A MINOR PROJECT REPORT

ON

ADVANCED BLIND STICK FOR VISUALLY IMPAIRED

SUBMITTED IN PARTIAL FULFILLMENT FOR THE AWARD OF DEGREE OF

BACHELOR OF TECHNOLOGY

IN

ELECTRONICS AND COMMUNICATION ENGINEERING

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CERTIFICATE

This is to certify that the minor project report entitled, "**ADVANCED BLIND STICK FOR VISUALLY IMPAIRED**" submitted by **ABHISHEK TIWARI, UDIT GUPTA AND AKSHITA CHAUDHARY** in partial fulfillment of the requirements for the award of Bachelor of Technology Degree in **Electronics and Communication Engineering** of the Jaypee Institute of Information Technology, Noida is an authentic work carried out by them under my supervision and guidance. The matter embodied in this report is original and has not been submitted for the award of any other degree.

Signature of Supervisor:
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DECLARATION

We hereby declare that this written submission represents our own ideas in our own words and where others' idea or words have been included, have been adequately cited and referenced the original sources. We also declare that we have adhered to all principle of academic honesty and integrity and have not misrepresented or fabricated or falsified any idea /data/fact/source in our submission.

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ABSTRACT

Imagine walking into an unfamiliar place. One has to ask for guidance in order to reach to the destination. But what if the person is visually impaired!! Person has to completely depend on other people to reach destination. Blind stick is an innovative stick designed for visually disabled people for improved navigation. We here propose an advanced blind stick that allows visually challenged people to navigate with ease using advanced technology. The blind stick is integrated with ultrasonic sensor along with water sensing.

Our proposed project first uses ultrasonic sensors to detect obstacles ahead using ultrasonic waves. On sensing obstacles the sensor passes this data to the microcontroller. The microcontroller then ahead using ultrasonic waves. On sensing obstacles the sensor passes this data processes this data and calculates if the obstacle is close enough. If the obstacle is not that close the circuit does nothing. If the obstacle is close the microcontroller sends a signal to sound a buzzer. It also detects and sounds a different buzzer if it where detects water and alerts the blind. The system has one more advanced feature integrated to help the blind find their stick if they forget they kept it. A wireless RF based remote is used for this purpose. Pressing the remote button sounds a buzzer on the stick which helps the blind person to find their stick.

ACKNOWLEDGEMENT

We would like to express our special thanks of gratitude to our supervisor Dr. JITENDRA MOHAN as well as our institute who gave us the golden opportunity to do this wonderful project on the topic ADVANCED BLIND STICK FOR VISUALLY IMAPIRED, which also helped us in doing a lot of research and we came across so many new things. We really thankful to them.

Secondly we would also like to thank our parents and friends who helped us a lot in finalizing this project within the limited time frame.

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CHAPTER 1

INTRODUCTION

Blindness is a state of lacking the visual perception due to physiological or neurological factors. The partial blindness represents the lack of integration in the growth of the optic nerve or visual center of the eye and total blindness is the full absence of the visual light perception. Those who have the visual acuteness of 6/6 or the horizontal range of the visual field with both eyes open have less than or equal to 20 degrees. These people are regarded as blind.

A survey by WHO (World Health Organization) carried out in 2011 estimates that in the world, about 1% of the human population is visually impaired (about 70 million people) and amongst them, about 10% are fully blind (about 7 million people) and 90% (about 63 million people) with low vision. The main problem with blind people is how to navigate their way to wherever they want to go. Such people need assistance from others with good eyesight. As described by WHO, 10% of the visually impaired have no functional eyesight at all to help them move around without assistance and safely. This study proposes a new technique for designing a smart stick to help visually impaired people that will provide them navigation.

With the rapid advances of modern technology both in hardware and software it has become easier to provide intelligent navigation system to the visually impaired. Recently, much research effort have been focused on the design of Electronic Travel Aids (ETA) to aid the successful and free navigation of the blind. Also, high-end technological solutions have been introduced recently to help blind persons navigate independently. paired people that will provide them navigation.

Our approach is to modify the ordinary blind stick with some electronics components and sensors, the electronic aiding devices are designed to solve such issues. The ultrasonic sensors, water sensor, buzzer, and RF transmitter/Receiver are used to record information about the presence of obstacles. Ultrasonic sensor have the capacity to detect any obstacle within the distance range of 2cm-450cm. Therefore whenever there is an obstacle in this range it will alert the user.

1.1 LITERATURE SURVEY

- S.Gangwar (2011) designed a smart stick for blind which can give early warning of an obstacle using Infrared (IR) sensors[1]. After identifying the obstacles, the stick alerts the visually impaired people using vibration signals. However the smart stick focused only for obstacle detection but it is not assisting for emergency purposes needed by the blind. And also the IR sensors are not really efficient enough because it can detect only the nearest obstacle in short distance.

- Benjamin etal (2011) had developed a smart stick using laser sensors to detect the obstacles and down curbs [2]. Obstacle detection was signalized by a high pitch "BEEP" using a microphone. The design of the laser cane is very simple and intuitive. The stick can only detects obstacle, but can not provide cognitive and psychological support. There exists only beep sound that triggers any obstacle and there is no any assistance to direct them.

- S.Chew (2012) proposed the smart white cane, called Blindspot that combines GPS technology, social networking and ultrasonic sensors to help visually impaired people to navigate public spaces. The GPS detects the location of the obstacle and alerts the blind to avoid them hitting the obstacle using ultra-sonic sensors. But GPS did not show the efficiency in tracing the location of the obstacles since ultra-sonic tells the distance of the obstacle[3].

- Voice operated outdoor navigation system for visually impaired persons done by Somnath and Ravi (2012). Uses a stick equipped with ultra-sonic sensors, GPS. The stick contains GPS which will have SD memory card which used to store different locations. The user can set the location by GPS will guide the person to his/her destination. This system will also provide the speed and the remaining distance to reach the destination. When the ultra-sonic sensors detect any obstacle directly the buzzer will activate the vibration motor. This system can be classified as a low cost system affordable by the user. The system uses the ARM processor which has more memory space, so that the operating speed is high. However this system cannot operate indoors because there will be no signal for the GPS system. The accuracy of the GPS signal need to be improved because it only can be controlled within 5 meters radios[4].

Chapter 2

ARDUINO NANO

2.1 INTRODUCTION

Arduino boards are widely used in robotics, embedded systems, and electronic projects where automation is an essential part of the system. These boards were introduced for the students and people who come with no technical background. The Arduino Nano as shown in Fig 2.1 is a small, complete, and breadboard-friendly board based on the ATmega328P (Arduino Nano 3.x). It lacks only a DC power jack, and works with a Mini-B USB cable instead of a standard one.

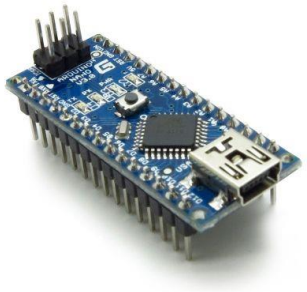

Fig. 2.1 Arduino Nano

Source: www.potentiallabs.com

2.2 SPECIFICATIONS

- Arduino Nano comes with exactly the same functionality as in Arduino UNO but quite in small size. Specification of Arduino Nano is shown in Table 2.1 and the pin description of Arduino Nano is shown in Fig 2.2. and Table 2.2..
- It comes with an operating voltage of 5V, however, the input voltage can vary from 7 to 12V.
- Arduino Nano Pinout contains 14 digital pins, 8 analog Pins, 2 Reset Pins & 6 Power Pins.
- Each of these Digital & Analog Pins are assigned with multiple functions but their main function is to be configured as input or output.
- Functions like pinMode() and digitalWrite() are used to control the operations of digital pins while analogRead() is used to control analog pins.
- Arduino Nano comes with a crystal oscillator of frequency 16 MHz. It is used to produce a clock of precise frequency using constant voltage.

