Smart Shoes for Blind Human

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Abstract

Smart shoes for the blind have emerged as a promising option for improving the mobility and freedom of those who are visually impaired. The purpose of this study is to examine the present state of the art in smart shoes for the blind and to highlight their advantages and disadvantages. Smart sneakers have sensors and software that identify impediments and deliver real-time feedback to the wearer. They are intended to help the user navigate new settings and increase their overall safety and confidence.

This article examines the numerous sensors used in blind smart shoes, such as ultrasonic sensors, infrared sensors, and pressure sensors. It also investigates the difficulties connected with incorporating these sensors into a small and portable device. The study also looks at the numerous feedback mechanisms used in smart shoes, such as haptic and audible feedback, and how these may be customized to match the demands of individual users.

Keyword: *Smart shoes, visually impaired, navigation, sensors, microprocessors, assistive technology, obstacle detection, hazard feedback*

I. INTRODUCTION

Blindness is a serious affliction that affects millions of individuals throughout the world. Navigating the world can be difficult for persons who are blind or visually impaired. With the advancement of technology, numerous methods for assisting blind people in navigating their environment have been developed. The adoption of smart shoes is one such approach. Smart shoes for the blind are a novel technology that helps the vision impaired navigate their environment more easily. These shoes are outfitted with sensors and other gadgets that provide the user with input about their surroundings via vibrations, audio, or other ways. The shoes can identify impediments, navigate over various terrains, and offer feedback to the wearer to assist them in avoiding any risks. Smart shoes for the blind are an intriguing new sector that has the potential to revolutionize how blind people navigate their surroundings. In this study, we will look at the various technologies utilized in smart shoes for the blind, their benefits, and future applications.

II. OBJECTIVE

- The primary objective of developing smart shoes for blind people is to offer a trustworthy and effective way of navigation in unidentified circumstances.
- The sneakers have to be made to provide the person instantaneous feedback, such vibrations or auditory information, so they can navigate around their environment with confidence and security.

III. LITERATURE REVIEW

The visually handicapped have traditionally experienced challenges getting around and being transported from one place to another. Some of them once used a guide dog to assist them navigate their surroundings and prevent accidents. Some of them used to request assistance from others. This encouraged many developers to create tools

that would help the blind and give them a sense of greater independence. The two most wellknown of these goods are White Cane and Sonic Guide.

White cane, sometimes called a "Hoover" cane after its designer Dr. Richard Hoover. The white cane is primarily intended to be used as a mobility aid for seeing items in a user's path. However, using a cane has some drawbacks. The difficulty of utilizing a cane when travelling is one of these drawbacks. For instance, using a cane at a crowded restaurant or fitting it into a car, aircraft, or even a bus is challenging. The White Cane is hefty, rigid, and prone to snapping or shattering since it is composed of metal. Currently conducting experiments and research to create an electronic white cane. (Vera, P., Zenteno, D. and Salas, 2014)(Gasser, R., Kim et al, 2014) (Rizzo, J.R. et al, 2017).

A smart head-mounted gadget called Sonic Guide utilizes a camera to gather photographs, analyses them using an algorithm to identify unusual items in the user's path, and alerts them by transmitting alarms to an earphone that is linked. However, this device itself also has some issues. It is cumbersome, and wearing a gadget on your head all the time might lead to neck problems and suffering. The camera, which continuously captures photographs, also uses energy. Some studies concentrate more on the new Sonice Guide. ((Dunai, L. et al 2013, 2014) (Bujacz, M. and Strumiłło, P. 2016).

There are other walking aids for persons with visual impairments besides Smart Shoes, such the Mini Guide and Ultra Cane (Sendero Group and Ultra Cane, respectively, 2017). We have sufficiently researched the current products to create one that is superior and more effective. Although there is always room for improvement, no product is perfect. We sought to lend a hand to those folks in Smart Shoes. In order to allow the user to utilize both hands while walking, we created a compact, wearable, hands-free gadget.

