created to assist in daily struggles that blind people are likely to encounter. It carries many innovative features, including: obstacle detection, navigation assistance, a panic button, and moisture detection. This device aims to ensure that the life of blind individuals can be moved forward confidently and independently to improve their quality of life, rather than depending on other people.

Key Words: Arduino, microcontroller, vibration feedback, ultrasonic sensor, obstacle detection.

I.INTRODUCTION:

Globally, blindness is a common disability, with 90% of blind people living in underdeveloped nations. These individuals primarily require assistance with walking and other everyday tasks. The Smart Blind Stick is a low-cost, easy-to-use, and low-maintenance tool that can assist the blind. It is user-friendly and adaptable due to its automated and manual functions. With its sophisticated navigation and obstacle recognition features, the Smart Blind Stick makes it much easier and more autonomous for people with vision impairments to navigate around.

II.RELATED WORK AND LITERATURE SURVEY:

A Smart Stick Prototype for visually impaired people was reviewed based on user feedback using the ultrasonic sensors and ESP8266 microcontroller. Three visually impaired users tested the prototype and rated it, and also explained their experiences.

The results were that the ultrasonic sensor-based stick proved beneficial to blind people as it provided better navigation. A.K. Shrivastava, A. Verma, and S.P. Singh in their study of 2010, ultrasonic sensors provide effective distance measurement for obstacles that stand in the path of persons or objects at relatively affordable price. This technology has already been applied in different practical applications, including the control of robotic movements and vehicle navigation as well as by devices for the visually impaired. The ultrasonic system includes an ultrasonic transmitter, a receiver, and a microcontroller like Philips P89C51RD2, which is an alternate for the 8051, affordable to the budget of those wanting such distance measure systems. The ultrasonic system has a great merit, measuring distances with high speed and accuracy, and has great utility in smart stick-based applications. Ultrasonic sensors can be used underwater; thus, they provide economical means of distance measurement from objects in both air as well as underwater environments. For a smart stick, these sensors would sense obstacles in the forward, left, or right direction of the user for navigation purposes.Research in 1998 by Jack Loomis, Reginald Golledge, and Roberta Katzke was designed to work toward developing a navigation system that would assist the blind to become independent, portable, and self-contained in familiar as well as unfamiliar territories. Their system uses auditory display modes and GPS navigation, so that blind people may travel to a destination on their own. It makes corrections if they are deviating from the correct course and will lead them to their destination, giving more independence over their daily travels.

III. PROPOSED METHOD

The Atmega328 is a low power, 8-bit CMOS microcontroller based on an enhanced RISC architecture and widely used in the Arduino UNO board. The ultrasonic sensor is a non-contact device measuring distance by emitting ultrasonic waves, which bounce off objects, and calculates the distance based on the time taken for the waves to return. The sensors are in the front, left, and right of the ultrasonic stick. The supply voltage is 5-volt, and the current consumption of the global level is at 15 mA. In the ultrasonic sensor, the frequency is at 40 kHz, while its range could reach up to 200 cm. The range was up to 10 cm minimum.

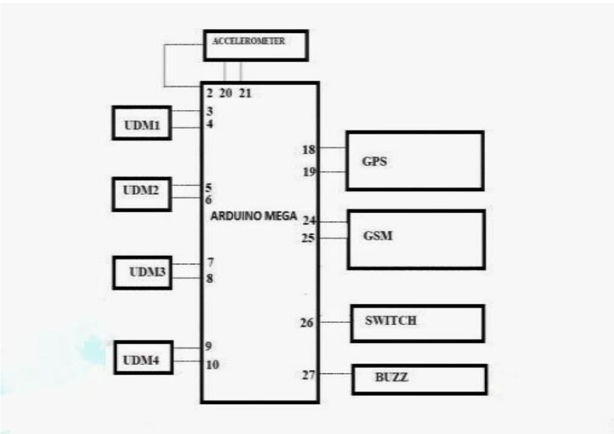

Fig 7.1:Arduino-based system with components

During the first stage, the ultrasonic sensors send ultrasonic waves to detect the obstacles blocking the user's path. There are also plans in future to install a GPS system and design foldable versions to make this tool more portable. A foldable stick is now on the plan table of this project system consisting of three ultrasonic sensors-sensors 2, 3, and 4 placed at the front, left, and right-hand sides, respectively to capture the obstacle. Each sensor has a detection range of 400 cm and covers an angle of 60 degrees. Also, the fourth ultrasonic sensor, or sensor 1, is installed at the bottom of the stick for pothole detection. All sensors are connected to the Arduino microcontroller, and the adjustable length of the stick according to the user's height would complete this sensor work.