- There is one limitation using Arduino Nano i.e. it doesn't come with DC power jack, means you can not supply external power source through a battery.
- This board doesn't use standard USB for connection with a computer, instead, it comes with Mini USB support.

Table 2.1 Arduino Nano Specification

MICROCONTROLLER	Atmega328p/Atmega 168
OPERATING VOLTAGE	5V
INPUT VOLTAGE	7-12V
DIGITAL I/O PINS	14
PWM	6 out of 14 pins
MAX CURRENT RATING	40mA
USB	Mini
ANALOG PINS	8
FLASH MEMORY	16KB or 32KB
SRM	1KB or 2KB
CRYSTAL OSCILLATOR	16 Mhz
EPROM	512 bytes or 1kB

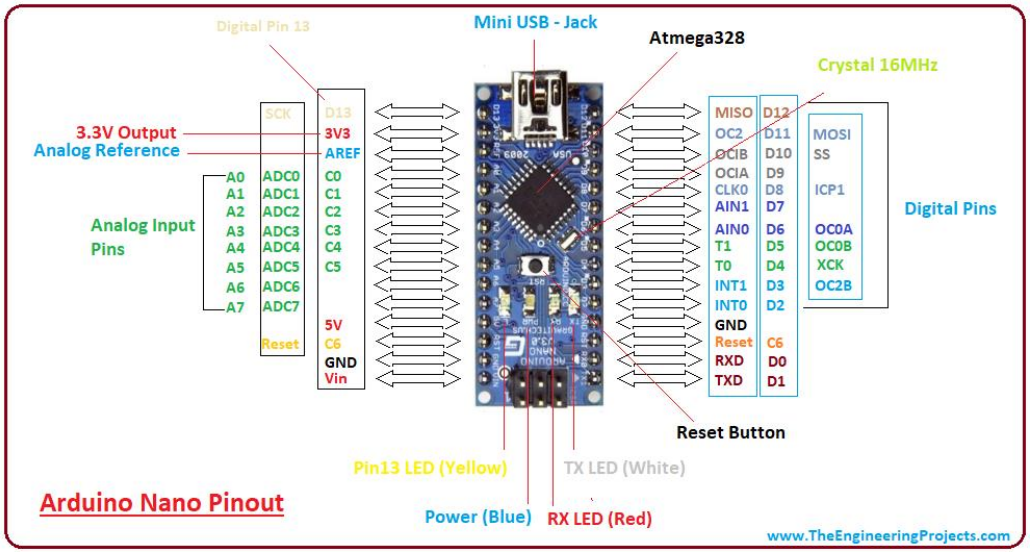

Fig 2.2 Arduino Nano Pin Description

Source: www.TheEngineeringProjects.com

Table 2.2 Arduino Nano Pin Description

Pin Number	**Pin Name**	**Description**
-	Vin	It is input power supply voltage to the board when using an external power source of 7 to 12 V.
-	5V	It is a regulated power supply voltage of the board that is used to power the controller and other components placed on the board.
-	3.3V	This is a minimum voltage generated by the voltage regulator on the board
-	GND	These are the ground pins on the board.
-	Reset	Reset pin is added on the board that resets the board. It is very helpful when running program goes too complex and hangs up the board. LOW value to the reset pin will reset the controller.
14,15,16,17,18,19	Analog Pins	There are 8 analog pins on the board marked as A0 – A7. These pins are used to measure the analog voltage ranging between 0 to 5V.
0,1	Rx, Tx	These pins are used for serial communication where Tx represents the transmission of data while Rx represents the data receiver
13	13	This pin is used to turn on the built-in LED
-	AREF	This pin is used as a reference voltage for the input voltage
3,5,6,9,10,11	PWM	Six pins 3,5,6,9,10, 11 can be used for providing 8-pit PWM (Pulse Width Modulation) output. It is a method used for getting analog results with digital sources
10 ,11 ,12 ,13	SPI	10(SS),11(MOSI),12(MISO),13(SCK) are used for SPI (Serial Peripheral Interface). SPI is an interface bus and mainly used to transfer data between microcontrollers and other peripherals like sensors, registers, SD card.
2,3	External Interrupts	Pin 2 and 3 are used as external interrupts which are used in case of emergency when we need to stop the main program and call important instructions at that point. The main program resumes once interrupt instruction is called and executed.

Chapter-3

COMPONENTS

This chapter gives the description of the various components that has been used in the designing of The Blind Stick. In this chapter we have described the following components.

- Ultrasonic Sensor
- Water Sensor
- Radio Frequency Module
- Encoder and Decoder
- DFPlayer MP3 Mini
- Vibration Motor
- Buzzer

3.1 ULTRASONIC SENSOR (HC-SR04)

3.1.1 INTRODUCTION

HC-SR04 Ultrasonic sensor as shown in Fig 3.1 is a 4 pin module. This sensor is a very popular sensor used in many applications where measuring distance or sensing objects are required. The module has two eyes like projects in the front which forms the Ultrasonic transmitter and Receiver.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. Fig 3.2 shows Ultrasonic Sensor Pin Diagram and Table 3.1 describes Ultrasonic Sensor Pin Specification.

Fig 3.1 Ultrasonic Sensor

Source: www.components101.com

3.1.2 SENSOR FEATURES

- Operating voltage: +5V
- Theoretical Measuring Distance: 2cm to 450cm
- Practical Measuring Distance: 2cm to 80cm
- Accuracy: 3mm
- Measuring angle covered: <15°
- Operating Current: <15mA
- Operating Frequency: 40Hz

Table 3.1 Ultrasonic Sensor Pin Specification

Pin Number	Pin Name	Description
1	Vcc	The Vcc pin powers the sensor, typically with +5V
2	Trigger	Trigger pin is an Input pin. This pin has to be kept high for 10us to initialize measurement by sending US wave.
3	Echo	Echo pin is an Output pin. This pin goes high for a period of time which will be equal to the time taken for the US wave to return back to the sensor.
4	Ground	This pin is connected to the Ground of the system.

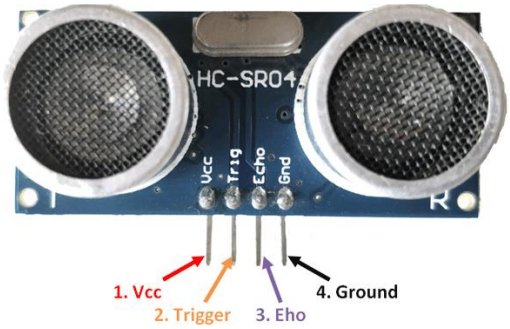

Fig 3.2 Ultrasonic Sensor Pin Diagram

Source: www.components101.com

3.1.3 WORKING OF SENSOR

The Ultrasonic transmitter transmits an ultrasonic wave, this wave travels in air and when it gets objected by any material it gets reflected back toward the sensor this reflected wave is observed by the Ultrasonic receiver module as shown in the picture Fig 3.3

Fig 3.3 Detection of object using Ultrasonic Sensor

Source: www.matbotix.com

Since we are using the Ultrasonic wave we know the universal speed of US wave at room conditions which is 330m/s. The circuitry inbuilt on the module will calculate the time taken for the US wave to come back and turns on the echo pin high for that same particular amount of time, this way we can also know the time taken. Now simply calculate the distance using a microcontroller or microprocessor.

