Ultrasonic Glass for Blind and Smart Stick using IOT

Mr. Shashidhara H V[1], Prajwal M J[2*]

Department of Computer Science and Engineering, Malnad College of Engineering, Hassan-573202
*Corresponding Author

Received: 05 June 2023/ Revised: 14 June 2023/ Accepted: 20 June 2023/ Published: 30-06-2023

Abstract— *Smart blind stick using Arduino, aimed at improving the mobility and safety of individuals with visual impairments. The smart blind stick incorporates ultrasonic sensors to detect obstacles and provides haptic feedback through a vibrating motor. This offers an affordable and accessible solution to assist visually impaired individuals in navigating their surroundings with increased confidence and independence. Visual impairments significantly impact an individual's ability to navigate their surroundings, resulting in challenges and limitations in their daily lives. Assistive technologies play a crucial role in empowering individuals with visual impairments by providing them with tools to enhance their mobility and independence. One such technology is the development of ultrasonic glasses designed specifically for the blind. Visual impairments encompass a wide range of conditions, from partial sight to complete blindness. These conditions affect millions of individuals worldwide and pose significant challenges in terms of mobility, object detection, and spatial awareness. Traditional mobility aids, such as white canes and guide dogs, offer assistance but have limitations in providing real-time information about obstacles and environmental surroundings.*

Keywords— Smart blind stick, Visual impairments, ultrasonic sensors, IOT.

I. INTRODUCTION

The smart blind stick using Arduino is an innovative assistive technology designed to enhance the mobility and safety of individuals with visual impairments. Visual impairments pose significant challenges to individuals in navigating their surroundings, leading to potential accidents and limited independence. The smart blind stick aims to address these challenges by integrating ultrasonic sensors and haptic feedback mechanisms into a traditional white cane or stick. Visual impairments affect millions of people worldwide, limiting their ability to move freely and safely in their environment. Traditional white canes are commonly used by individuals with visual impairments as a means of detecting obstacles. However, these canes rely solely on the user's physical contact with objects, which may not be sufficient to prevent accidents or provide timely information about upcoming obstacles. Visually impaired people often need assistance in day to day life for navigating through their residence and outside. Having a human assistance is not possible all the time and so a solution to this problem is being researched from a long time. Well here we develop a smart solution to this problem using ultrasonic glasses.

Also the glasses are fitted with vibrator rather than a buzzer as constant buzzing sound would be more of a nuisance rather than help. The Smart Glasses would offer the following Advantages:

- **Ultrasonic Based Obstacle Detection**
- **Sound Alert on Glasses**
- **Light Weight System**

The system makes use of 2 x Ultrasonic sensors, an atmega microcontroller, battery, transparent glasses, basic electronics components and a PCB to develop this system. The glasses can now detect obstacles and transmit this to the blind person. The ultrasonic sensors are mounted on glasses on 2 side to act as eyes. The sensors constantly transmit and receive ultrasonic waves to receive obstacle data. The Microcontroller is constantly getting this data from the sensors.

II. OBJECTIVES

The primary objective of this project is to develop a smart blind stick using Arduino that can provide real-time obstacle detection and haptic feedback to users. By integrating ultrasonic sensors, the blind stick can detect objects in the surrounding environment and alert the user through vibrations, enabling them to navigate with greater confidence and safety.

The primary objective of this project is to design and implement ultrasonic glasses for the blind, which utilize ultrasonic sensor technology to detect obstacles and provide auditory or haptic feedback.

III. SYSTEM REQUIREMENTS

3.1 Hardware Components

a) **Arduino Board:** Select a suitable Arduino board, such as Arduino Uno or Arduino Nano, which provides the necessary computational power and input/output capabilities.

b) **Ultrasonic Sensor:** Choose an ultrasonic sensor module capable of measuring distances accurately. The sensor should typically have four pins: VCC, GND, TRIG, and ECHO.

c) **Vibrating Motor or Buzzer:** A vibrating motor or buzzer will be used to provide haptic feedback to the user. Select a motor or buzzer that can be easily controlled by the Arduino.

d) **White Cane or Stick:** A traditional white cane or stick serves as the physical base onto which the hardware components will be mounted. Ensure it is sturdy and suitable for attaching the sensors and actuators securely.

