

# Empowering Visually Impaired through the Assistance of SAHAYAK – A Walking Aid for the Blind

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**Abstract-** To help blind people overcoming difficulty in their movement in the physical environment and even in their home, a study on an engineering concept is very much necessary. So, our research comes out with an aid that will help blind people in their surroundings. It can detect any obstacle that will block the path of the blind. And The motion of the user can be sensed by the bot. Thus, Blind people can comfortably receive the help of our bot in assisting their movement from one place to another. This paper describes about an automated vehicle which can be controlled by an ultrasonic sensor to avoid obstacles when they move in their environment. Our automated robotic system is made up of an ultrasonic sensor and Arduino micro controller controls our automated bot. It is located in the front part of the bot. The ultrasonic sensor retrieves the data from the environment through the sensors attached to the bot. When any obstacle is detected then immediately that path is changed and an obstacle free path is chosen. The bot wheel is moved based on the data received by the controller from the sensor. The direction and wheel movement of the bot and will be decided from the ultrasonic sensor sensing and also using wheel encoder. It is used for detection and avoidance of interference. The controller is also programmed to be used with an android application.

**Index Terms-** Blindness, Arduino, ultrasonic sensor, bot wheel, motor driver.

## I. INTRODUCTION

Blindness is one of the critical stumbling blocks to all the disabilities of Human being. It is not possible for the blind people to live like normal people. They cannot feel their surrounding environment. So, there is a need for some assistance which can help them travel to navigate with easily in their physical surroundings. Some of the researchers have invented many devices for the blind people to navigate freely in the environment. But most of them are costly and task-specific. So, A device with lot of features is required to gain independent navigation. To fulfill this goal an automaton named “sahayak” is designed. This automated device removes the requirement of help of a human being for visually disabled when they travel in the physical environment. The parts of the automated device when compared with industry bots are reliable and low in cost. Each different part of the device is simulated and tested. It also needs low power and can run by any operator. The Sahayak detects obstacles holes and steps and notifies the user with sound. The “sahayak” that helps the blind, means HELPER in Hindi. It does what its name means, it helps people especially blind people when moving from one place to another.

A resource like a human is needed continuously to guide a blind person and provide assistance to the blind. As technology advances, human resources are reduced to guide a blind person.

But the inventions are not sufficient enough to guide him smoothly. To overcome the complexity, there is a need to design the technology that has a significant scope for further research. In future , there may be more developments for this project which would be very more useful and easier to use by blind people. The word SAHAYAK means HELPER in Hindi. It does what it's name means, it assists people especially blind people in moving from one place to another.

**Existing System:** TheNavBelt:Computer-Assisted travel assistance, proposed by Shruga Shoval, Johann Borenstein, and Yoram Koren, is one of the most helpful wearable assistive technologies for the visually impaired. It's a combination of a portable compute, stereo headphones, and an ultrasonic sensor. SMART WALKING STICK IS AN ELECTRONIC APPROACH TO HELP THE Blind proposed by Mohammad Hazzaz Mahmud, Rana Sahaand Sayemul Islam to design the smartest competition prototype of SMARTWALKINGSTICK for the visually impaired, provides artificial vision with the ability to mimic good dimensions of help and avoid small obstacles. This low power, lightweight, and affordable device is designed to embrace the traditional portable device paradigm. The main goal of this work is to narrow down the complications of blindness in visually impaired people by developing automated microcontrollers.

**Proposed System:** Our proposed system explains about a bot vehicle which avoids interference and it is controlled by an ultrasonic sensor. Arduino microcontroller is used for controlling ultrasonic sensor that is used for making up of the robot. The bot at the front side is facilitated with ultrasonic. The sensor mounted on the bot, receives the data from surroundings around the device. It has a capability to detect the interference and changes its path and the path is chosen without any interference. The bot wheel movement is based on the data received by the controller from the sensor and based on the sensing of ultrasonic sensor and the wheel encoder the direction will be decided. Here the automated bot is used for detection and avoidance of interference. The Controller is used with an android application.