3.2 WATER SENSOR

Water Sensor as shown in Fig 3.4 is an easy-to-use, cost-effective high level/drop recognition sensor, which is obtained by having a series of parallel wires exposed traces measured droplets/water volume in order to determine the water level. Easy to complete water to analog signal conversion and output analog values can be directly read Arduino development board to achieve the level alarm effect. The pin specification of Water Sensor is shown in Table 3.2.

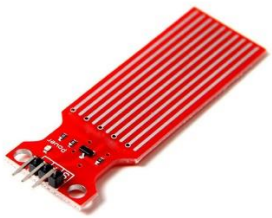

Fig 3.4 Water Sensor

Source: www.robokits.co.in

3.2.1 FEATURES

- Operating voltage: DC3-5V
- Operating current: less than 20mA
- Sensor Type: Analog
- Detection Area: 40mmx16mm
- Product Dimensions: 62mmx20mmx8mm

Table 3.2 Water Sensor Pin Specification

Pin Name	Description
Signal Pin (P)	It outputs the analog voltage signal in proportion to the amount of the sensor which is covered with liquid.
Positive (+)	Connects to +5V pin of Arduino Nano
Negative (-)	Connects to ground.

3.3 RADIO FREQUENCY MODULE

An RF module is a small electronic device used to transmit and/or receive radio signals between two devices. In an embedded system it is often desirable to communicate with another device wirelessly. This wireless communication may be accomplished through optical communication or through radio-frequency (RF) communication. For many applications the medium of choice is RF since it does not require line of sight. RF communications incorporate a transmitter and a receiver.

433 MHz Module Specifications:

- Wireless (RF) Simplex Transmitter and Receiver
- Receiver Operating Voltage: 3V to 12V
- Receiver Operating current: 5.5mA
- Operating frequency: 433 MHz
- Transmission Distance: 3 meters (without antenna) to 100 meters (maximum)
- Data Transmission speed: 10Kbps
- Low cost and small package

3.3.1 TRANSMITTER

The device used to transmit signal from one place to the other is known as transmitter. The signal consists of information in the form of voice, video or data. It uses antenna to transmit the signal into the air. Fig 3.5 shows the 433 MHz RF Transmitter Module And Pinout and Table 3.3 shows RF Module Transmitter Pin Specification

Fig 3.5 433 MHz RF Transmitter Module And Pinout

Source: www.components101.com

Table 3.3 RF Module Transmitter Pin Specification

Pin No.	Pin Name	Description
1	Vcc	Power supply (+5V only)
2	Data	Data to be transmitted is sent to this pin
3	Ground	Connected to the ground of the circuit
4	Antenna	Solder wire/antenna to improve range (not mandatory)

3.3.2 RECEIVER

The device which decodes the transmitted information from the received signal is known as receiver. The receiver also uses antenna to receive the signal from the air similar to the transmitter. Fig 3.6 shows 433 MHz RF Receiver Module and Pinout and Table 3.4 shows RF Module Receiver Pin Specification.

Fig 3.6 433 MHz RF Receiver Module And Pinout

Source: www.components101.com

Table 3.4 RF Module Receiver Pin Specification

Pin Number	Pin Name	Description
1	Vcc	Power supply (3V to 12V)
2, 3	Data	Data received can be obtained from either of the pins
4	Gnd	Connected to the ground of the circuit
5	Antenna	Solder wire/antenna to improve range (not mandatory)

3.4 ENCODER(HT12E) AND DECODER(HT12D)

The IC HT12E can be used only with its pair HT12D. These two ICs together form an Encoder and Decoder pair. They are 12-bit Encoders/Decoders, meaning they can transmit 12-bit a data among them. But your encoder IC should not communicate with someone else decoder IC, so an Encoder and Decoder IC pair will share a common Address which is an 8-bit data. So out of the 12-bits 8-bits will be used to set address and the remaining 4-bit will be used to transmit data. With 4-bit data we can create 16 types (2^4 =16) of combinations.

3.4.1 HT12E

The primary function of HT12E as shown in Fig 3.7 is to encode a 12-bit and send it out through the output pin. Since the IC comes with an in-built Oscillator it is very easy to make this IC work. Table 3.5 shows HT12E Encoder Pin Description.

- The IC is has a wide range of operating voltage from 2.4V to 12V, but normally the Vcc pin (pin 18) is powered by +5V and the ground pin (pin 9) is grounded. Pull the Transmission Enable pin (pin 14) to ground to activate transmission.
- For decoding a data the IC will requires an oscillator, luckily this IC has one in-built. We just have to connect the OSC1 and OSC2 (pin 15 & 16) through a 1M resistor to invoke it.
- The 4-bit data that has to be sent has to be given to the pins AD0 to AD1 and an address of 8-bit has to be set using the pins A0 to A7. It is very important that your Decoder should also have this same address for them to talk to each other.

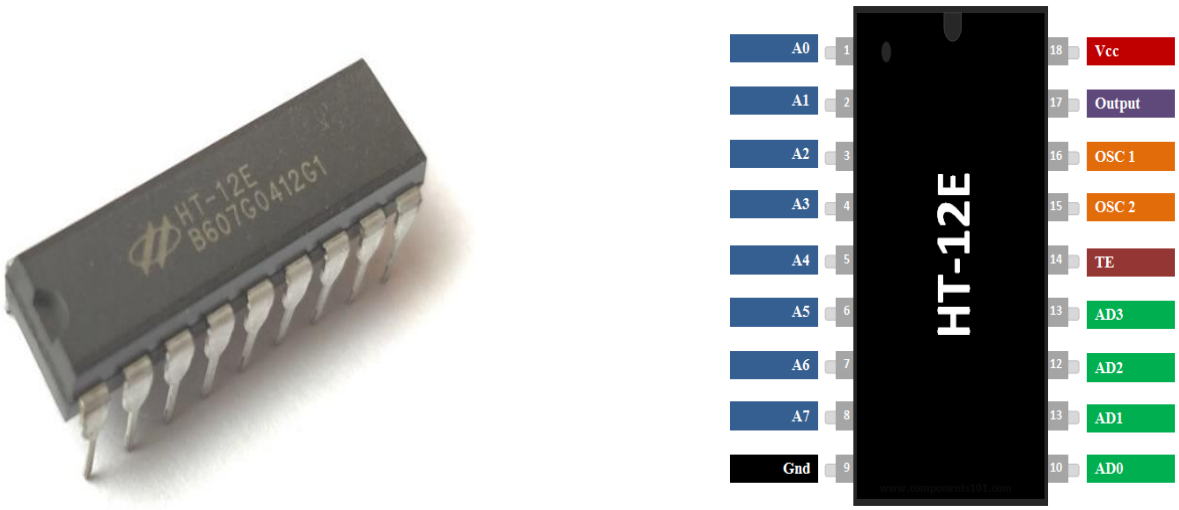

Fig 3.7 HT12E RF Encoder IC and Pin Diagram

Source: www.components101.com

Table 3.5 HT12E Encoder Pin Description

Pin No.	Pin Name	Description
1 to 8	A0,A1,A2,A3, A4,A5,A6 & A7	These are the 8-bit address bits, which is used to protect your data. We should set the bits in same pattern on Encoder and Decoder IC to pair them.
9	Ground/Vss	Connected to the Ground of circuit
10 to 13	AD0, AD1, AD2 & AD3	These four pins are used to send data, the data encoded here will be decoded on HT12D IC sharing the same address bits
14	Transmission Enable(TE)	This pin has to be connected to Ground (0V) to enable the Transmission.
15 and 16	Oscillator pins 1 & 2	The IC has a built in oscillator. This oscillator can be used by connecting these two pins through a 1M Resistor
17	Output	The Encoded 12 bit output data can be obtained from this pin
16	Vcc/Vdd	This pin powers the IC, typically +5V is used. Can range from 2.4V to 12V

3.4.2 HT12D

- The primary function of HT12D as shown in Fig 3.8 is to decode the 12-bit that is received by the input pin.
- The IC comes with an in-built Oscillator.
- The IC should be powered by 5V (pin 18) and the ground pin (pin 9) is grounded. For decoding a data the IC will requires an oscillator, this IC has one in-built.
- We just have to connect the OSC1 and OSC2 (pin 15 & 16) through a 470K resistor to invoke it.
- The 4-bit data that is received can be obtained on pins AD0 to AD1 and an address of 8-bit has to be set using the pins A0 to A7. It is very important that your Decoder should have the same address of that of the encoder. Table 3.6 shows the HT12D Decoder Pin Description.

