ISSN No. 0976-5697

Volume 11, Special Issue I, May 2020

nternational Journal of Advanced Research in Computer Science

CONFERENCE PAPER

Available Online at www.ijarcs.info

# SMART BLIND STICK USING ARDUINO

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**ABSTRACT**: This paper describes the design of smart blind stick, this is an approach to alert visually impaired people from obstacles around them this device is composed with ultrasonic sensors, IR sensor, Arduino Mega 2560 where ultrasonic sensor detects the distance between stick and obstacle in front of them and IR sensor is used to detect the obstacles which are very close. If any obstacle occurs, the system will alert the person by generating an alarm using buzzer. So, the person can avoid collisions with the obstacles. Our project aims to design and implement an efficient and cheap stick.

**Keywords**: Arduino Mega2560, ultrasonic sensor, IR sensor.

## 1. INTRODUCTION

Visually Impaired face difficulty in interacting and feel the environment. The physical movement is challenge for visually impaired people, as it can become tricky to distinguish obstacles appearing in front of them, and these people are not able to move from one place to another place. They depend on someone for mobility. They also have to depend for financial support on their families. This opposes them participating in social activities. Different systems are designed with limitations without a solid understanding of the no visual perception.

Smart walking stick is specially designed for visually impaired for the detection of obstacles to navigate care-free. The audio messages in this smart blind stick will keep the user alert and thereby accidents are reduced. Voice enabled automatic switching is incorporated which help them in private space as well. This smart walking stick is a simple mechanical device used to detect the obstacles on the ground. The device is light in weight, and it is portable. The main aim of this smart blind stick is to provide an efficient navigation aid for the blind people that give a sense of vision and thereby providing the information about the surroundings and objects around them. The range of this is limited due to its own size. In case this walking stick is lost around him a rf transmitter is incorporated in the stick along with Arduino and ultrasonic sensor and the blind person carries an rf transmitter with him when he press the button the stick starts giving a sound that is beeping so he can find the stick.

## 2. LITERATURE SURVEY

In paper [1], The smart blind stick is based on sensors and microcontroller. The features considered are detection of obstacles near the stick and alert them back using Arduino Mega 2560, ultrasonic sensors, IR sensors, and buzzer. It has a low cost, simple and lightweight system design. By using these sensors and microcontroller, sensors sense the distance between obstacles and the blind stick and then alert with the buzzer where the frequency of vibration indicating the proximity of obstacles.

In paper [2], The design and implementation of a smart blind walking stick is with Arduino UNO, ultrasonic sensor, IR sensor and the voice playback module. This stick detects any obstacles in front of the person, and alerts the person through a voice playback module which detects the user spoken word through a microphone. Using this blind stick, a person can walk more comfortably and confidently. This device will be the best solution to overcome their difficulties.

In paper [3], The smart walking stick helps blind people to perform navigation and to do their work easily. This smart blind stick, composed with Arduino nano, ultrasonic sensors, IR sensor, buzzer. Where, the ultrasonic sensors detects the distance between the obstacles and the person which are fixed in such a way that the obstacles in different heights can be detected and the IR sensor can also detect the front hole while the stick is around 21.5cm far from the hole.
If any obstacle comes in front of blind person, they can know about the obstacle by hearing the sound generated by the BUZZER.

In paper [4], The blind stick is designed for visually impaired people for improved navigation. This stick integrated with ultrasonic sensor and water sensor. Ultrasonic sensor used to detect the obstacles ahead using ultrasonic waves then passesthe data to microcontroller. This microcontroller calculates the distance between obstacle and stick. If the obstacle is close, then the microcontroller sends a signal to sound a speaker. It also detects the water and gives a different sound. It also helps the user to find the stick if they forget they forget where they kept it by using a wireless RF based remote.

In paper [5], the design of smart blind stick is with infrared sensor to detect staircases and ultrasonic sensors where in the first one is to detect any other obstacles in front of the user, within a range of few meters and the other sensor is placed at the bottom of the stick to avoid puddles. Speech alert messages and the vibration motor are activated when any obstacle is detected

## 3. SYSTEM OVERVIEW

It involves the basics required in order to complete the task at hand and to gain better understanding of the concepts.

### A. ARDUINO MEGA 2560

Arduino is an open-source electronics platform. There are many types of Arduino whereas here we are using Arduino mega 2560 which acts as the core part of this smart bind stick system. Most of the coding is designed in the Arduino based on the ATMEGA 2560. C programming language and the Arduino IDE software are used to run the entire system of a smart blind walking stick. The distance between the obstacle and the blind stick is calculated in Arduino using the code.

### B. ULTRASONIC SENSOR

Ultrasonic sensors are used to detect the objects in front of the person. HC-SRC04 ultrasonic sensor has 4 pins called ground, Vcc, trigger and Echo. The ranging of this sensor is from 2cm to 400cm. It has two opening, one is transmitter which transmits the signal and the other one is receiver which helps in receiving the signal. It sends ultrasonic waves at high frequency to the objects nearby and receives back the signal.