3.2 Circuit Design and Connection Blind Stick:

Once the hardware components are selected, the circuit needs to be designed and the connections established:

a) Connect the VCC pin of the ultrasonic sensor to the 5V pin of the Arduino board, and connect the GND pin of the sensor to the GND pin of the Arduino.

b) Connect the TRIG pin of the ultrasonic sensor to a digital pin of the Arduino (e.g., pin 7), and connect the ECHO pin to another digital pin (e.g., pin 8).

c) Connect the positive (red) wire of the vibrating motor or buzzer to a digital pin of the Arduino (e.g., pin 9), and connect the negative (black) wire to the GND pin of the Arduino.

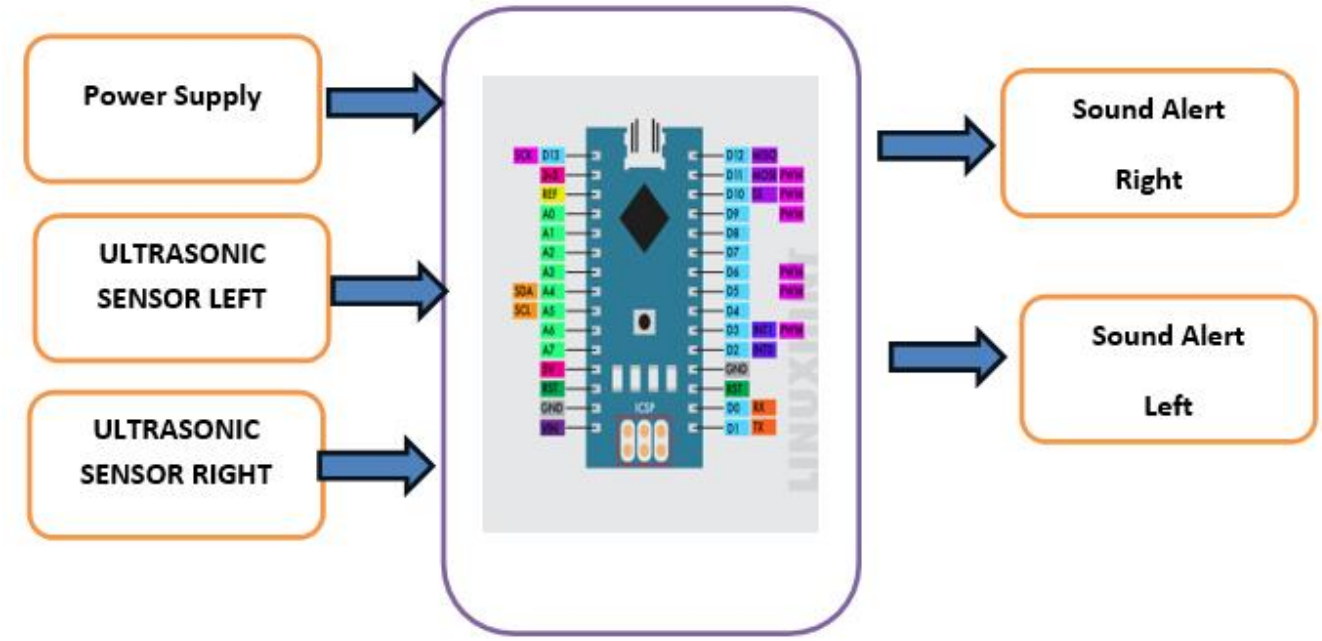

FIGURE 1: Block Diagram OG Blind Eye Glass

3.3 Arduino Programming Code:

To enable the functionality of the smart blind stick, Arduino programming code needs to be developed and uploaded to the Arduino board. The code should include the following key aspects:

a) Define the necessary variables, including the pin numbers for the ultrasonic sensor, vibrating motor/buzzer, and variables for distance measurements.

b) In the setup () function, initialize the pin modes for the sensor, motor/buzzer, and begin serial communication if required.

c) In the loop () function, measure the distance using the ultrasonic sensor by sending a trigger signal and calculating the duration of the echo signal.

d) Based on the measured distance, implement conditional statements to determine if an obstacle is within a specific range.

e) If an obstacle is detected, activate the vibrating motor or buzzer to provide haptic feedback to the user.

f) Print appropriate messages to the serial monitor to indicate the presence of obstacles or clear pathways.

