

Smart Blind Stick using Aurdino

Sanjay Patel H. R¹, Anil Kumar B. D², Yashwanth C. M³, Chiranth Gowda G.P⁴ and Dr. Kuldeep B⁵
¹⁻⁵Department of Mechanical Engineering, Rajeev Institute of Technology, VTU, Hassan, Karnataka, India
Email: anilgowda6256@gmail.com, sanjaypatelhr84@gmail.com, gowdayashwanth51@gmail.com, chiranthgowdagp@gmail.com, kuldeepb.deep@gmail.com

Abstract—A smart blind stick is a device that can help visually impaired individuals navigate their environment safely and independently. In this work, Arduino UNO (At mega 328P), an ultrasonic sensor (SR04), a buzzer, and an LED are used to create a cost-effective and efficient solution. The ultrasonic sensor is used to detect objects in front of the user and calculate the distance between the user and the obstacle. The Arduino UNO processes the data and triggers the buzzer and LED to alert the user of any potential obstacles. The user can also receive audio feedback on the distance and direction of the obstacle. The Arduino UNO is a popular and easily programmable microcontroller board that allows for easy integration of various components. The ultrasonic sensor (SR04) is a common distance sensor that uses ultrasonic waves to measure distance accurately. The buzzer and LED provides feedback to the user. Overall, this works provides an accessible and affordable solution for visually impaired individuals to navigate their surroundings safely and independently.

Index Terms— Arduino, Blind Stick and ultrasonic sensor.

I. INTRODUCTION

The smart blind stick using Arduino UNO is an innovative solution designed to assist visually impaired individuals with mobility and safety. It is an electronic device that uses an ultrasonic sensor (HC SR04) to detect obstacles in the user's path and sends signals to an Arduino UNO microcontroller. The microcontroller processes the data and triggers the buzzer and LED accordingly to alert the user of the obstacle's distance and location. The smart blind stick is powered by a battery and is equipped with a buzzer and LED for audio and visual alerts.

For visually impaired individuals, the ability to navigate safely and independently is crucial for their quality of life. Traditional canes provide limited assistance, and the use of guide dogs is not always feasible or practical. The smart blind stick offers a cost-effective and efficient solution that can enhance the mobility of visually impaired individuals.

The purpose of this paper is to provide a brief overview of the smart blind stick using Arduino UNO, including the components required, the design of the device, how it works and the potential applications of the device. Also, a better understanding of the capabilities and benefits of the smart blind stick using Arduino UNO for visually impaired individuals.

In addition to assisting visually impaired individuals with mobility and safety, the smart blind stick has potential applications in other areas, such as robotics and automation. The technology used in the smart blind stick, including the ultrasonic sensor and microcontroller, can be adapted for other purposes, such as obstacle avoidance for autonomous vehicles or industrial robots.

Shaik et al. [1], presented a smart blind stick that uses an Arduino Uno board and an ultrasonic sensor SR04. The

system also includes a buzzer and an LED to provide feedback to the user. The authors conducted experiments to evaluate the performance of the system and concluded that it can help visually impaired people navigate safely. Raut and Shinde [2] we introduced a smart electronic aid for the visually impaired. The smart cane provides a solution to the visually impaired that face complications in detecting obstacles and changes in the environment. The smart cane comprises three sensors: infrared sensor, ultrasonic sensor, and flame sensor. These sensors are implemented and programmed using a microcontroller (Arduino UNO R3). This stick can detect obstacles that lie in the range of about 2m from the user. This system aims to provide an affordable and reliable smart cane that would help the visually impaired to navigate Freely.Yadav and Gaikwad [3], demonstrated a smart blind stick utilization of Arduino on an ultrasonic visually impaired strolling stick. 30 million individuals are for all time visually impaired and 285 billion are outwardly hindered, as indicated by the WHO. When you consider them, you will realize very well that without the aid of others they can't walk to reach your destination one has to ask for directions. During their everyday lives, they need to confront more difficulties. The visually impaired handle is more secure for an individual to walk. The bar detects the thing before the individual and gives the purchaser a vibrational answer or on request.To explore the commonness and reasons for visual disability and visual impairment in an example of Polish more established grown-up. Oyedele and Fakolujo [4],design and plan and execution of an ultrasonic sensor-based strolling stick for an outwardly disabled individual. An ultrasonic sensor module, HCSR04 is utilized for impediment discovery in the way of the visually impaired individual, and a ringer is utilized to make the individual cautious. The proposed framework is carried out utilizing PIC microcontroller 16F877A. Dazzle people can utilize this strolling stick for a safe route. It can identify impediments inside 5 to 35 cm scope of distance. Daze People utilizes white sticks to help in obstruction identification and evasion inSingh et al.[5], design and usability features of a low-cost knee-above obstacle detection system and report results from controlled field experiments. From the very beginning of human history, people are suffering from many disabilities. Among those, blindness is very common and unendurable. Science and technology always try to make human life easier. So the main purpose of this paper is based on abating the disabilities of blindness by constructing microcontroller-based automated hardware that can corroborate a blind to detect obstacles in front of him/her instantly. Based on the literature the general block diagram of detection and feedback system is as shown in figure 1.

