

“SMART GUIDING SYSTEM FOR BLIND”

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Abstract— This paper describes a guidance system for blind and partially sighted people with the aim of coping in the known and unknown internal and external spaces without the assistance of human guides. This work represents a significant step forward in the application of innovative technological solutions to increase independence and improve the quality of life for people with disabilities. This paper describes the technical and functional architecture of the system for orientation and guidance of a blind person using available modern technology. Smart system for visually impaired, that make use of ultrasonic sensor as assistive devices. Visually impaired individuals find navigation difficult as they struggle every day in performing actions for bypassing obstacles and hurdles in their path. In order to help blind people navigate safely and quickly this system is proposed. This system is based on embedded technology. Ultrasonic sensor is placed on the stick which is used for obstacle detection. The project hypothesizes a smart walking stick that alerts visually-impaired people over ground level obstacles, in front which could help them

Index terms- Ultrasonic sensor, Attiny85 arduino, Vibrating motor,

I. INTRODUCTION

Blind mobility is one of the main challenges encountered by visually impaired persons in their daily lives. The blind people life and activities are greatly restricted by loss of eyesight. They can only walk in fixed routes that are significant in their lives, with blind navigation equipment and the accumulated memories in their long-term exploration. There are approximately 37 million people across the globe who are blind, over 15 million are from India. Currently most blind people depend on other people or dogs. Many disabled people prefer to do things independently rather than depend on others. The smart guiding system for blind can provide a solution to this problem. The main objective of the project is to develop a low cost, reliable, portable, user friendly, low power and robust solution for smooth navigation. This paper is organized as follows: Section I describes the introduction, Section II illustrates the proposed guidance system with the block diagram and its explanation, Section III describes the methodology of the work with each sub units. Section IV describes Result and Discussion. Conclusion is described in Section V, and future work of the project is illustrated in section VI.

II. THE PROPOSED GUIDANCE SYSTEM

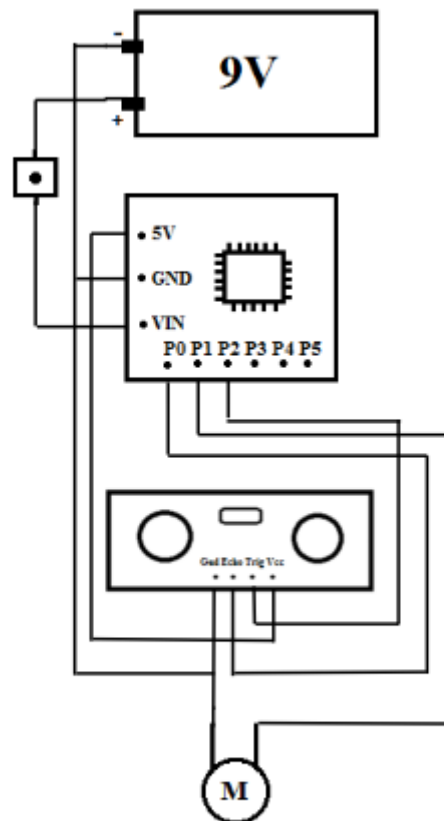


Figure.1: Circuit Diagram of Smart Guiding System for Blind

Figure shows the proposed Smart guiding system for blind.

The system needs -

1x ultrasonic sensor pair 1x Arduino Micro (PLC) 1x Pushbuttons

1x vibrating motors

9V Battery Connecting Wires

Ultrasonic sensor senses the obstacles in vision of sight by continuously transmitting the ultrasonic waves. If any obstacle comes in its vicinity then the ultrasonic waves gets reflected back to the system. The ultrasonic receiver senses these ultrasonic waves and this information is passed as a high pulse to the microcontroller. The microcontroller gives alerts based on distance of the obstacle through vibrating motor. Ultrasonic sensor which is used to detect obstacle from

the user position consists of 3 major parts: A transmitter, a receiver and a timer. To measure a distance the timer triggers the transmitter which emits a series of pulses, and then the timer waits until the receiver detects the reflection of the pulses and stops the timer. The time measured is then divided by 2 and multiplied with the speed of sound. The result is the distance between the sensor and the object in front of it. The output of the microcontroller activates the vibrating motor which gives message about the detected obstacle in the form of intensity of vibration and is conveyed to the blind person. The distance is calculated as explained as follows:

Distance Measurement:

The relationship between distance, time and speed is represented by equation. Distance calculated is twice the actual distance because it includes returning time also. Hence, only half of the distance is considered to indicate actual distance from the user to an obstacle. Using equation the distance is calculated.

$$D = \frac{(\text{Elapsed time}) * (SV)}{2}$$

Where,

D = Distance in cm

SV = Sound velocity in cm/s

Elapsed time= time taken by the sensor to send and receive the ultrasound wave.