Advantages of the proposed system:

1. The device is designed to assist visually impaired persons in moving about independently by making the work easier for them, and it also includes a navigation system through which voice commands direct them on the way.

2. The system detects obstacles on the path of the user in order to make navigation safe.

3. It comes with an embedded panic button allowing sending an emergency alert including user's location to the predefined number during their required hours.

4. This equipment can be used along with several different blind sticks also.

5. Its moisture detector feature alerts to remind for determining soil moisture levels boosting an awareness about environmental condition also.

IV. IMPLEMENTATION:

The Smart Blind Stick uses an HC-SR04 ultrasonic sensor to detect obstacles and alert the user through an audible buzzer. The sensor works by transmitting an ultrasonic pulse out through its trigger pin and then measures how long it takes for that pulse to bounce back via the echo pin. It then calculates the distance to the obstacle and displays this on an LCD screen in both centimeters and meters. If an obstacle is detected within 60 cm, the system triggers the buzzer to alert the user. The device continuously updates the reading from the distance every half a second to give them constant feedback. This therefore improves the safe navigation capability by giving immediate audio alarms should obstacles be too close. Microcontroller Arduino handles the functioning of the sensor in such a system to make sure it ensures the up-to-date output of the distance available in the display. Thus it is the simplest mode used to help blind people track what is before them as threats.

V. RESULTS:

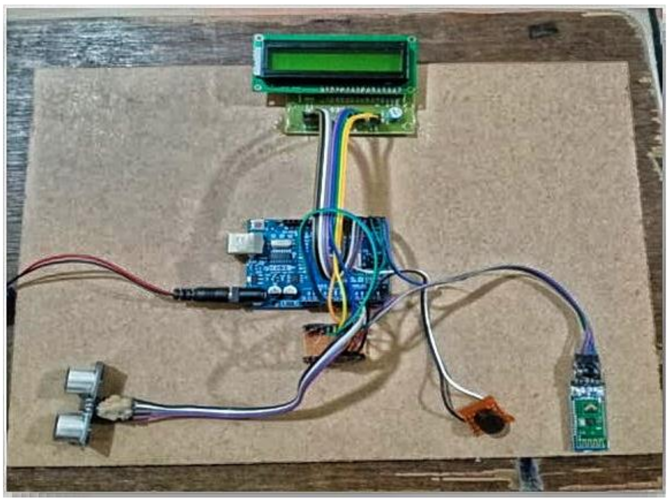

Fig7.2: Arduino microcontroller connected to a 16x2 LCD display

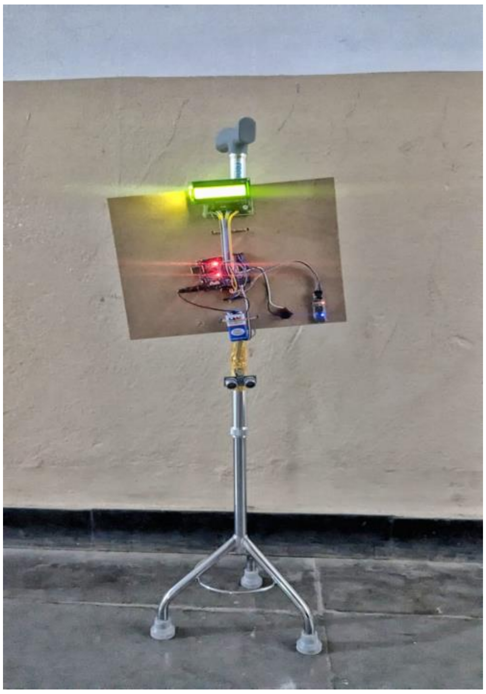

Fig7.3: Ultra sonic blind stick

Fig7.4: App Interface for Obstacle Detection Assistance

VI. CONCLUSION AND FUTURE SCOPE:

The Smart Blind Stick is a gadget that enables the visually impaired person to sense and be safe while doing their activities. Before using the stick, the user is also trained on the different buttons of the gadget and what they mean. To operate the system, an Android phone with installed application is required, so only wired earphones can be used since the user cannot see.This prototype for the smart walking stick tries to overcome the problems which the blind face in trying to go through their surroundings and move without depending on others. The system comprises a Global Positioning System (GPS) which in coordination with the voice navigation system gives real-time location and distance information to the user using voice instructions. The device can be used to connect to other devices, offering enhanced functionality, and it has a direct link to emergency services, like police. This innovative solution looks at mobility and safety improvement as empowering a blind person to move freely without fear and worry.