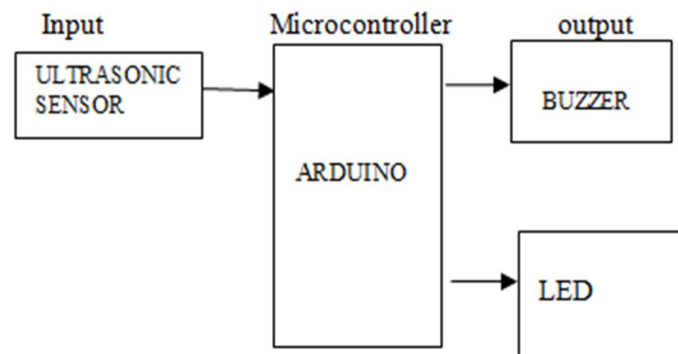


Figure 1. Block diagram

II. METHODOLOGY

- Gather all the required components: Arduino UNO, At mega 328P, ultrasonic sensor, SR04, buzzer, LED, and other required components.
- Assemble the hardware components: Connect the ultrasonic sensor, buzzer, LED, and other required components to the Arduino UNO board as per the circuit diagram.
- Write the code: Use the Arduino IDE to write the code for the smart blind stick. The code should include the logic to read the data from the ultrasonic sensor, process it, and provide output to the buzzer and LED.
- Upload the code: Once the code is written, upload it to the Arduino UNO board using the Arduino IDE.
- Test the smart blind stick: After uploading the code, test the smart blind stick by placing it in front of different objects at different distances. The buzzer and LED should provide the necessary feedback to the user based on the distance of the object.

III. PRODUCT DEVELOPMENT

ARDUINO UNO (figure 2): This is a microcontroller board based on the ATmega328P microcontroller. This microcontroller chip that forms the core of the Arduino UNO board, is the brain of the smart blind stick and controls all the other components. It is responsible for executing the program instructions and controlling the input/output operations.



Figure 2. Arduino uno

ULTRASONIC SENSOR (figure 3): This is a device that uses high-frequency sound waves to detect obstacles in the path of the smart blind stick. The sensor emits a sound wave and measures the time it takes for the wave to bounce back from an object, enabling the device to determine the distance to the obstacle.



Figure 3. Ultrasonic sensor

BUZZER (figure 4): This is a sound-producing component that emits an audible alarm when the ultrasonic sensor detects an obstacle. The buzzer can be used to alert the user of the smart blind stick of the presence of an obstacle in their path.



Figure 4. Buzzer

LED (figure 5): This is a light-emitting diode that can be used to provide visual feedback to the user of the smart blind stick.



Figure 5. Led

IV. SOFTWARE REQUIREMENTS

Software

Arduino IDE: It is an open-source integrated development environment that provides a user-friendly interface for writing, compiling, and uploading code to Arduino board

CODE SNIPPET (Figure 6&7)