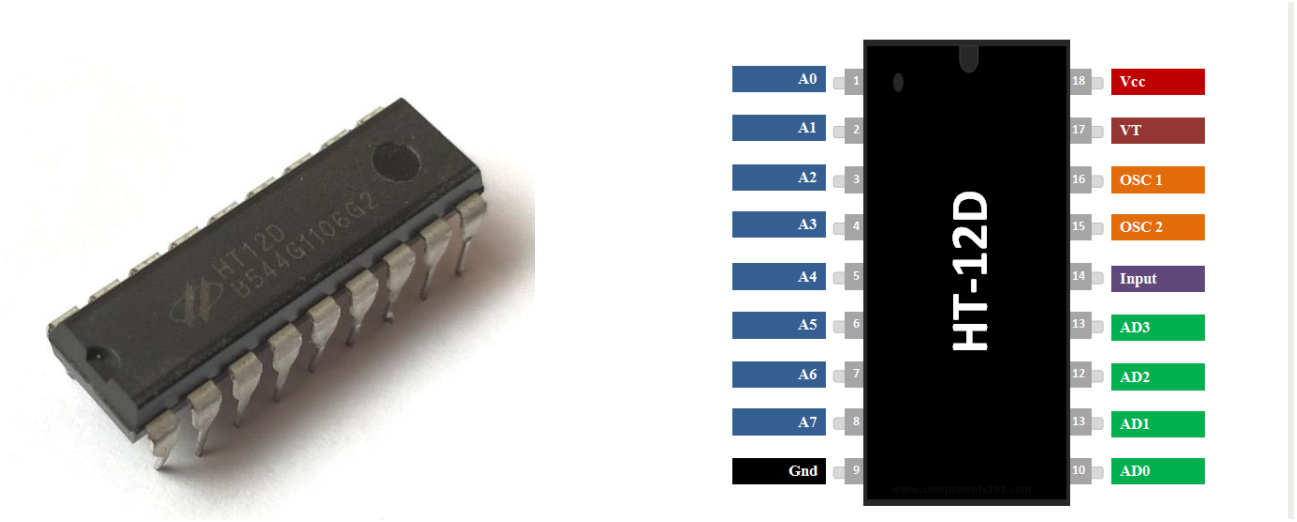

Fig 3.8 HT12D RF Decoder IC and Pin Diagram

Source: www.components101.com

Table 3.6 HT12D Decoder Pin Description

Pin Number	**Pin Name**	**Description**
1 to 8	A0,A1,A2,A3,A4,A5,A6 & A7	These are the 8-bit address bits, which is used to protect your data. We should set the bits in same pattern on Encoder and Decoder IC to pair them.
9	Ground/Vss	Connected to the Ground of circuit
10 to 13	AD0, AD1, AD2 & AD3	These four pins are used to obtain the data bits by decoding the data from HT12E IC
14	Input	The Encoded 12 bit output data obtained from HT12E has to be given here
15 and 16	Oscillator pins 1 & 2	The IC has a built in oscillator. This oscillator can be used by connecting these two pins through a 1M Resistor
17	Valid Transmission (VT)	This pin will go high when a data is received. It is not mandatory to use it.
16	Vcc/Vdd	This pin powers the IC should use only 5V

3.5 DFPlAYER MINI MP3 MODULE

3.5.1 INTRODUCTION

The DFPlayer Mini MP3 Player as shown in Fig 3.9 for Arduino is a small and low price MP3 module with an simplified output directly to the speaker. The module can be used as a stand alone module with attached battery, speaker and push buttons or used in combination with an Arduino UNO/Nano or any other with RX/TX capabilities.

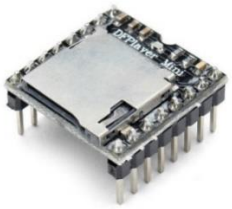

Fig 3.9 DFPlayer MP3 Mini

Source: www.banggood.com

3.5.2 APPLICATIONS

- Car navigation voice broadcast.
- Road transport inspectors, toll stations voice prompts.
- Railway station, bus safety inspection voice prompts.
- Fire alarm voice prompts.
- Multi-channel voice alarm or equipment operating guide voice.
- The electric tourist car safe driving voice notices.

3.5.3 PIN SPECIFICATION

The Pin Specification of DFPlayer MP3 Mini is shown in Table 3.7 and Fig 3.10 shows the DFPlayer MP3 Mini Pinout.

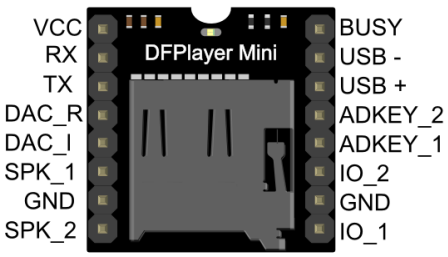

Fig 3.10 DFPlayer MP3 Mini Pinout

Source: www.dfrobot.com

Table 3.7 DFPlayer MP3 Mini Pin Specification

Pin Number	**Pin Name**	**Description**	**Note**
1	VCC	Input Voltage	-
2	RX	UART serial input	-
3	TX	UART serial ouput	-
4	DAC_R	Audio output right channel	Drive earphone and amplifier
5	DAC_L	Audio output left channel	Drive earphone and amplifier
6	SPK2	Speaker-	Drive speaker less than 3W
7	GND	Ground	Power GND
8	SPK1	Speaker+	Drive speaker less than 3W
9	IO1	Trigger port 1	Short press to play previous(long press to decrease volume)
10	GND	Ground	Power GND
11	IO2	Trigger port 2	Short press to play next(long press to increase volume)
12	ADKEY1	AD port 1	Trigger play first segment
13	ADKEY2	AD port 2	Trigger play fifth segment
14	USB+	USB+ DP	USB Port
15	USB-	USB- DM	USB Port
16	BUSY	Playing Status	Low means playing\High means no

3.6 VIBRATION MOTOR

The Eccentric Rotating Mass vibration motor as shown in Fig 3.11, or ERM, also known as a pager motor is a DC motor with an offset (non-symmetric) mass attached to the shaft. As the ERM rotates, the centripetal force of the offset mass is asymmetric, resulting in a net centrifugal force, and this causes a displacement of the motor. With a high number of revolutions per minute, the motor is constantly being displaced and moved by these asymmetric forces. It is this repeated displacement that is perceived as a vibration.

Fig 3.11 Vibration motor

Source: www.dfrobot.com

3.7 BUZZER

A piezo buzzer as shown in Fig 3.12 is a type of electronic device that's used to produce a tone, alarm or sound. It's lightweight with a simple construction, and it's typically a low-cost product. Yet at the same time, depending on the piezo buzzer specifications, it's also reliable and can be constructed in a wide range of sizes that work across varying frequencies to produce different sound outputs.