VII.REFERENCES:

[1] Niranjana S., Hareshaa S. K., Irene Z. B., and J. Anand, “Smart Monitoring System for Asthma Patients”, International Journal of Electronics and Communication Engineering, Vol. 7, Issue 5, pp. 5-9, May 2020.

[2] Nowak, Michal, et al. "Characteristics of refractive errors in a population of adults in the central region of Poland." International journal of environmental research and public health 15.1 (2018): 90.

[3] G. Gayathri, M. Vishnupriya, R. Nandhini and M. Banupriya “Smart Walking Stick for Visually Impaired. “International Journal of Engineering and Navigation.” International Journal of Latest Research in Engineering and Technology, vol. 2, number 5, 45-50, 2016.

[4] A. Jose, G. George, M.R. Nair, M. J. Shilpa and M. B. Mathai “Voice Enabled Smart Walking Stick for Visually Impaired.” International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering, vol. 5, pp. 80-85, 2016.

[5] M.H. Mahmud, R. Saha, and S. Islam, “Smart Walking Stick – An Electronic Approach to Assist Visually Disabled Persons”, International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering, Vol. 5, pp. 80-85, 2016.

[6] C.S. Kher, Y.A. Dab Hade, S.K Kadam., S.D. Dhamdhere and A.V. Deshpande “An Intelligent Walking Stick for the Blind.” International Journal of Engineering Research and General Science, vol. 3, number 1, pp. 1057- 1062, 2015.

[7] E. J. Chukwuma and G. M. Onegite “Design and Implementation of Microcontroller Based Mobility Aid for Visually Impaired People.” International Journal of Science and Research. Vol. 5, issue 6, pp. 680-686, 2015.

[8] C. S. Kher, Y.A. Dab Hade, S.K. Kadam, S.D. Dhamdhere, and A. V. Deshpande, “Intelligent Walking Stick for the Blind”, International Journal of Engineering Research and General Science, Vol. 3, No. 1, pp. 1057-1062, 2015.

[9] B. G. Roopashree, B.S. Patil and B. R. Shruthi, “Smart Electronic Stick for Visually Impaired”, International Journal of Innovative Research in Science, Engineering and Technology, Vol. 4, No. 7, pp. 6389-6395, 2015.

[10] G. Prasanthi, and P. Jejaswitha, “Sensor Assisted Stick for the Blind People”, Transactions on Engineering and Sciences, Vol. 3, No. 1, pp. 12-16, 2015.

[11] S. Menon, and J. Anand, “Cooperative and Secured Data Forwarding in AODV Routing Protocol”, International Journal of Advanced Research in Electronics and Communication Engineering, Vol. 4, Issue 4, pp. 1026-1031, April 2015.

[12] R. Sheth, S. Rajinder, S. Laddha and R. Chaudhari “Smart White Cane – An Elegant and Economic Walking Aid.” American Journal of Engineering Research. Vol. 3, number 10, pp. 84-89, 2014.

[13] O. Lakhani, “A Multidimensional Walking Aid for Visually Impaired Using Ultrasonic Sensors Network with Voice Guidance", International Journal of Intelligent Systems and Applications (IJISA), vol. 6, number 8, pp. 53-59, 2014. DOI: 10.5815/ijisa.2014.08.06

[14] R. Sheth, S. Rajandekar, S. Laddha, and R. Chaudhari, “Smart White Cane – An Elegant and Economic Walking Aid”, American Journal of Engineering Research, Vol. 3, No. 10, pp. 84-49, 2014.

[15] O. Lakanmi, “A Multidimensional Walking Aid for Visually Impaired using Ultrasonic Sensors Network with Voice Guidance, International Journal of Intelligent Systems and Applications, Vol. 6, No. 8, pp. 53-59, 2014.

[16] J. Anand, B. Thyla, and B. Sharmila, “Coverage Area-based Routing in MANETs” International Journal of IT, Engineering and Applied Sciences Research), Vol. 3, No. 2, pp. 41-44, Feb 2014

[17] Helen S., Sharnee K., and Jose A., “A Reliable Routing Technique for Wireless Sensor Networks”, International Journal of Research in Engineering & Advanced Technology, Vol. 2, Issue 2, pp. 1-7, April-May 2014.

[18] M.H. Mahmud, R. Saha and S. Islam “Smart Walking Stick – An Electronic Approach to Assist Visually Disabled Persons.” International Journal of Scientific and Engineering Research, vol. 4, number 10, pp. 111-114, 2013.