**Merits:**

- Most of the mobile bot navigation systems avoid obstacles by the bots can be used.
- They are also used for automatic vacuum cleaning in houses.

**II. SYSTEM DESIGN**

**1. Arduino Uno:** A Tmega32 is the basis for Arduino Uno. There are fourteen digital input/output pins in total. Six pins are used for PWM output and other six pins are used for analog input. It starts by connecting to a computer with a USB cable and it fully supports the microcontroller. The Arduino IDE is used to program Arduino Uno. Sketch is the simple C program code for the Arduino. Group of sketches which are related to particular functionalities is known as libraries. The Arduino UNO based on ATmega-328 Microcontroller. Arduino can be programmed in a way which responds to the data received from the input channels or to the commands sent from the computer through different software interfaces and works independently without being connected to a computer.

**2. Motor Driver :** The L298 NH-bridge module is used in motors with voltage levels between 5 and 35 VDC . In addition to this module, a 5V regulator is also integrated so that the board can supply 5V with a maximum supply voltage of 12V.

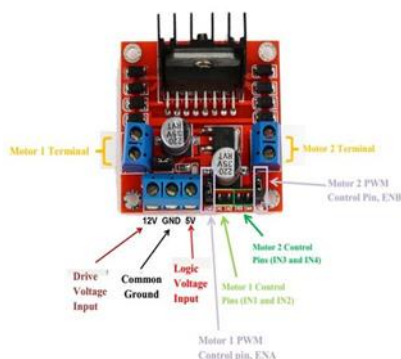


Figure 1

**3. Bluetooth Module (HC-05) :** The HC05 module can be easily used with Bluetooth SPP (Serial Port Protocol) modules designed to establish transparent wireless serial connections. The HC-05 Bluetooth module is an important wireless communication solution a kit can be used in master or slave configuration. Also known as a Bluetooth serial interface module. It is a fully certified Bluetooth V2.0+EDR (Enhanced Data Rate) 3Mbps modulation with a complete 2.4GHz radio transceiver and baseband. It uses CSR Bluecore 04 External single-chip Bluetooth system with CMOS technology and AFH (Adaptive Frequency Hopping Feature).



Figure 2

**4. DC Motor:** The main purpose of DC motor is bot navigation. One or two DC motors are controlled by H-Bridge L298N module. Motor A and B connections on the -Bridge L298N module is connected to each of the DC motor. The polarity of the motors must be same on both inputs. The power is supplied to the positive pin 4 on the module and negative/GND to pin 5 if two motors are used for a bot. When the power supply is up to 12V, 5V is available from pin 6 on the module and the 12V jumper can be avoided It can connect this to the Arduino's 5V pin and power it from the motor's power supply. To complete the circuit, we need to connect Arduino GND to pin 5 of the module. The Arduino has 6 digital output pins, including 2 pins for PWM (Pulse Width Modulation). These are identified by a tilde (~) after the pin number and connect the digital output pins to the driver module. Since two DC motors are used here, digital pins D6, D8, D7 and D6 are connected to pins IN1, IN2, IN3 and IN4 respectively. Also, the D10 module is connected to pin 7 and D5 is connected to pin 12. The direction of the motors is controlled by sending here HIGH or LOW Signal to each motor's drive.

**5. Ultrasonic Sensor HSR-04:** The Ultrasonic sensors are used to detect obstacles and disturbances. Ultrasonic waves are transmitted from the sensor head and ultrasonic waves reflected by the target are received. An ultrasonic sensor is defined as a device that can measure distance or detect obstacles using sound waves. By emitting an ultrasonic wave at a specific frequency and noting that this sound bounces back, you can measure distance. Here, we use an ultrasonic distance sensor to determine the distance of an object, connect the sensor output to a signal conditioning unit, and then process it with an Arduino microcontroller. Results are measured, displayed on the LCD and transferred to the PC. The sensor is connected to the motor and detects the pole spacing around the sensor upto 1800

revolutions. Histwouses for the application are detecting obstacles and collisions and knowing the exact distance.