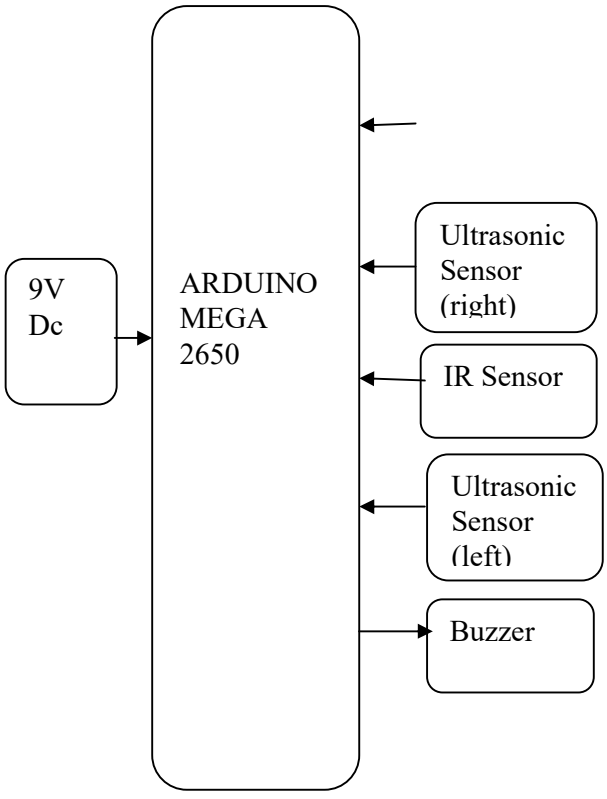
### C. IR SENSOR

IR Sensor is used as obstacle detector where it transmits the infrared waves and hits the object and the signal is reflected to the sensor, the sensor ranges from 700nm to 1mm. Usually IR sensors used to detect nearer obstacles The output of IR sensor depends on infrared rays that have been received. If IR receiver does not receive any signal, the LED does not glow, whereas if it receives any signal, the output goes high and LED Starts Glowing.

## 4. METHODOLOGY

The methodology consists of start and end of the stepwise process in finding the obstacles in front of the blind stick using Arduino Mega 2560, ultrasonic sensors, IR sensor, buzzer, Direct current.

The elemental part of system is microcontroller is Arduino Mega 2650.An Ultrasonic Ranging Module HC-SR04 is used as it is not affected by colour or transparency objects. When triggered, transmitter emits ultrasonic waves and starts timer. Ultrasonic waves travel outwards until they come across through any object, it causes the wave to be reflected the unit. The reflected wave is detected by ultrasonic receiver and stops the stop timer. Following the distance calculated information is send to Arduino and then the buzzer produces the voice. The three ultrasonic sensors sense three directional distances and send data to Arduino mega.

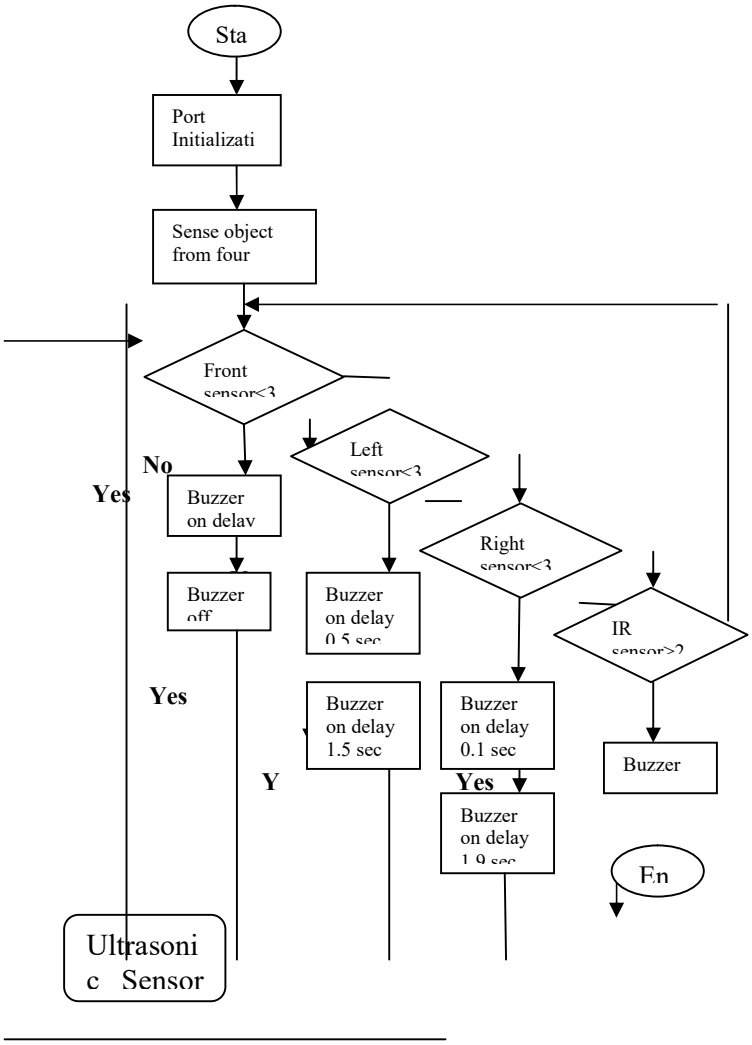



**Flow** diagram of the model

## 5. IMPLEMENTATION

The detailed working of the model is explained in the architectural design diagram of the model.