Fig 3.12 Mini Piezo Buzzer

Source: www.pcboard.ca

Chapter 4

WORKING OF THE STICK

4.1 SYSTEM INFORMATION

The proposed blind stick is integrated with the following:

- Ultrasonic Sensor 1 (for object detection)
- Ultrasonic Sensor 2 (for staircase detection)
- Water Sensor
- Vibration motor
- Radio Frequency remote
- DFPlayer Mini and Speaker

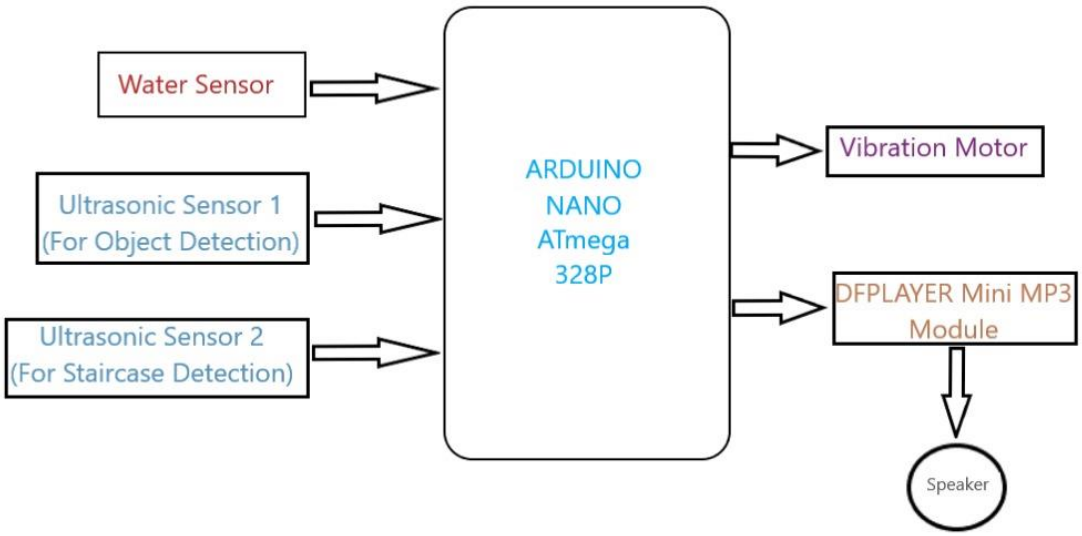

Fig 4.1 Block Diagram of The System

The block diagram as shown in Fig 4.1 depicts the proposed design of a smart stick. The system elements consist of various subsystems. The sensor based circuitry consisting of sensors such as Ultrasonic sensors and Water sensor. The feedback system has auditory interface. The complete circuit is mounted on a simple white cane or on a ordinary blind stick. The system has one more advanced feature integrated to help the blind find their stick if they forget where they kept it. A wireless RF based remote is used for this purpose

4.2 CONNECTIONS

In Fig 4.2 Arduino Nano is used as the platform. Ultrasonic sensors, Water Sensor and DFPlayer MP3 Mini all are connected to Arduino Nano and Table 4.1 shows the connection of various components with Arduino Nano. Fig 4.3 and Fig 4.4 shows the RF remote transmitter circuit and RF remote receiver circuit respectively.