**6. 12 V Battery:** It is used to supply power to motor drivers.

**7. Buzzer:** 5V continuous tone buzzer, a sound generating device is used. A beeper also known as buzzer, an audio signaling device is piezoelectric, electromechanical or mechanical.

### III. IMPLEMENTATION

This is how the homepage of the application looks like, which is used in establishing connection with Bluetooth module.



Figure 3

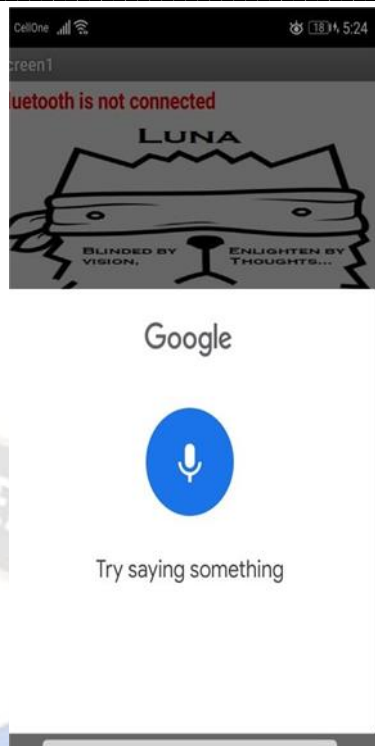


Figure 5

Tap on the microphone and say 'room', then the speech is converted to text and received via Bluetooth. The robot first goes straight until it finds an obstacle and when it does it turns right and so on.

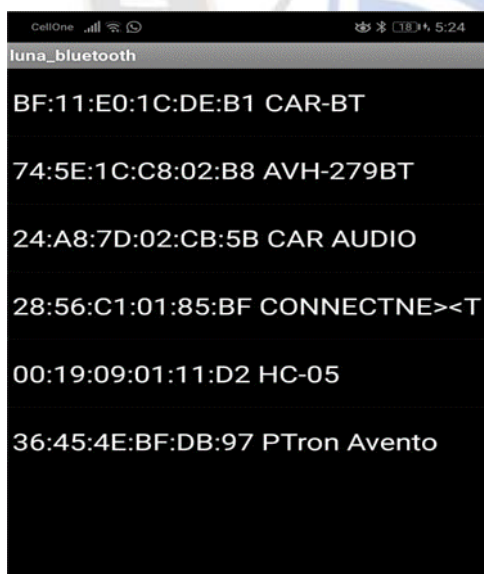


Figure 4

Pair with HC-05 Bluetooth module.

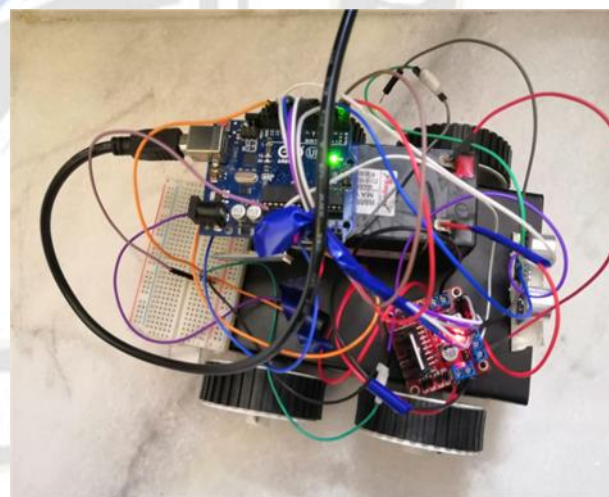


Figure 6

### IV. CONCLUSION

The vital purpose of the Sahayak is to facilitate blind people with a stress-free environment when navigating or traveling in the outside world. The bot provides user-friendly indoor and outdoor navigation for the blind. Considering certain components unavailability, appropriate data from the sensors, Sahayak has been developed to avoid complexity around the blind person's walkway.

**Future Scope:** The Sahayak offers great help for blind people. But there are still many ways to make a contribution: In addition to batteries, which are rechargeable, solar panels are also used. Audio notifications can also be attached. The automated device or bot can also be connected to a wheelchair that provides an automated navigation system for visually impaired blind people.

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