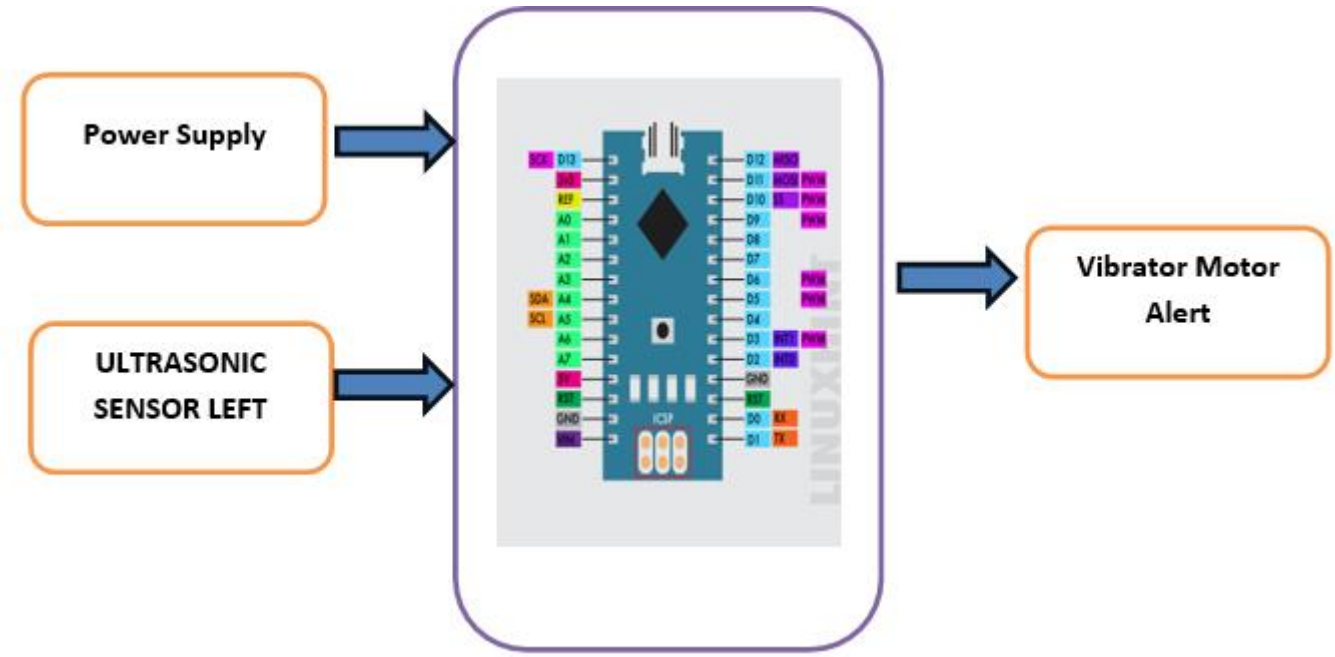

FIGURE 2: Block Diagram of Blind Stick

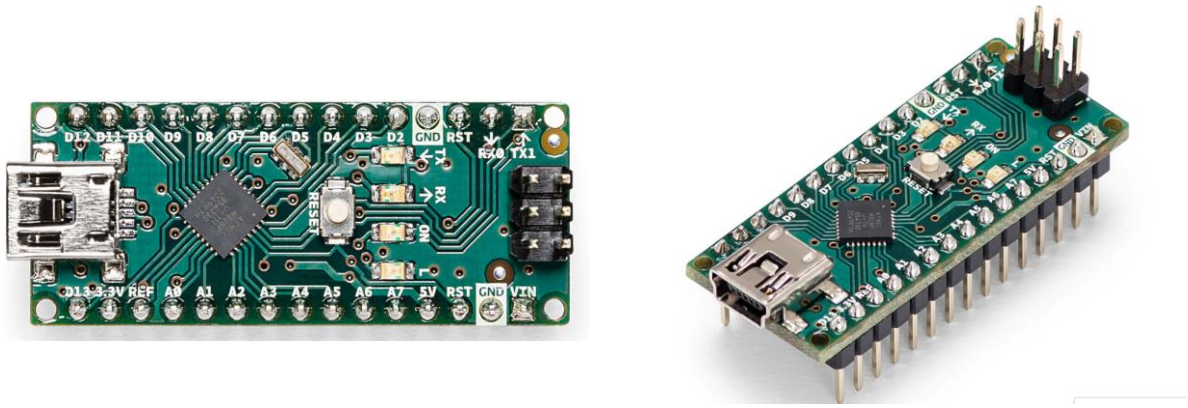

FIGURE 3: Arduino nano

TABLE 1
MICROCONTROLLER AND SPECIFICATION

Microcontroller	ATmega328
Architecture	AVR
Operating Voltage	5 V
Flash Memory	32 KB of which 2 KB used by bootloader
SRAM	2 KB
Clock Speed	16 MHz
Analog IN Pins	8
EEPROM	1 KB
DC Current per I/O Pins	40 mA (I/O Pins)
Input Voltage	7-12V
Digital I/O Pins	22 (6 of which are PWM)
PWM Output	6
Power Consumption	19 mA
PCB Size	18 x 45 mm
Weight	7 g
Product Code	A000005

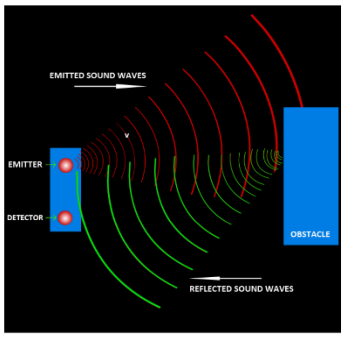

FIGURE 4: Ultrasonic sensor Diagram

TABLE 2
I/O CONTROLLER

Digital I/O Pins	22 (6 of which are PWM)
PWM Output	6
Power Consumption	19 mA
PCB Size	18 x 45 mm
Weight	7 g
Product Code	A000005

FIGURE 5: Vibration Motor

IV. CONCLUSION

The smart blind stick using Arduino demonstrates the potential to improve the mobility and independence of individuals with visual impairments. Its obstacle detection capabilities, combined with haptic or auditory feedback, create a valuable tool for safer and more confident navigation. By addressing limitations and incorporating user feedback, the smart blind stick can continue to evolve and positively impact the lives of visually impaired individuals. Smart ultrasonic sensor eyeglasses provide a valuable assistive technology for individuals with visual impairments, offering enhanced obstacle detection and improved navigation capabilities. With continued advancements and refinements, these glasses have the potential to greatly improve the quality of life and independence of visually impaired individuals.

ACKNOWLEDGEMENTS

