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DEVELOPMENT OF SMART SHOES AND VOICE ASSISTANCE FOR BLIND PEOPLE

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Abstract: Sight is considered the most important sense and the blind people are observed upon with pity by others. Technology helps the blind people to communicate with the environment, the communication process and the dissemination of information has become very fast and on a wider scale to include all parts of the world which greatly affected to the human life, thus increasing the ways of entertainment and comfort and reduced suffering and hardship in many things. Blind people are part of this world, so the technology must leave a significant impact on their lives to make what was impossible for them as possible and available to them today. The assistance provided earlier for blind people were as a particular hardware devices such as talking OCR Products, identifying color, barcode readers; that hardware were expensive and limited capabilities due to rapid change in hardware. The challenges faced by impaired/blind people in their daily lives are not well understood. In this paper, we try to present an application called SMART SHOES where is it's a way to give hand to blind people with the aid of technology in order to solve some of their faced problems. The Application results enhance the understanding of the problems facing blind people daily, and may help encourage more projects targeted to help blind people to live independent in their daily lives.

Keywords: VISUALLY IMPAIRED, BLIND PEOPLE, real time system, Arduino, Android, and voice recognition..

I. INTRODUCTION

285 million people are estimated to be visually impaired worldwide: 39 million are blind and 246 have low vision, about 90% of the world's visually impaired live in low-income settings where 82% of people living with blindness are aged 50 and above. Globally, uncorrected refractive errors are the main cause of moderate and severe visual impairment; cataracts remain the leading cause of blindness in middle- and low-income countries. The number of people visually impaired from infectious diseases has reduced in the last 20 years according to global estimates work and 80% of all visual impairment can be prevented or cured.

II. RELATED WORKS

In the past, the visually impaired used to face difficulties in moving and transporting from a place to another. Some of them used to have a guide dog to help them walk around and to avoid collisions. Some of them used to ask for someone else's help. This inspired a lot of developers to develop products to assist the visually impaired and to make them feel more independent. Two of these popular products are: White Cane, and SonicGuide. White cane also known as a "Hoover" cane, named after Dr. Richard Hoover who designed it. White cane is designed primarily as a mobility tool used to detect objects in the path of a user. But using a cane has some disadvantages. And some of these disadvantages are that using a cane is difficult while travelling. For example using a cane is difficult in a crowded restaurant, or in placing it into a car or a plane or even a bus. The White Cane is made from metal, which makes it heavy and inflexible and susceptible for snapping or cracking. Currently got some researches and experiments to develop an e-white cane. (Vera, P., Zenteno, D. and Salas, 2014)(Gassert, R., Kim et al, 2014)(Rizzo, J.R. et al, 2017).

SonicGuide is a smart head mounted device that uses a camera that takes pictures and analysis them based on an algorithm to find the abnormal objects in the way and warns the user by sending alarms to a connected earphone. But also this device has some problems on its own. It is heavy and wearing a device on the head all the time may cause pain and some neck injuries. It is also power consuming due to the camera that takes pictures all the time. Some research focus more on new Sonice Guide. ((Dunai, L. et al 2013, 2014) (Bujacz, M. and Strumiłło, P., 2016). The Smart Shoes is not the only assistive walking device for the visually impaired people, there was some devices such as: Mini Guide (Sendero Group.com, 2017), and UltraCane (ultracane.com, 2017). We have studied the existing products well enough to develop a better and more efficient one. There is no perfect product, but there is always room for improvement. In Smart Shoes, we tried to give a hand to help those people. We have designed a small, wearable and a hands-free device that allows the

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user to use both of their hands while walking. Nevertheless we took care of battery issue, so we used the right hardware that does not as power consuming as the other devices. Portability, low cost, and above all simplicity of controls are most important factors which govern the practicality and user acceptance of such devices. The Smart Shoes device is a kind of portable device. Hence it should be a small-sized and lightweight device to be proper for portability, the device should be easy to control: no complex control buttons, switches and display panel should be present. Moreover, the device should be low-price to be used by more blind persons. Our system is developed for portable (small size and lightweight), connected with Android application, easy to use, and low power consumption (supplied by battery).

