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Smart Assistive Shoes for the Blind People

[*1]Shristhi Thakur, [#1]Pankaj Sharma, [*1]Parth Dhall, [*1]Shubham Rastogi, [*1]Rishav Agarwal
Department of Electronics and Communication Engineering
Moradabad Institute of Technology, Moradabad
[*1]*srishtithakur21@gmail.com*, [#1]*pankaj354518@yahoo.com*,[*1]*parth.dhall40@gmail.com*, [*1]*rastogishubham99@gmail.com* ,
[*1]*kinshurishav@gmail.com*

Abstract-This paper presents an idea about dealing with the problems faced by blind people through smart shoes and cane. Most of the people not only in India but internationally too is dealing with this issue that is blindness. Because of this inability blind people are dependent on others for their motion and other activities.We are introducing a combination of shoes and cane which will assist them in their motion and other needed activities. The shoes and cane will be detecting nearby obstacles and eventually will send a message to the receiver connected at the cane which is next given to the person holding it. So thereby, the blind person will get to know about the obstacles around them without any help or guidance of someone else. This will make them more independent.

Keywords: *IR sensor, obstacle, Ultrasonic sensor, PIC microcontroller, Bluetooth connectivity.*

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I. Introduction

Many people suffer from serious visual impairments preventing them from travelling independently. Accordingly, they need to use a wide range of tools0 and techniques to help them in their mobility. The increasing number of blind persons attracts the development of many assistive devices around the world. Starting from the example of Malaysia, The increasing trend of people with disabilities has been reported by Country Report Malaysia, the 7th ASEAN and Japan High Level Officials Meeting on Caring Societies in 2009. As stated in the report, in 2008, there were only 30,522 children with disabilities detected. The amount increased to 13.7% in 2009 where 35,368 people with disabilities were registered with the Department of Social Welfare. One in every 179 people is blind. 21% of Indians, across the world, is blind. In India itself, around 8 million people out of around 39 million people are blind. And in a million, 53 thousand people are visuallyimpaired, 46 thousand people have Low Vision and 6800people have complete vision loss i.e. they are blind. Andunfortunately, as per the current statistics only 5% of themhave access to any kind of assistive technology.

One of the techniques to help the blinds in their mobility is orientation and mobility specialist who helps the visually impaired and blind people and trains them to move on their own independently and safely depending on their other remaining senses. Another method is the guide dogs which are trained specially to help the blind people by navigating around the obstacles to alert the person to change his/her way. However, this method has some limitations such as difficulty to understand the complex directions given by these dogs, and they are only suitable for five years. The cost of these dogs are very expensive, also it is difficult for many of blinds to provide the necessary care for the other living creature.

II. Literature Survey

Mohd Helmy Abd Wahabin **2011** said that technology can help in reducing many barriers that people with disabilities face. These kinds of technologies are referred to as assistive technology (AT). Different kind of disabilities can be cured by an AT such as hearing aid or blindness however their major limitation is their highly expensive rates. The main problem with the blind people is the loss of their physical integrity. They do not have confidence in themselves. This statement has been proven in which an experiment name "Project Prakash" has been carried out. It was intended at testing the visually-impaired to utilize their brain to identify set of objects. This can also be applied to different situation. When the visually-impaired walk into a new environment, they will find it difficult to memorize the locations of the object or obstacles. These examples demonstrate the difficulties of visually-impaired people [1].

The Guide Cane is designed to help the visually-impaired users navigate safely and quickly among obstacles and other hazards. Guide Cane is used like the widely used white cane, where the user holds the Guide Cane in front of the user while walking. The Guide Cane is considerably heavier than the white cane, because it uses a servo motor. The wheels are equipped with encoders to determine the relative motion. The servo motor, controlled by the built-in computer, can steer the wheels left and right relative to the cane. To detect obstacles, the Guide Cane is equipped with ten ultrasonic sensors. A mini joystick located at the handle allows the user to specify a desired direction of motion. Guide Cane is far heavier than the ordinary white cane and also it is hard to keep because it cannot be folded [1].

Harshad Girish Lele in **2013** said that now a days different kind of canes are being used such as the white cane, the smart cane and the laser cane. This tool has several constraints: long length of the cane, limitation in recognition of obstacles, and also difficulty to keep it in public places. Recently, many technologies have been developed for blind persons based on signal processing and sensor technology. These are called Electronic Travel Aids(ETA) that help the blind to move freely in an environment regardless the surroundings and the dynamic changes. ETAs are mainly classified into two major aspects: Sonar input and camera input systems. Sonar input comprises of the laser signal, infrared signals or the ultrasonic signals whereas the camera

input systems consist of the mini CCD camera. The way these devices operates just like the radar system that uses ultrasonic laser to identify height, the direction and speed of fixed and mobile objects. The distance between the objects and the person is measured by the time taken by the wave to travel. However, all the existing devices or systems inform the blind of the presence of the object at a specific distance in front of or near to them. These details permit the user to change his/her way. Information about the object characteristic can create additional knowledge to enhance space manifestation and memory of the blind person [2].