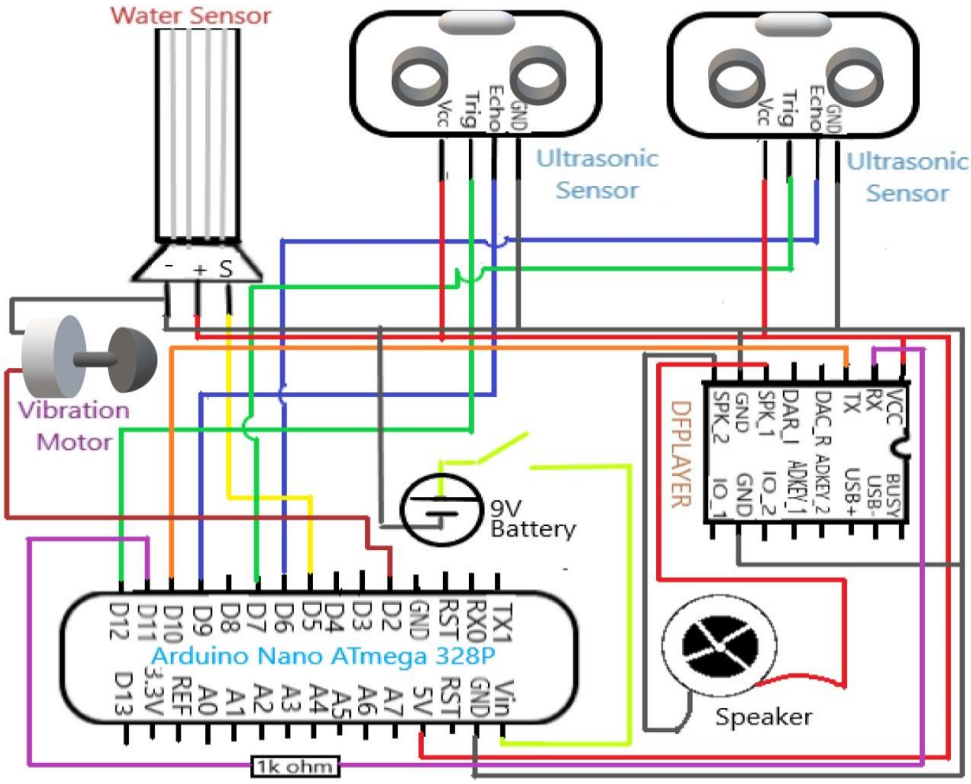

Fig 4.2 Complete circuit of The stick

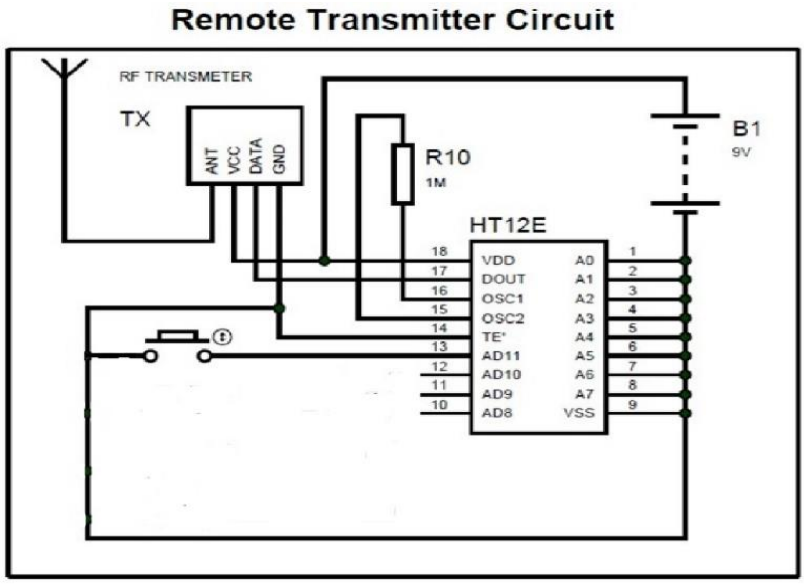

Fig 4.3 RF Remote transmitter circuit

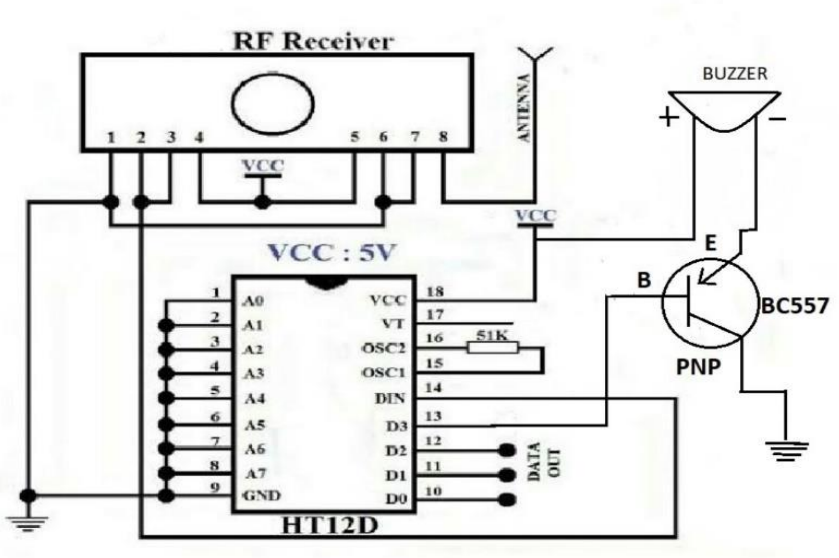

Fig 4.4 RF Remote receiver circuit

Table 4.1 Connection of all the components with Arduino Nano

DFPLAYER MP3 MINI	**ARDUINO NANO PIN**	**ULTRASONIC SENSOR 1 PIN**	**ULTRASONIC SENSOR 2 PIN**	**WATER SENSOR PIN**	**VIBRATION MOTOR**	**SPEAKER**
Vcc	5V	Vcc	Vcc	Vcc	-	-
Rx	D11	-	-	-		-
Tx	D10	-	-	-	-	-
GND	GND	GND	GND	GND	GND	-
SPK_1	-	-	-	-	-	Positive
SPK_2	-	-	-	-	-	Negative
-	D12	Trigger	-	-	-	-
-	D9	Echo	-	-	-	-
-	D7	-	Trigger	-	-	-
-	D6	-	Echo	-	-	-
-	D5	-	-	S pin	-	
-	D2	-	-	-	Positive	-

4.3 POWERING THE STICK

- As we provide power to the stick all the components on the stick turn ON and start to perform their functions.
- Working of the various sensors (Ultrasonic Sensor 1, Ultrasonic Sensor 2 and Water Sensor) and RF remote is explained through the following flowcharts.
- Fig 4.5 shows the working of Ultrasonic Sensor 1 which is used for obstacle detection.
- Fig 4.6 shows the working of Ultrasonic Sensor 2 which is used for staircase detection.
- Fig 4.7 shows the working of Water Sensor which is used for detection of water.
- Fig 4.8 shows the working of RF Remote(transmitter and receiver circuit) which is used for finding the stick.

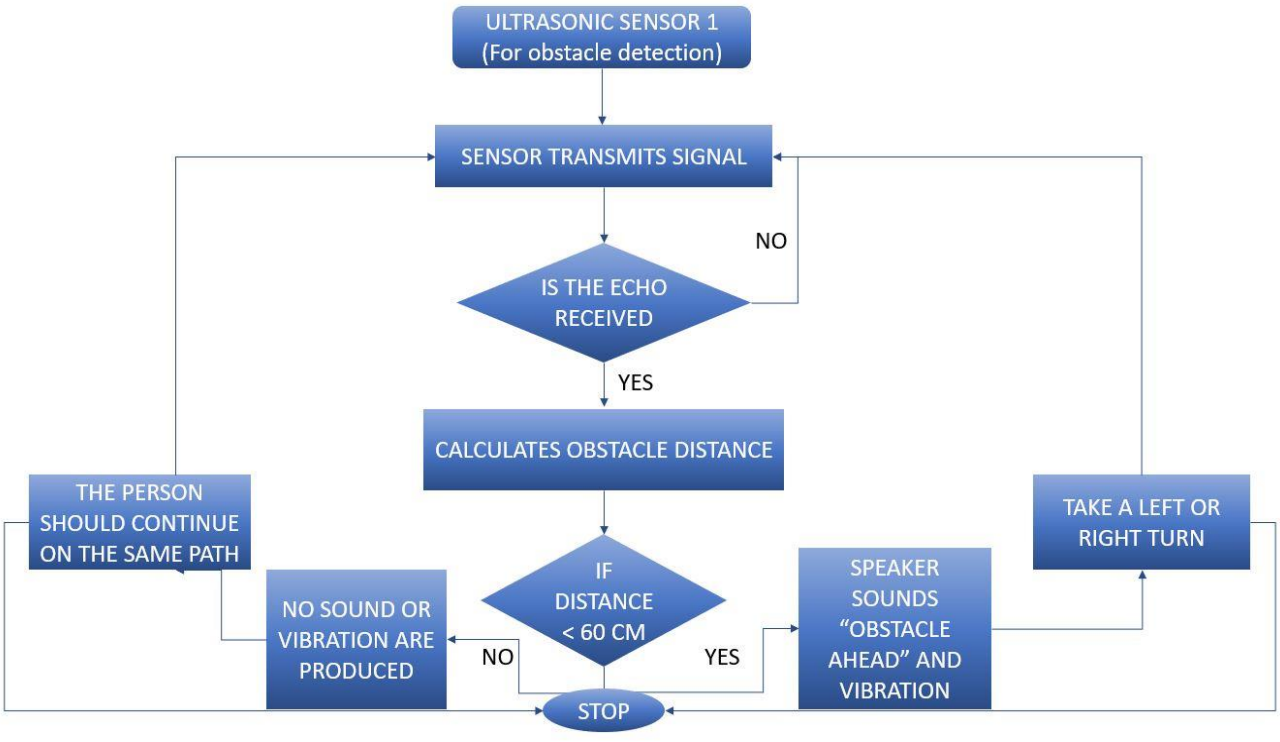

Fig 4.5 Flowchart of Ultrasonic Sensor 1 (obstacle detection)

