

## A Novel approach of blind stick based on Ultrasonic Sensors

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**Abstract** Vision sense is one of the best gift human beings have received so far. It is the basic sense which provides independence in attaining our goals, fulfilling our dreams in life. But this vision sense is unfortunately lacked by some people in our society. The situation becomes difficult when they have to face some barrier or hurdle. Until now as the solution of the problem the white cane became an efficient attribute for a blind navigation which later lead to an improvement by a remote sensor. But the solution was not up to the mark and this led to the concept of ultrasonic blind stick as an improved navigation technique. This paper presents a basic theoretical concept of the smart blind stick. Low cost and high quality navigation is the basic aim of the overall system which provides information about the present environment scenario and the things around them. The distance between the obstacle and the blind person is calculated by the ultrasonic sensor which acts as a guide for the user. The blind person get the output as a beep or a buzzer.

**Keywords:** ultrasonic sensor, navigation

### Introduction

In the world total population of 7.7 billion approximately 37 million from the world and over 15 million people from India are visually challenged. The situation becomes problematic even for non-visually challenged people sometimes it is worst for visually challenged. Visually challenged People are usually dependent on external aids. These external aids can be human beings, fully trained dogs and most appropriate other special electronic devices which are invented with the advancement of Technology. Among the special electronic devices one of the commonly used is white cane which was able to detect and identify objects emerging on their front. But the major drawback of this device was that it was not able to detect a sudden depth or hurdles at a certain level. The limitation of this device was overcome by the smart ultrasonic blind stick which is now a days used popularly. The basic design of the white cane and the stick is similar but some additional sensors are inserted to it which makes it more user friendly.

### Argument

The most important among all the five senses is the sense of vision of human psychology. Around 83% of information analyzed by human beings is done with the help of sight. The most commonly used special devices are C5 laser cane, meld dog, MO watt sensor, sonic torch. But these devices lack accuracy in some or the other aspects. The major drawbacks are that little information is transferred and it also offers less range of movement. This have led to high end technological solutions that is the use of ultrasound as it offers good immune to the environment sounds also this technology is inexpensive and offers less complex circuit.

### Literature survey

A Mission was launched namely project Prakash for the assistance of the blind people which mainly aims to train them so as to utilize their brains to acknowledge certain hurdles around them. The stick consists of things Sonar sensor which is used to detect the objects which are at a certain distance. It also consists of water sensor to detect the presence of water. The microcontroller was placed outside but in order to ensure the security of the device the controller consists of a security code.

The concept of artificial vision and object detection with the presence of GPS which is less expensive and highly efficient system [4].

A smart blind stick concept which works with the help of infrared sensor was given by [5] because of the presence of infrared sensor it has only focused on the identification of hurdles and not providing the assistance when needed by visually challenged people.

## Details of Components

### Name of major components

1. Ultrasonic sensor
2. AVR microcontroller
3. RF module 8

### Major Component description

#### 1) Ultrasonic sensor

Ultrasonic waves are longitudinal waves and ultrasonic sensors are electro-mechanical sensors which transform the energy to measure the distance. Ultrasonic sensors are categorized in two types on the bases of their working principle

1. Piezoelectric sensors
2. Electrostatic sensors.

Here we are working with HC-SR04 piezoelectric type ultrasonic sensor.

Sensor consists of receiver, transmitter, resonator, vibrator, Unimorph Disc metallic net, outer casing. In order to protect the sensor from rain, dirt and dust sensor is covered with metal case.

Sensor provides ranging from the distance of 2cm to 300cm is used with the accuracy of 3mm .I/O trigger of 10us is used and frequency of 40kHz is automatically sends by the sensor. The time duration of sending and receiving the signal is calculated in order to calculate distance. The ultrasonic sensor has a wide range of applications like in different fields. Few applications are sonar. Apart from measuring distance these sensors are also used in medical fields, in industries to detect the flaws in machines.



Fig 1. Ultrasonic sensor

The main advantage of using ultrasonic sensor is, it is not effected by the Colors . In comparison with radar ultrasonic sensor can detect the object more effectively.

#### 2) AVR microcontroller-

Atmega 32-8 bit AVR microcontroller is based on RISC architecture. Atmega 32 is CMOS microcontroller with 40 pins. It can work on the frequency of 1-8 MHz. It has 32 X 8 general purpose registers. Atmega 32 is consider as a powerful microcontroller due to monolithic chip with self-programmable flash. 3 timers one of 16bit and other two are of 8bit are present. It does not need external input due to the presence of oscillator. It has 4 pulse width modulation channel. With 32 programmable pins it has various application in embedded system. It has flash memory is of 8Kb .Its basic advantage is the absence of accumulator due to which any of its register can hold the result.



Fig 2. AVR microcontroller

#### 3. RF module-

RF module also known as radio frequency module is an electronic device which is used for sending or receiving radio frequency from one device to another. The main requirement which embedded system has to fulfill is a wireless communication. This wireless communication can be achieved via optical communication or RF module. Usually RF module is preferred over optical communication as the line of sight is not required for this type of communication. The fundamental decisions regarding the strategic orientation

### List of equipment required

#### Software required

1. Atmel studio
2. Proteus

#### Hardware required

1. Zero PCB
2. Adaptor
3. FF wires
4. Atmega32 controller
5. 40 pin base
6. Reset switch
7. Female bug strip

8. Male bug strip
9. AVR project board
10. Buzzer
11. RF module
12. Ultrasonic sensor
13. BC547
14. AVR programmer
15. 9V battery

### System description

This paper basically focuses on the theoretical concept to design an intelligent blind stick to support visually challenged people by the use of technology. This device uses the combination of the two technologies of AVR microcontroller and ultrasonic sensor to help those people to escape from hurdles.

The circuit activates with the help of 6f22 9v general purpose battery. The ultrasonic sensors consists of an emitter or transmitter, receiver along with the control circuit. Wave of the known frequency is emitted by the emitter and after hitting the obstacle or target it reflects back and received by the receiver and gives to the microcontroller. AVR Microcontroller processes it and through the mathematical calculations (which is the part of programming), time calculated and then the distance. If the obstacle is within the range of 3m the buzzer starts beeping and as the person goes more near to the object the buzzer will beep with more frequency.

Stairs can also be detected with this stick. A button is glued underneath the stick. As soon as the stick touches the ground, the working of the button is activated and ultrasonic sensor calculate the hypotenuse and with the help of known perpendicular distance, base is calculated. Again with the help of buzzer but this time with different beep sound one can detect the stairs.

One RF remote with receiver is also provided along with this obstacle detecting stick. One can find his/her misplaced stick with the help of this remote. The whole system is guided by the AVR microcontroller.

### Features

- *Easy to carry even in outdoor environment*
- *Fully automated system*
- *Less expensive*
- *User friendly*
- *Low power consumption*

### Future Scope

- Infrared waves can be proved as a very good alternate of ultrasonic waves.
- The application of the stick can also be replaced with waist belt, goggles, and boots. In all these cases one do not have to hold anything he or she can only wear these things.
- Shape detection technique can also be used as it offers accuracy.
- GPS installation can be a very good option in order to increase the credibility of the device as the GPS system offers the feature of tracking and it can also help the person when in times of need.

### Conclusion

The studies which have been analyzed in the research paper show that in order to design ultrasonic blind walking stick .There are various number of methods available but the advantage of the system is that it provides a less expensive solution for 37 million blind people in the world. Also this product is visible to use and easy to carry.

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