

Navigator Shoes for Visually Impaired Persons with Obstacle Avoidance

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ABSTRACT: The designed smart shoe is enriched with various sensors along with their numerous features which would help blind persons to make their way to a destination. It consists of sensors and vibrators for sensing the surroundings and thus giving feedback to the blind person about the position of the nearest obstacles. Sensors will sense the obstacles, and the vibrators will vibrate irrespective of its path. Using this smart shoe, blind people need not to be dependable on others for their movability. Ultrasonic sensors detect the sound waves with a frequency above the human audible range. They do not require any physical contact with their target and hence can detect certain obstacles through their path. In order to understand whether there is any obstacle in the path, buzzers are being connected for alerting the person while travelling. Thus after wearing these shoes, they will get rid of the stick which they usually have to carry along with them always. Thus connecting some of the android applications to these smart shoes with a hearing sensation and will inform them where the obstacle is hence providing them with a secure destination.

KEYWORDS: Smart, Shoes, Blind, Path finder.

I. INTRODUCTION

285 million people are estimated to be visually impaired worldwide. Among these large number, 39 million are blind and 246 have low vision. In the past, the impaired used to face many difficulties while travelling. So they usually have to carry a guide along with them to help them in their way. Sometimes they used to ask some people to help them. This has inspired to make this special type of shoe designed for disabled people especially those who are blind. As sight is considered to be the most important sense for everyone, and since blind people lack behind just because of the absence of this sense. Due to this disability, there are many obstacles which they have to face in their daily life. So the technology must leave a significant impact on their lives to make changes. So by using this technology, it is designed which will be enriched with various sensors along with their numerous features which would help blind persons to make their way to the destination.

II. METHODOLOGY

This system design presents a prototype model and a concept to provide a smart electronic shoe for blind people.

Hardware Requirements:

- Microcontroller Arduino UNO (ATMEGA 328P)
- Vibration Unit
- Ultrasonic Sensors (SONAR)
- DC Battery
- Cables
- Shoe

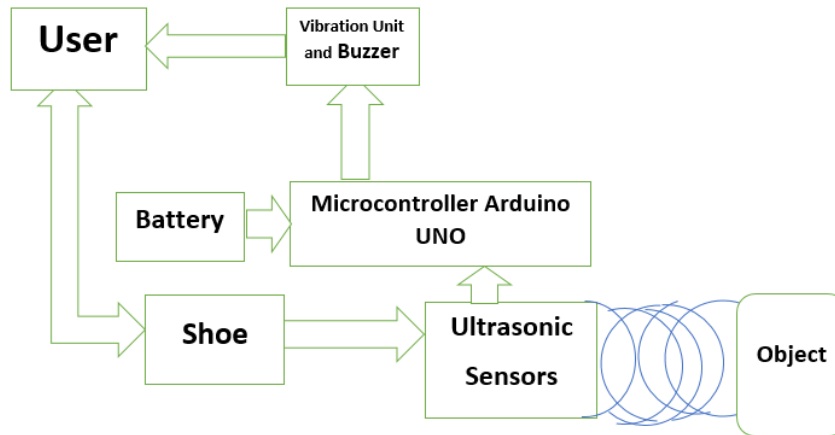


Fig. 1: Block Diagram of the Developed Model of Smart Shoe

The system consists of ultrasonic sensors and object vibrator for sensing the obstructions and to give feedback to blind people about the position of the nearest objects. Sensors will detect the presence of the obstacle and vibrator will vibrate through shoes. By using Smart Shoe blind people does not have to rely on others for their mobility. Ultrasonic sensors are based on measuring the properties of sound waves with a frequency above the human audible range. Ultrasonic sensors do not require any physical contact with their target and hence can detect certain obstacles. To help blind people to recognize whether there is any obstacle or not audio alarms are used. After wearing the shoe blind person will get rid of holding sticks. By using Android technology, a hearing sensation will be generated which will inform them of the position of the obstacle. The ultrasonic sensor can measure the distance in meter by a formula $0.034 * (\text{time}) / 2$. Here time is divided by 2 because two times notifications are received by the shoe when the ultrasonic sound hits the object from the trigger pin and the other one when the ultrasonic sound reflects from the object to the echo pin.

Working Principle:

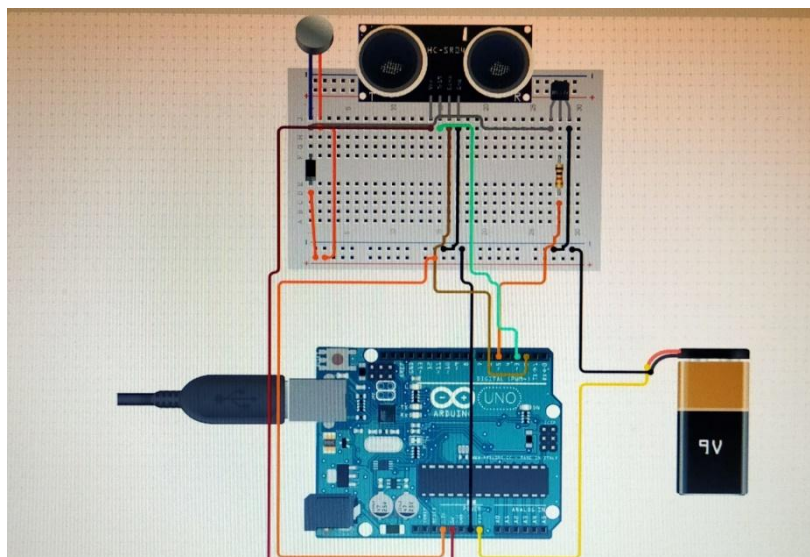


Fig 2: Schematic diagram of the work

Ultrasonic Sensor is used to measure the distance from the object. If anything comes in front of the shoe within 20 cm distance, the ultrasonic sensor will produce a sound for 10ms from the trigger pin of the sensor. The sound strikes the object and reflects it back to the echo pin of the ultrasonic sensor. According to the program if the shoe finds the