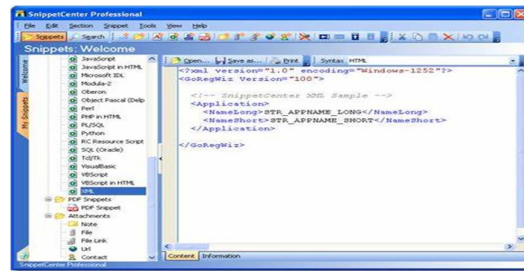


Figure 6. Coding for smart blind stick using Arduino

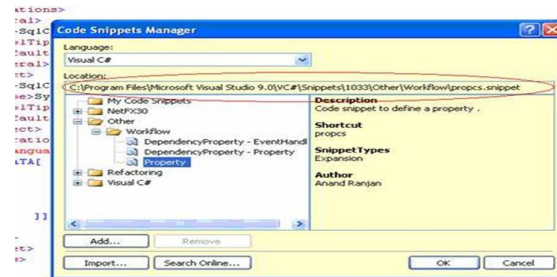


Figure 7. Uploading the coding for smart blind stick using Arduino

Program

```
// defines pins numbers
const int trigPin = 9;
const int echoPin = 10;
const int buzzer = 11;
const int ledPin = 13;
// defines variables
long duration;
int distance;
int safetyDistance;
void setup() {
  pinMode(trigPin, OUTPUT); // Sets the trigPin as an Output
  pinMode(echoPin, INPUT); // Sets the echoPin as an Input
  pinMode(buzzer, OUTPUT);
  pinMode(ledPin, OUTPUT);
  Serial.begin(9600); // Starts the serial communication
}
void loop() {
  // Clears the trigPin
  digitalWrite(trigPin, LOW);
  delayMicroseconds(2);
  // Sets the trigPin on HIGH state for 10 micro seconds
  digitalWrite(trigPin, HIGH);
  delayMicroseconds(10);
  digitalWrite(trigPin, LOW);
  // Reads the echoPin, returns the sound wave travel time in microseconds
  duration = pulseIn(echoPin, HIGH);
  // Calculating the distance
  distance= duration*0.034/2;
  safetyDistance = distance;
  if (safetyDistance <= 5){
    digitalWrite(buzzer, HIGH);
    digitalWrite(ledPin, HIGH);
  }
}
```

```

}
else{
  digitalWrite(buzzer, LOW);
  digitalWrite(ledPin, LOW);
}
// Prints the distance on the Serial Monitor
Serial.print("Distance: ");
Serial.println(distance);
}

```



Figure 8. Final model

The Smart Blind Stick (figure 8) scans the path in front of it with the help of an HC-SR04 Ultrasonic sensor. Whenever the sensor detects any object in its path the buzzer starts beeping and also at the same time the LED turns on. The blind person can hear the beeping of the buzzer and manage to change the way. In this way, the person can easily find his way without getting injured. This smart stick works in the same way as the Ultrasonic range finder did. Also, the real-time values of the distance in cm on the Arduino serial monitor can be obtained. Further, based on the range of ultrasonic sensor, it can be programmed to detect the obstacles early and modified accordingly.

- The project was made with the working hardware model, detecting the obstacles if come across any obstacles ranging from 4cm to 50 cm.
- The blind stick proposed model can aid the virtually impaired user by helping him/her navigate through different terrains and obstacles.
- Detecting the obstacle with the help of Ultrasonic sensors and it can provide notification to user holding it in the sound form via Arduino buzzer

V. CONCLUSION

The effort is made to fabricate the smart blind stick at low cost of rupees 1200 and tested successfully. From the results, the following conclusions are drawn,

- Lost cost smart blind stick is successfully fabricated.
- Arduino UNO (At mega 328P), ultrasonic sensor, SR04, buzzer, and LED is a highly effective and efficient device for visually impaired individuals.
- This smart blind stick operates using ultrasonic waves, which can detect obstacles and signal the user through an audible buzzer and LED light.
- The Arduino UNO acts as the main control unit, processing data from the sensor and activating the appropriate signal based on the proximity of an obstacle.
- The smart blind stick using Arduino is not only cost-effective but also easily customizable and adaptable to the specific needs of each user.
- Overall, it provides an excellent solution for enhancing the mobility and independence of visually impaired individuals, allowing them to navigate their surroundings with ease and confidence.

REFERENCES

- [1] F. Shaikh, N. N. Nalawade, & S. D. Thakare, "Smart Blind Stick Using Arduino Uno",. International Journal of Research in Advent Technology, vol. 6, issue 6, pp. 163-166, 2018.
- [2] S. B. Raut, & S. S. Shinde, "Development of Smart Blind Stick Using Arduino and Ultrasonic Sensor", International Journal of Innovations in Engineering and Technology, vol. 11, issue 1, pp. 37-41, 2018.

- [3] S. U. Yadav, & S. G. Gaikwad, "Design and Development of Smart Blind Stick Using Ultrasonic Sensor and Arduino UNO", International Journal of Scientific Research in Computer Science, Engineering and Information Technology, vol. 5, issue 1, pp. 239-245, 2019.
- [4] M. O. Oyedele, & O. O. Fakolujo, "Design and Implementation of a Smart Blind Stick Using Arduino",. Journal of Information Engineering and Applications, vol. 9, issue 8, pp. 16-25, 2019.
- [5] Singh, A. Jain & P. Jain, "Smart Stick for Blind People Using Arduino", International Journal of Innovative Research in Electronics and Communications, vol. 4, issue 1, pp. 16-19, 2017.