ISSN No:-2456-2165

A Smart Blind Stick for Aiding Visually-Impaired People

Disha Roy
Student
B. Tech , Department of EEE
SRM IST

Omkar More
Student
B. Tech , Department of EEE
SRM IST

Rajeswari Devi
Student
B. Tech , Department of EEE
SRM IST

V. Kubendran
Department of EEE
Assistant professor
SRM IST

Abstract:- The main idea of this paper is to design a theoretical model and a system concept to provide visually impaired people walk with ease and be warned whenever their walking path is obstructed with other objects, people or similar odds. The closer the distance of obstruction more will be the buzzer beep frequency which is inversely proportional to the distance. The main component used is ultrasonic sensor transmitting a high frequency sound pulse and then calculate the time to receive the signal of the sound and to reflect back. Arduino UNO is selected as the major platform.

Keywords*: Visually-impaired, ultrasonic sensors, Arduino, buzzer etc.*

I. INTRODUCTION

Visually impaired people face a lot of problems in their day to day lives. They faces many type of hurdles in performing every day routine works, the barrier of low vision does not let them to become part of the society. There can be an apprehension or awkwardness on the part of sighted people when dealing with the blind, which can lead to difficulty for the blind in developing relationships.

Physical movement becomes a challenge for them every time. To move, especially in unknown places, they are in constant need someone's help. They are always dependent on a friend or family for doing small things in their lives.

Next thing that comes is unemployment. Due to limited jobs a blind person can do, more than half of the visually impaired people remain unemployed. So, even financially, they are dependent on others and are not capable of living life on their own.

Although it is kind to offer assistance, the worst thing one can do for a blind friend or family member is to do too much for them. First, it makes them feel helpless, and it removes any possibility for them to learn to do things themselves.

Keeping these things in mind, research has been conducted for new devices to design a good and reliable system for visually impaired persons to detect obstacles and warn them at danger places. There are some systems which has some deficiencies.

A Navbelt was developed by Shovalet. al [7], an obstacle avoidance wearable portable computer which is only for indoor navigation. Navbelt was equipped with two modes, in the first one the system information was translated to audio in different sounds. One sound for free for travel direction and other for blocked, it was difficult for the person to differentiate the sounds. Other problem was the system would not know the user momentary position.

A stick for distance measurement using infrared sensors, have introduced by S. Innet and N. Ritnoom [5] which is a complex and time wasting process. The stick has different vibration modes for different range which is difficult for a blind to differentiate, it needs time for training. The stick informs the person clearly at dangerous stage which conveys less information and safety. The stick has no location and positioning features.

J.Na [6] proposed an interactive guide system for indoor positioning, which can't detect the obstacles and hurdles. The system is not suitable for the outdoor activities.

Our project aims at developing a smart stick using arduino for the visually impaired people that will detect obstacles from different directions and thus, help the person to move without any danger.[4]

II. RESEARCH SIGNIFICANCE

In this fast moving world, technology has been updated at a massive height and nobody has got time for one another, everything has become digital and needs precision. So, in this world the people which face a major problem are the physically challenged people. Specially the blind people, actually they go through a big challenge. So for making their life safer and easier, we have designed a prototype known as the Blind stick.

The blind stick will help the users to scan and notify the surrounding for any obstacles and helps to identify them. So in today's world precision matters for their safety.[2]

ISSN No:-2456-2165

Here in our design we have used interesting phenomena of physics " The Ultrasonic sound waves", which provides maximum distance and precision with an easy handling. Keeping in mind the challenges faced by these people, we have designed a handy and a useful model of the Blind stick which will be of great use to blind people.

And as the person holding the stick will have to move in three directions, we have different identifications for different directions. So the person can easily identify the direction of the obstacle and also have the idea of the distance of the obstacle as the intensity of the alarm varies according to the distance.

III. EXPERIMENTAL PROGRAM

A. Materials

The Arduino UNO is a microcontroller board developed by Arduino.cc. The board is equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards (shields) and other circuits. It receives input from various sensors and senses the environment and also affects the surroundings by controlling relays, lights and other devices. We use the microcontroller by programming it using Arduino software. An ultrasonic sensor is a sensor that generates high frequency sound and calculates the time interval between the sending of signal and the receiving of echo. So, it is used for measuring distance. The sensor HC-SR04 can measure up to 400cm of distance.

The sensor consists of a transmitter, a receiver and a control module. The transmitter and receiver operates at the same frequency. The circuit is built with 555 timer or CMOS(complementary metal-oxide semiconductor devices. The buzzer consists of an outside case with two pins to attach it to power and ground. Inside it is a piezo element, which consists of a central ceramic disc surrounded by a metal (often bronze) vibration disc. When we apply current to the buzzer it causes the ceramic disk to contract or expand. This causes the surrounding disc to vibrate.[1] That produces the sound we hear. We may change the pitch of the resulting sound by changing the frequency of the buzzer, which in turn changes the speed of the vibrations.