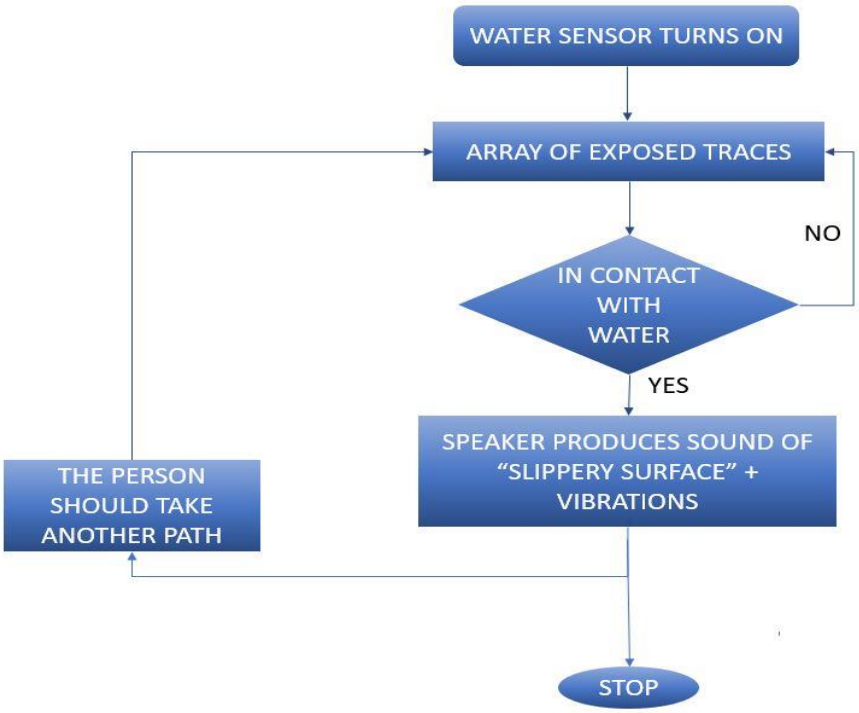

Fig 4.6 Flowchart of Water Sensor

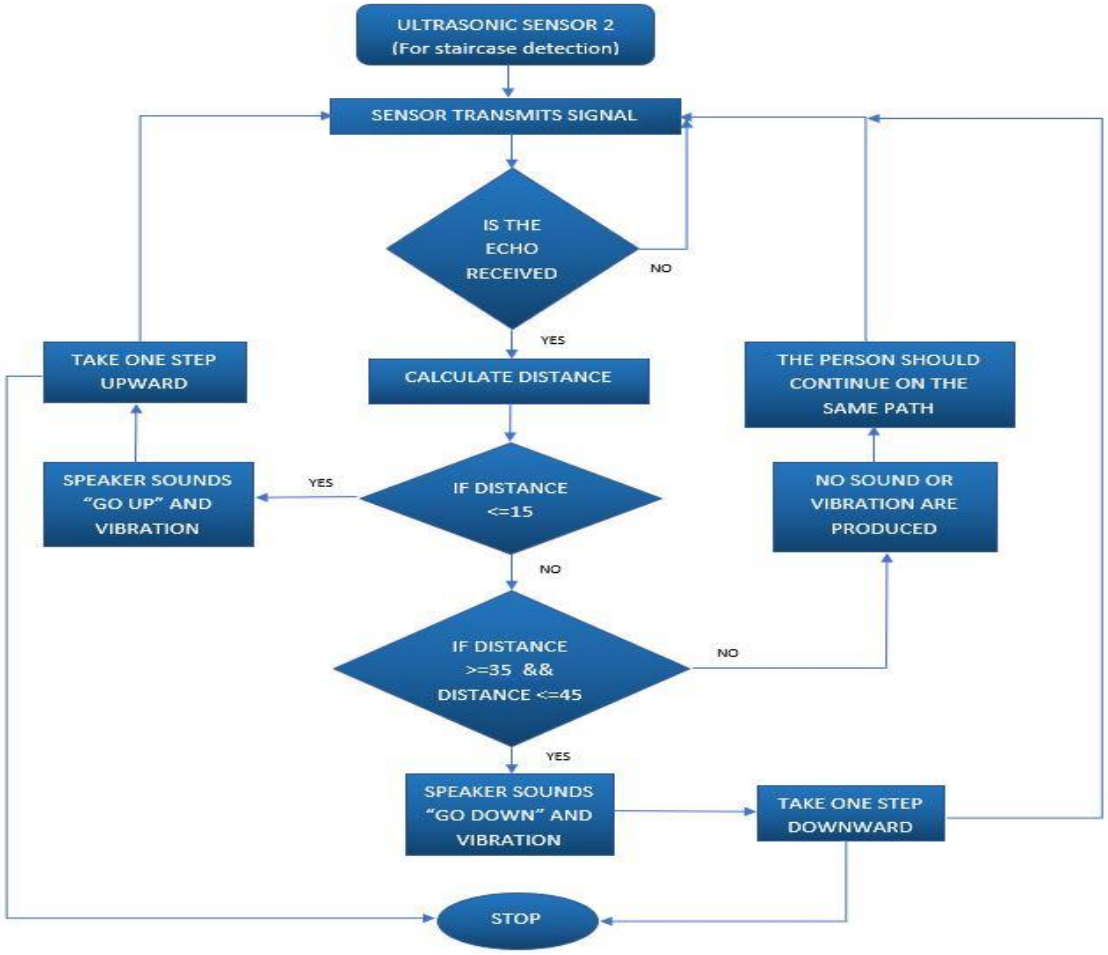

Fig 4.7 Flowchart of Ultrasonic Sensor 2 (for staircase detection)

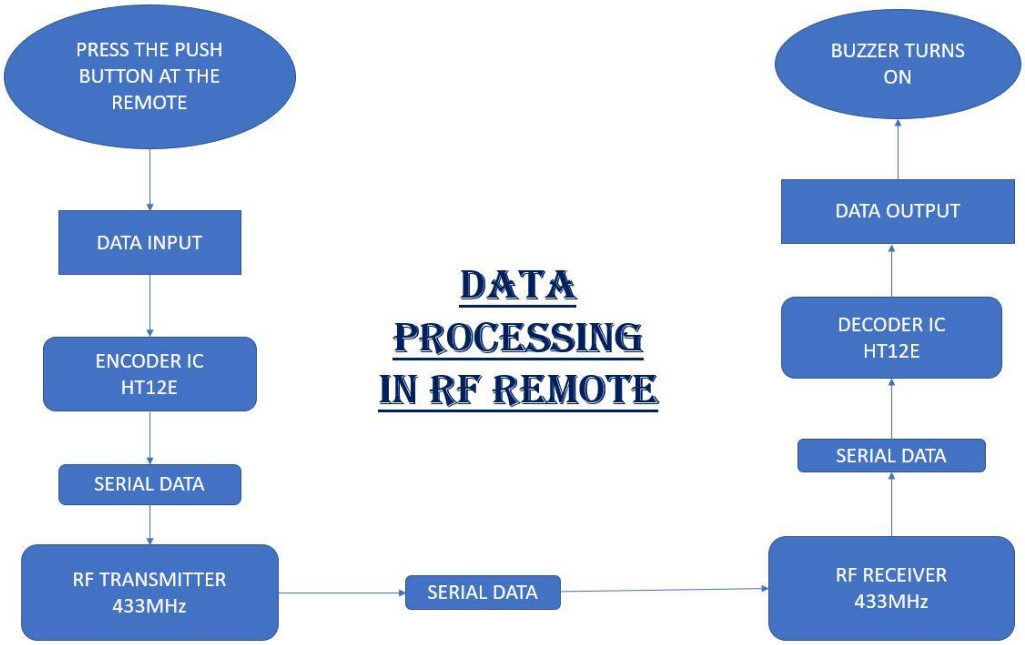

Fig 4.8 Flowchart of RF remote

Chapter 5

CONCLUSION AND FUTURE SCOPE

5.1 CONCLUSION

The Smart Stick acts as a basic platform for the coming generation of more aiding devices to help the visually impaired to be more safe. It is effective and afford. It leads to good results in detecting the obstacles and staircase lying ahead of the user. This system offers a low-cost, reliable, portable, low power consumption. Though the system is hard-wired with sensors and other components, it's light in weight. Further aspects of this system can be improved via wireless connectivity between the system components, thus, increasing the range of the ultrasonic sensor and implementing a technology for determining the speed of approaching obstacles. While developing such an empowering solution, visually impaired and blind people in all developing countries were on top of our priorities.

The system is designed, implemented, tested, and verified. The real-time results of the system are encouraging; it revealed an accuracy of 93% in detecting distances. The results indicate that the system is efficient and unique in its capability in specifying the source and distance of the objects that may encounter the blind. The ultrasonic sensor has been fully utilized in order to advance the mobility of the blind and visual impaired people in safe and independent way. The water are used for the detection of presence of water. This system does not require a huge device to be hold for a long distance, and it also does not require any special training. This system also resolves limitations that are related to the most of the movement problems that may influence the blind people in their environment.