III. METHODOLOGY

The ultrasonic sensor detects objects, and the microcontroller processes the data. If an object is too close, it triggers the buzzer. The SOS switch can be used to send an emergency signal. The GSM module enables communication, while the GPS module provides location information to the guardian.

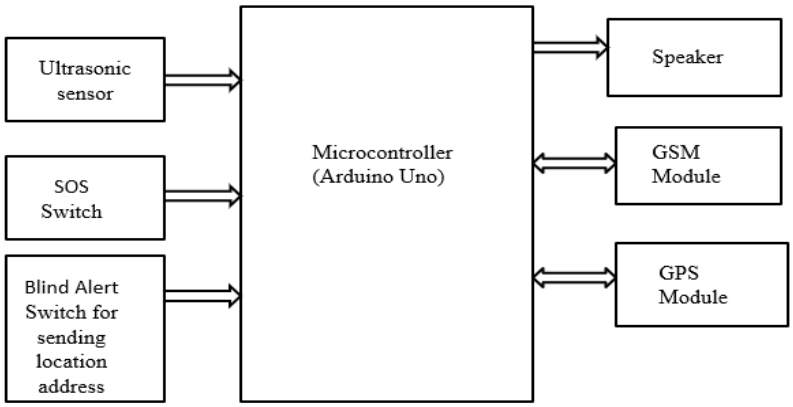

Fig 1: Block Diagram of built in the Smart Shoe

A. Hardware Requirements

- Microcontroller : Aurdino Uno
- Ultrasonic Sensor
- Buzzer
- Battery 9Volts
- Pair of Shoes
- GSM Module
- GPS Module
- SOS Switch

B. Software Requirements

- Arduino IDE : Version 1.6.12
- Operating System : Windows7
- Language : C programming

IV. RESULTS OBTAINED

The prototype of Smart shoes is shown in Figure 2 and 3 where it shows the Smart Shoes with the attached device from front and side as well.

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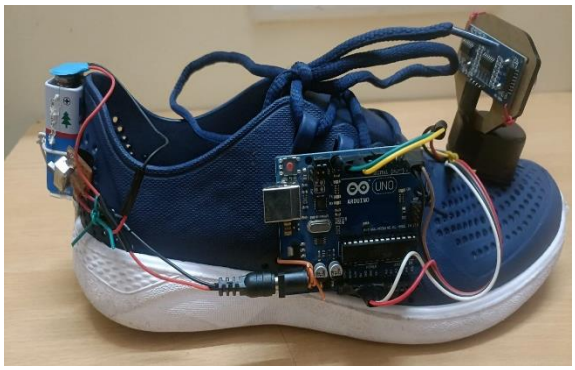

Fig 2 Side View of smart shoe

Fig 3 Front View of smart shoe

V. CONCLUSION

There is no doubt that every project has its own weaknesses. In this section, we are going to mention the weaknesses of the Walk Me Home project. One of the weaknesses in our project, is that it is only compatible only on Android platforms. Another weakness is that the hardware is not waterproof yet. A third weakness in the mobile application is when the user asks the application to walk him home, they need to tap the navigate button on the right bottom corner, since they are visually impaired users, it is going to be a problem, and since we aim to provide the best product. One of the strengths in our product that it's depending on voice commands. Since we are dealing with visually impaired users, this gives our product a strong advantage. The hardware we worked on helps not only the user, it also helps the other people nearby. For example, if someone is moving towards the user, and the user couldn't notice them, a connected beeper is going to make beeping noises to warn them. The room for improvement still wide and open in this area. In particular this project can be improved by adding some other pieces of hardware into a device such as a Controller that fully controls the functionality of the hardware, by turning it on and off, connecting the device to the mobile application by Bluetooth technology, and also saving the current location and translating the voice commands. Another improvement is enhancing the mobile application by growing the database which allows the user to save more than one location to visit in the near future, also creating a community for visually impaired users, which allows them to interact with volunteers, and arranging possible meetings.

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