An electric battery is a device that consists of one or more electrochemical cells with external connections provided to power electrical devices. When a battery is supplying electric power, its positive terminal is the cathode and its negative terminal is the anode.[3] The terminal marked negative is the source of electrons that when connected to an external circuit will flow and deliver energy to an external device. When a battery is connected to an external circuit, electrolytes are able to move as ions within, allowing the chemical reactions to be completed at the separate terminals and so deliver energy to the external circuit. It is the movement of those ions within the battery which allows current to flow out of the battery to perform work.[3] The battery used in this project is of 5 volts. A jumper wire is an electrical wire, or group of them in a cable, with a connector or pin at each end. In this project, both male to male as well as male to female jumper wires are used according to our convenience.

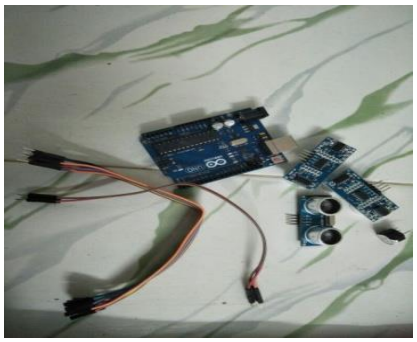

Fig 1:- Components

B. Design and development:

This paper work comprises of effective designing of the blind stick to aid in efficient and economical way. It consists of three sensors having four pins:

- Vcc: connected to 5v supply
- Ground
- Trigger: transmits data
- Echo: receives data

Each sensor is depicting different directions. From the direction in which the sensor is placed, if it measures anything closer than the range fixed, the buzzer connected to the arduino will be giving a different sound. Frequency of the buzzer can be changed with PWM signals to give different sounds for all the three different directions. From arduino, input comes to trigger .then wave is sent and propagated, signal goes to echo. The echo will send signal as output to arduino and then the buzzer will detect the obstacle.

For one way distance, formula used:

Distance = (Duration/2)/29.1
Speed of sound= 0.0345 cm/microseconds

The code used for the given theoretical model involves initialization, pin mode and function parameters according to the requirement. This model assists in auto detection, obstacle detection with indication support and gives an economical approach.

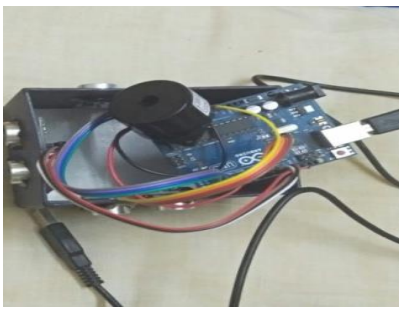

Fig 2:- Blind- stick

ISSN No:-2456-2165

IV. CONCLUSION

The main motive behind this design of the blind stick is to assure the safe and independent movement of the blind people with more ease. The designed product identifies the obstacles placed at different distances in front of the user. After the test carried out the stick we designed has completed the objective. And this product will help in increasing the autonomy for the blind. The developed blind stick having multiple sensors will help in navigating the way while walking and give the person an alert if any danger obstructed.

REFERENCES

[1]. Nurulnadwan Aziz, NurHazwani Mohamad Roseli, ErratulShelaEshak, &Ariffin Abdul Mutalib. (2010). Assistive Courseware for the Visually Impaired based on Theory of Multiple Intelligence. In Proceedings of Knowledge Management International Conference 2010. UUM.
[2]. Fathauher G. H., "Ultrasonic Sensor", IEEE transaction on Ultrasonic, Vol. 3, pp. 57, 1999.
[3]. Iovine, J., "PIC microcontroller project book: for PIC Basic and PIC Basic for Compilers", TAB Robotics, Vol.2, p.1, 2004.
[4]. Borenstein J and K oren Y., "Error Eliminating Rapid Ultrasonic Firing for Mobile Robot Obstacle A voidance", IEEE Robotics and Automation, Vol. 11, No. 1, pp. 132-138, 2000.
[5]. Donald P. M. "Optimizing sensor selection" Choosing a n Ultrasonic sensor for Proximity of distance Measurement, IEEE transaction on Ultrasonic, Vol. 3, pp. 23- 36, 2000 16. Hamelain J. C., "Recording Rain Gauge using.
[6]. Brown M. K., " Feature Extraction Techniques for Recognizing Solid Object With Ultrasonic Range Sensor", IEEE Journal of Robotics and Automation, Vol. 1, No 4, pp. 32-35, 2002.
[7]. Han Y. an d Hahn H., "Localization and Classification of Target Surface Using 2 Pairs Of Ultrasonic Sensors", IEEE International Conference on Robotic and Automation, Detroit Michigan, pp. 1-2, 22 May 1999.