The originality of this proposed system is that it utilizes an embedded vision system of three simple IR sensors and brings together all reflective signals in order to codify an obstacle through PIC microcontroller. Hence, in addition to distance the proposed guidance system enables the determination of two main characteristics of the obstacles which are material and shape[2].

Syed Tehzeeb Alamin **2015** said that related to the guide cane there was also a smart cane invented with almost same configurations. This cane uses ultrasonic sensors and the servomotors to detect the obstacles. There is a microcontroller inside the cane which will work on the received instructions like right, left, straight etc. However this system also has some limitations like it not easy to handle and requires large area or space to be placed because they cannot be folded. Additionally this cane, due to the presence of large number of ultrasonic sensors and servomotors, is very expensive. So every blind person cannot afford it [3].

The smart cane utilizes the technique of RFID (Radio Frequency Identification) RFID is used to detect objects or obstacles in front of the user and detects the RFID tag that has been placed in several areas to navigate the users. This invention is just like a normal stick but is equipped with a bag, worn by the user. The bag supplies electricity power to the invention and informs the user through speakers inside the bag. However this system if confined in a small area because it is limited to the areas where the RFID tags have been placed. Otherwise at the places without tags it will behave as a normal stick. This system will be of higher cost if it is implanted in external environment because to implant those tags at every place is difficult as well as expensive[3].

White cane is assigned to detect the obstacles up-to knee level within the range of 2 to 3 feet. When an obstacle is detected the cane vibrates or makes a sound. The sensor and the controller are embedded inside the cane and it usually offers a battery life of 10 hours. The delay time can be calculated by the calculation of the time taken to reach the waves to the obstacle and its return journey.Distance information is conveyed to the user though a vibrator. Vibration frequency increases as the obstacle comes closer. Enables the person to effectively scan the area in front and detect obstacles on the ground such as uneven surfaces, holes, steps, walls etc. The user keeps the cane at aconvenient inclination. As a result the ultrasonic detection cane is directed upwards and allows detection of knee above obstacles[3].

Another way to detect nearby obstacles for blind persons is the shoes. There can be a kind of shoes which are capable for detection of the nearby objects by using the implemented ultrasonic sensors inside it. These sensors can detect the obstacles at some distance in a definite range. These sensors when sense any problem will ultimately ping the user about it by the vibrations. Now the vibrations will be produced through another device which can be placed inside the pocket of the user. So, the other working senses will be helping the blind person in their mobility without handling any cane. Arduino controller keeps polling the ultrasonic sensors and provides feedback via the vibrating system. Blind Shoes can charge the battery by itself through kinetic generator pinned under the soles of shoes. The battery will be charged automatically when the user step[3].

III. Conclusion

Hence we conclude that this experiment would be successful if we apply this in real lives of blind people. This project can help those who need it. Use of shoes and cane is ordinary so there would be no embarrassment in using this in public. Secondly, the components being used are easily available. Blinds will not need an external assistance so they will feel more independent. The estimated cost of the project is also reasonable.

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IV. Author's Profile

Shristhi Thakur, currently pursuing B.Tech in Electronics and Communication fromMoradabad Institute of Technology, Moradabad. She is a student of B.Tech 4th year and has keen interest in electronics field like network and analysis , switching theory etc. and aspire to go in research in this field only.

Dr. Pankaj Sharma received his B.E. Degree in E&T.C Engineering from North Maharashtra University, Jalgaon(M.S), India, M. Tech and Ph.D degree from MNNIT, Allahabad, India. He is currently with M.I.T Moradabad(UP), India, where he is working as an Associate Professor in the Department of Electronics and Communication Engineering. He is a member of IEEE, Institute ofEngineers(India), Institution of Electronics and Telecommunication Engineers(IETE), Computer Society of India (CSI), Indian Society for Technical Education(ISTE) and International Association of Engineers (IAEN), Hong-Kong. He has authored or co-authored more than 45 technical papers.

Parth Dhall, currently pursuing B.Tech in Electronics and Communication fromMoradabad Institute of Technology, Moradabad. He is a student of B.Tech 4th year and has keen interest in electronics field like digital logic design , integrated circuit technology etc. and aspire to go in research in this field only.

Rishav Agarwal, currently pursuing B.Tech in Electronics and Communication fromMoradabad Institute of Technology, Moradabad. He is a student of B.Tech 4th year and has keen interest in electronics field like digital logic design and embedded system and aspire to go in research in this field only.

Shubham Rastogi, currently pursuing B.Tech in Electronics and Communication from Moradabad Institute of Technology, Moradabad. He is a student of B.Tech 4th year and has keen interest in electronics field like digital logic design, integrated circuit technology etc. and aspire to go in research in this field only. He is a member of IEEE and authored and coauthored 4 technical papers.

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