5.2 FUTURE SCOPE

In the future, further modifications to enhance the performance of the system will be added. These include: A global positioning method to find the position of' the user using the GPS, and GSM modules to communicate the location to a relative or care giver. It should also accommodate wide varying grips for flexible handling.

In order to run this integrated set of hardware we can use solar panels as an alternative to the battery. The use of solar panel occurs to be more advantageous as it uses sunlight, the easily available renewable resource of energy, to get recharged.

REFERENCES

[1] M. Bousbia-Salah, A. Larbi, and M. Bedda, “An approach for the measurement of distance travelled by blind and visually impaired people,” in Proc. 10th IEEE International Conference on Electronics, Circuits and Systems, Sharjah, United Arab Emirates, pp. 1312-1315, 2003.

[2] Shruti Dambhare and A.Sakhare, G.H, “Smart stick for Blind: Obstacle Detection, Artificial vision and Real-time assistance via GPS”, International Journal of Computer Applications (IJCA), No. 1, 31 – 33, 2011.

[3] Bhatlawande, Shripad S., Jayant Mukhopadhyay, and ManjunathaMahadevappa. "Ultrasonic spectacles and waist-belt for visually impaired and blind person." Communications (NCC),ss NationalConference on. IEEE, 2012.

[4] S. Shoval, J. Borenstein, and Y. Koren, “The NavBelt- A computerized travel aid for the blind based on mobile robotics technology,” *IEEE Transactions on Biomedical Engineering*, vol. 45, no 11, pp. 1376-1386, 1998.

[5] Amit kumar, M. Manjunatha and J. Mukhopadhyay, “An Electronic Travel Aid for Navigation of Visually Impaired Person,” Proceeding of the 3rd International Conference Communication Systems and Networks, pp.1-5, 2011.

[6] Ulrich, and J. Borenstein, “The guide cane-Applying mobile robot technologies to assist the visually impaired,” *IEEE Transaction on Systems, Man, and Cybernetics-Part A: Systems and Humans*, vol. 31,no. 2, pp. 131-136, 2001.

APPENDICES

PROJECT CODE

```
#include <Arduino.h>
#include <SoftwareSerial.h>
//-----------------------------------ULTRASONIC SENSOR 1 FOR OBJECT DETECTION----------
int const trigPin1 = 7;
int const echoPin1 = 6;
//-----------------------------------------------------WATER SENSOR--------------------
int const s_pin = 5;
//---------------------------------ULTRASONIC SENSOR 2 FOR STAIRCASE DETECTION----------
int const trigPin2 = 12;
int const echoPin2 = 9;
//-----------------------------------------------------VIBRATION MOTOR-----------------
int const vibration = 2;
SoftwareSerial mySerial(10, 11);
# define Start_Byte 0x7E
# define Version_Byte 0xFF
# define Command_Length 0x06
# define End_Byte 0xEF
# define Acknowledge 0x00 //Returns info with command 0x41 [0x01: info, 0x00: no info]
void setup () {
  mySerial.begin (9600);
//ULTRASONIC SENSOR 1(OBJECT DETECTION)
  pinMode(trigPin1 , OUTPUT);
  pinMode(echoPin1 , INPUT);
//ULTRASONIC SENSOR 2(STAIRCASE DETECTION)
  pinMode(trigPin2 , OUTPUT);
  pinMode(echoPin2 , INPUT);
 //WATER SENSOR
  pinMode(s_pin,INPUT);
//VIBRATION MOTOR
```

```
  pinMode(vibration,OUTPUT);
}
void loop ()
{
    static int flag1=0;
    static int flag2=0;
    static int flag3=0;
    static int flag4=0;
    static int flag5=0;
    static int flag6=0;
//------------------------------------ ULTRASONIC SENSOR 1(OBJECT DETECTION)-------------------------
-------------
    int duration1, distance1;
    digitalWrite(trigPin1, HIGH);
    delay(1);
    digitalWrite(trigPin1, LOW);
    duration1 = pulseIn(echoPin1, HIGH);
    distance1 = (duration1 / 2) / 29.1;
////---------------------------------- ULTRASONIC SENSOR 1(STAIRCASE DETECTION)-----------------------
-------------
    int duration2, distance2;
     digitalWrite(trigPin2, HIGH);
      delay(1);
      digitalWrite(trigPin2, LOW);
      duration2 = pulseIn(echoPin2, HIGH);
      distance2 = duration2 / 58.3;
    if(distance2 <=15)
      {
        digitalWrite(vibration,HIGH);
          flag1=0;
          flag2=0;
          flag3=0;
          flag5=0;
          if(flag4==0)
          {
```

```
      play1(3);
      flag4++;
    }
    else
    {
      play();
    }
  }
  else if(distance2 >= 28 && distance2 <=40)   // distance 38 cm approx(yet to confirm)
  {
    digitalWrite(vibration,HIGH);
    flag1=0;
    flag2=0;
    flag3=0;
    flag4=0;
    if(flag5==0)
    {
      play1(4);
      flag5++;
    }
    else
    {
      play();
    }
  }

else if(distance1 <= 40 && digitalRead(s_pin)!=LOW)
{
   digitalWrite(vibration,HIGH);
   flag1=0;
   flag2=0;
   flag4=0;
   flag5=0;
   if(flag3==0)
```

```
  {
    play1(2);
    flag3++;
  }
  else
  {
    play();
  }
}
 else if (distance1 <= 30) {
  digitalWrite(vibration,HIGH);
  flag2=0;
  flag3=0;
  flag4=0;
  flag5=0;
  if(flag1==0)
  {
     play1(1);
     flag1++;
  }
  else
     play();
 }
 else if(digitalRead(s_pin)!=LOW)
 {
  digitalWrite(vibration,HIGH);
  digitalWrite(13,HIGH);
    flag1=0;
    flag3=0;
    flag4=0;
    flag5=0;
    if(flag2==0)
    {
      play1(5);
```

```
          flag2++;
         }
         else
         {
          play();
         }
      }
       //const distance that we want to set b/w floor and ultrasonic sensor is 28 cm
      else
      {
       digitalWrite(vibration,LOW);
       digitalWrite(13,LOW);
       pause();
      }
    delay(60);
}
void playFirst()
{
  execute_CMD(0x3F, 0, 0);
  delay(500);
  setVolume(20);
  delay(500);
  execute_CMD(0x11,0,1);
  delay(500);
}
void pause()
{
  execute_CMD(0x0E,0,0);
  //delay(500);
}
void play()
{
  execute_CMD(0x0D,0,1);
  delay(500);
```

```
}
void playNext()
{
  execute_CMD(0x01,0,1);
  delay(500);
}
void play1(int d)
{
  execute_CMD(0x03,(d >> 8) & 0xFF, d & 0xFF );
  delay(500);
}
void playPrevious()
{
  execute_CMD(0x02,0,1);
  delay(500);
}
void setVolume(int volume)
{
  execute_CMD(0x06, 0, volume); // Set the volume (0x00~0x30)
  delay(2000);
}
void execute_CMD(byte CMD, byte Par1, byte Par2)
// Excecute the command and parameters
{
    // Calculate the checksum (2 bytes)
    word checksum = -(Version_Byte + Command_Length + CMD + Acknowledge + Par1 + Par2);
    // Build the command line
    byte Command_line[10] = { Start_Byte, Version_Byte, Command_Length, CMD, Acknowledge,
                              Par1, Par2, highByte(checksum), lowByte(checksum), End_Byte};
      //Send the command line to the module
    for (byte k=0; k<10; k++)
    {
      mySerial.write( Command_line[k]);
    }
```