distance of an object that is less than 20cm then the vibrator in the shoe will keep vibrating continuously. Now if the distance of an object from the shoe is greater than 20cm then the shoe will stop vibrating.

III. RESULTS AND DISCUSSIONS

The above-shown pictures are the pictorial representation of the developed model. Here the shoe is designed or arranged in such a manner so that it can handle all the required things to work as a helping aid. Smart shoes would be providing a hearing sensation to the person. Wearing this shoe will inform them about the obstacle and provide them with a secure way to the destination. Technology helps the blind people to communicate with the environment. The communication process and the dissemination of information has become very fast. The application results enhance the understanding of the problems facing blind people daily and may help encourage more works targeted to help blind people to live independently in their daily lives. The smart shoes for the blind person will help to reach the destination with the whole navigation system provided in the shoes which will inform the blind person through an earphone.



Fig. 3: Different views of the Developed Model of Smart Shoe

IV. CONCLUSION

Smart shoes are wearable system design to provide directional information to blind people. This prototype will help the generation to become successful if it is applied in the real lives of blind people. Use of shoes, is ordinary so there would be no embarrassment in using this in public. The estimated cost of the design is reasonable. Blinds will not need external assistance so they will feel more independent. If any GSM (Global System Management) and GPS (Global Positioning System) are attached to the model, the immediate connection may reach to the nearest security management and also to the persons present at home. GPS can locate the exact presence of the person with location tracker through



Internet of Things. As the person moves throughout the day, the total database can be collected through advanced technology transfer. In future, a GSM Module can be added to this shoe. By adding this electronic component communication with the person who is wearing this shoe is possible. It would be possible to track the person by using mobile phones, laptops or computers as well. Hence in case, if they get lost anywhere, they can be easily found out by tracking their exact location and henceforth would be able to rescue them. Since this is electronic equipment based smart shoe, any disabled person would not be able to wear this in places such as muddy areas and if his shoe gets in touch with water, then it would stop working and will get damaged.

REFERENCES

- [1]F. van der Heijden, P.P.L. Regtien, “Wearable navigation assistance - a tool for the blind ”, Laboratory for Measurement and Instrumentation Faculty of Electrical Engineering, Mathematics and Computer Science University of Twente, P.O. box 217, 7500AE Enschede, The Netherlands.
- [2]Shubham Adhe, Sachin Kunthwad, Preetam Shinde, Mrs. V.S. Kulkarni, “Ultrasonic Smart Stick for Visually Impaired People”, e-ISSN: 2278-2834,p- ISSN: 2278-8735. PP 11-15.
- [3]Emanuele Frontoni, Adriano Mancini, Primo Zingaretti, Andrea Gatto, “ENERGY HARVESTING FOR SMART SHOES: A REAL LIFE APPLICATION”, Proceedings of the ASME 2013 International Design Engineering Technical Conferences and Computers and Information in Engineering Conference IDETC/CIE 2013 August 4-7, 2013, Portland, Oregon, USA.
- [4]Ying-Xun Lai, Yi-Wei Ma¹, Yueh-Min Huang¹, Jiann Liang Chen, and Subhas Chandra Mukhopadhyay.” Ubiquitous Motion Sensing Service Using Wearable Shoe Module and Mobile Device”, 1National Cheng Kung University, Tainan, Taiwan 2016.
- [5]Miss. Smita S. Auti, Prof. Nagnath B. Hulle,” Advanced shoes with embedded position tracking and path guidance to keep track of Alzheimer’s patients”, Electronics & Telecommunication Dept., GHRCOEM, Chas, Ahmednagar, India, January 2015.
- [6]Shristhi Thakur, Pankaj Sharma, Parth D hall, Shubham Rastogi, Rishav Agarwal Smart Assistive Shoes for the Blind People in International Journal on Recent and Innovation Trends in Computing and Communication ISSN: 2321-8169, Volume: 4 Issue: 9 47 – 49.
- [7]R. Velázquez, Wearable Assistive Devices for the Blind. Chapter 17 in A. Lay-Ekuakille& S.C. Mukhopadhyay (Eds.), Wearable and Autonomous Biomedical Devices and Systems. Issues and Characterization, LNEE 75, Springer, pp 331-349, 2010.
- [8]Ziad O. Abu-Faraj, Paul Ibrahim, Elie Jabbour, Anthony Ghaoui, Design and Development of a Prototype Rehabilitative Shoes and Spectacles for the Blind in 2012 5thInternationalConference on Bio-Medical Engineering and Informatics (BMEI2012).