III. METHODOLOGY

The proposed system consists of following sections.

1-Input--Ultrasonic sensor

2-control unit—PLC (Attiny85 Arduino)

3-Output--Vibrating motor

In this system, ultrasonic sensor is used to detect the obstacles in the path of a blind person, and it gives input to control unit and control unit interprets the signal and gives signal to output i.e. vibrating motor which will vibrate accordingly and warns the person about obstacle. Ultrasonic sensor HC-SR04 is a 4 pin device which is placed on the stick of blind person. The Ground pin of the sensor is connected to power supply of 9v dc and vibrating motor, the Echo pin of the sensor is connected to P0 pin of microcontroller Arduino Attiny 85 to trigger ultrasonic sensor, Trig of the ultrasonic sensor is connected to P2 pin of microcontroller and Vcc of ultrasonic pin is connected to 5v of microcontroller.

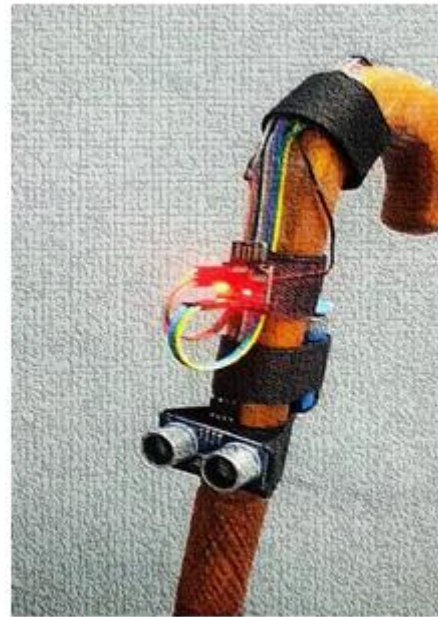


Figure.2. Proposed Guiding system

IV. RESULT AND DISCUSSION

Ultrasonic sensors, Attiny 85 are tested individually as well as an integrated system. As ultrasonic sensors work on principle of echo, study of its reflection properties on different object surfaces is very important. Four such tests are carried on concrete wall, static human body, wood and metal. Surface smoothness plays key role in obstacle detection. Smooth surface object can be detected from maximum detection range of ultrasonic sensors. Metal surface gives highest reflections and then concrete wall, wood and human body. These four surfaces are considered for testing as subject can come across any of them during navigation.

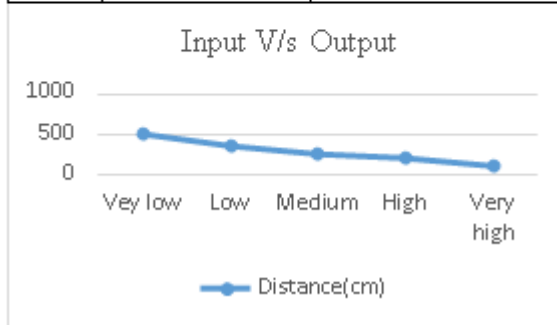
Table 1. Detection range

| Obstacle Surface | Detection range in cm | | | |
|------------------|-----------------------|--------|--------|--------|
| | Test 1 | Test 2 | Test 3 | Test 4 |
| Metal | 490 | 485 | 476 | 480 |
| Concrete wall | 412 | 446 | 437 | 450 |
| Wood | 400 | 402 | 412 | 406 |
| Human body | 392 | 380 | 401 | 394 |

Another test conducted to check the feasibility of smart stick and following observation is recorded.

Table 2. Input vs. output

| S.No | Obstacle Distance(cm) | Output (Vibrating Intensity) |
|------|-----------------------|------------------------------|
| 1 | 500 | Very low |
| 2 | 385 | Low |
| 3 | 300 | Medium |
| 4 | 235 | High |
| 5 | 100 | Very high |



V. CONCLUSION

The main objective of this project is to assist blind or visually impaired people to safely move among obstacles and other hurdles faced by them in their daily life. The smart system has been tested in indoor as well as outdoor environment. Using this guiding system the blind people can travel in the unknown areas independently. Less training time period is required to use this smart system. The solution developed is a low cost and user friendly navigational aid for the visually impaired.

Advantages:

- Accurate detection of the obstacles in front, left and right direction.

- Less training time is required
- Very low cost as compared to others
- Low power consumption.

VI. FUTURE WORK

One could spend quite a bit of time analysing in detail the various firmware/software combinations for each system. We only brushed the surface of the firmware/software analysis. We would like to have been able to integrate the various parts purchased for this effort and actually get it work, but this proved infeasible within the allotted timeframe. We are still working on it to make it more feasible and easy to use...we have several concept regarding how it can be mounted as regarding to use for blind concept. We are analysing best design to work out. In future GPS based bus information module with user request can be designed. Entertainment panel (like music) can also be provided.

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