The development of ultrasonic sticks for the blind offers a valuable tool for navigating the environment. By incorporating ultrasonic sensors into the design, these sticks can detect obstacles in real-time and provide haptic or auditory feedback to the user, assisting them in safely maneuvering through their surroundings.

The visually impaired individuals who have participated in user trials and provided feedback have played a crucial role in the development and improvement of ultrasonic sticks. Their experiences and insights have been invaluable in refining the technology and ensuring its effectiveness in real-world situations.

Furthermore, the collaboration between researchers, engineers, organizations, and the visually impaired community has been crucial in the development of ultrasonic sticks for the blind. By working together, they have created a tool that helps enhance accessibility and independence for individuals with visual impairments.

REFERENCES

[1] Agarwal, Rohit, et al. "Low cost ultrasonic smart glasses for blind." *2017 8th IEEE Annual Information Technology, Electronics and Mobile Communication Conference (IEMCON)*. IEEE, 2017.

[2] Simões, Walter CSS, and V. F. De Lucena. "Blind user wearable audio assistance for indoor navigation based on visual markers and ultrasonic obstacle detection." *2016 IEEE International Conference on Consumer Electronics (ICCE)*. IEEE, 2016.

[3] Siswono, Hartono, and Widyastuti Widyastuti. "Glasses for the blind using ping ultrasonic, ATMEGA8535 and ISD25120." *TELKOMNIKA (Telecommunication Computing Electronics and Control)* 18, no. 2 (2020): 945-952.

[4] Romadhon, A. S., and A. K. Husein. "Smart stick for the blind using Arduino." *Journal of Physics: Conference Series*. Vol. 1569. No. 3. IOP Publishing, 2020.

[5] Dey, Naiwrita, et al. "Ultrasonic sensor based smart blind stick." *2018 international conference on current trends towards converging technologies (ICCTCT)*. IEEE, 2018.