**Architectural Design**




System Operation:

Initially, power is supplied to Arduino Mega 2560 by 9v battery. And then ultrasonic sensor (front) is sensed the object between 2cm to 30cm. If an object is found less than 30cm, buzzer starts an alarm with delay 1 second. If the object is not found, then the left ultrasonic sensor is sensed. If the object is found less than 30cm, the buzzer starts an alarm with delay 1.5 seconds. If the object is not found, then the right ultrasonic sensor is sensed. If the object is found less than 30cm, the buzzer will start alarm with delay 1.9 seconds. If the object is not found, the IR sensor is sensed. If the object is found greater than 20cm, the buzzer will start alarm. If the object is found by the IR sensor, the system starts automatically.

## 6. RESULTS

This paper is analysed.The smart blind stick prototype has successfully designed. The blind stick is tested for different heights of obstacles and for the holes in the front. In this stick there are two ultrasonic sensors are used which detects a different height of obstacles whether it is high, or it is low and also a laser ranging sensor is used to detect a hole in the front. This is especially designed for adult users. This blind stick is able to detect the obstacles below the level of 80cm, as shown in the fig 1, which is considered low obstacle, on the other hand, if the detection height is greater than 80cm, it is called high obstacles. In addition to this, the laser ranging sensor has been successfully tested for hole detection. The blind stick can detect the hole when the stick is within 21cm far from the hole. Hence this smart blind stick is capable to assist a blind person to move independently.

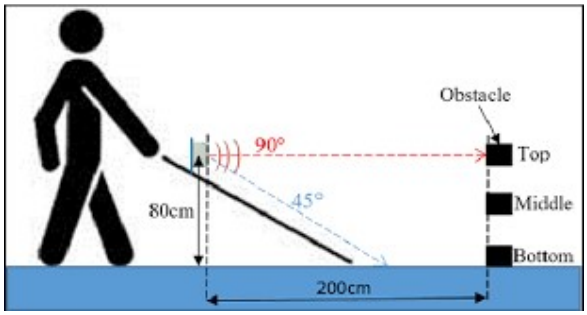



Fig 1. Smart blind stick with range notification

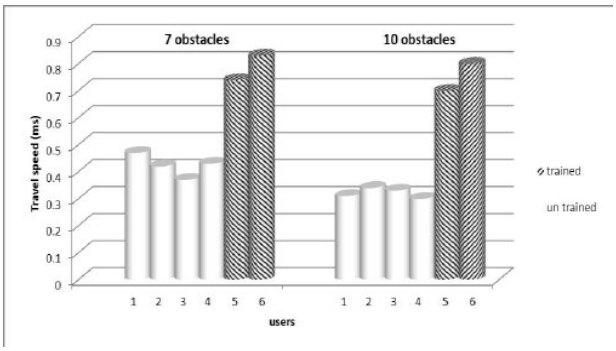



Fig 2. Performance and accuracy of the smart stick

Figure 2 shows the performance and the accuracy of the Smart blind stick in a graphical representation. To evaluate the Performance and efficiency of the stick, testing is performed. Experiment has been carried out by considering number of Obstacles v/s how the trained blind people with this stick and the untrained people will tackles the obstacles. Here, six blind people are considered from which two people were trained and four were not. In this experiment user's walking speed is recorded and calculated the average speed of both trained anduntrained blind people. The results show that the trained people

gaining thetwice speed that of the untrained and increased the user trust in avoiding obstacles.

## 7.CONCLUSION

The smart blind walking stick has been finally made into prototype which can be used to guide the visually impaired people. The system takes the measures to ensure the safety of blind. The aim is to solve the problems faced by the blind people in their daily life. The project will operate to help the blind people to make them easier to walk everywhere they want. This was designed to help the people who are visually impaired to move in front very well. This paper is used to help the blind people to facilitate the movement and increase safety.

## 8.FUTURE ENHANCEMENT

The objects above the level of the stick can be detected.The obstacles behind the person can be detected.It can also has a special feature of connecting the walking stick to Aadharr card of the users, which helps the government to serve the visually impaired even better.

## 9. ACKNOWLEDGEMENT

Our regards to Prof. Ananda Shankar A, Professor of Computer Sciences, Reva University for his support and guidance for the project so that we achieve aimed project.

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