Nevertheless, we addressed the battery issue by using the proper hardware, which uses less power than the competing 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).

IV. SMART SHOES PROJECT

Many blind persons need navigational assistance when navigating unfamiliar surroundings. We introduce the Smart Shoes initiative, which enables people with mobility issues who are blind to avoid impediments. Our system identifies obstacles like curbs, stairs in the ground, and even moving objects by using current robotics technology, and it conveys obstacle information through haptic feedback (vibrations and alarms). Early tests demonstrate that our system enables human users to securely navigate both interior and outdoor situations. Generally speaking, being blind means having no functional vision at all. Blindness, on the other hand, entails variable degrees of vision capacity, occasionally under varying circumstances. Light rays striking the retina at the back of the eye cause the optic nerve to transfer electrical impulses to the brain, which results in vision. Blindness occurs when an inadequate amount of light hits the retina, or the information has not been delivered to the brain correctly. An examples of the targeted visually impaired users shown in table 1.

	User	**Notes**
User 1	Legally blind person	Complete blindness
User 2	Color blind person	Also called “dyschromatopsia”
User 3	Night blind person	

Fig. No. 1

IV.1. ARDUINO COMPONENTS (MODULES) USED IN THE PROJECT

1.1 COST ESTIMATION

S.NO.	Name Of Components Used	Cost Of The Component
1	Arduino Nano	Rs. 500
2	Ultrasonic Sensor	Rs. 180
3	Buzzer	Rs. 55
4	Battery	Rs. 140
5	Shoes	Rs. 1100
6	Jumper Wire	Rs. 125
7	Vibration Motor	Rs. 100

Total Cost: 2200

1.2. ULTRASONIC SENSOR

An ultrasonic sensor is a device that uses sound waves at a frequency above the range of human hearing to measure distances. It emits high-frequency sound waves and then detects the echoes that bounce back from nearby objects, allowing it to calculate the distance to those objects. Ultrasonic sensors are commonly used in robotics, industrial automation, and automotive applications.

Fig. No. 2

1.3. BUZZER

A buzzer is an electromechanical device that produces a continuous or intermittent buzzing sound. It consists of a vibrating element, such as a piezoelectric crystal or a magnetic coil, that is driven by an electrical signal. Buzzer are commonly used in alarm systems, electronic games, etc.

Fig. No. 3 1.4. ARDUINO NANO

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Arduino Nano is a small, versatile microcontroller board based on the ATmega328P chip. It is similar to the popular Arduino Uno, but is smaller and more compact, making it well-suited for projects with space constraints. The Arduino Nano can be programmed using the Arduino Integrated Development Environment (IDE), and can be used to control a wide variety of electronic devices and systems.

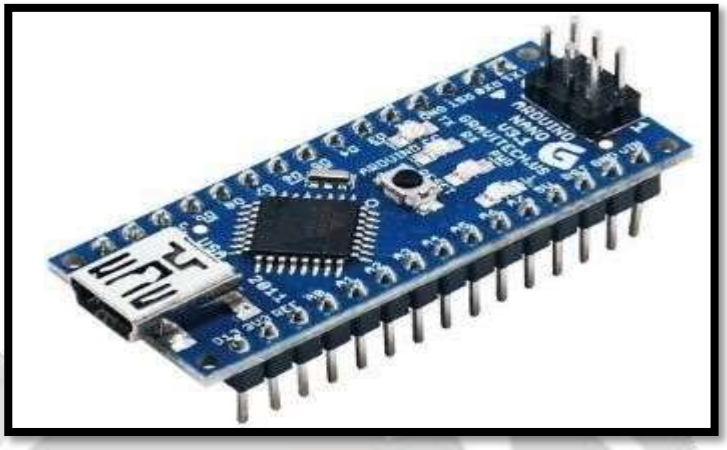

Fig. No. 4

1.5. LITHIUM-ION BATTERY

A lithium-ion battery is a rechargeable battery that uses lithium ions as the primary component of its electrolyte. Lithium-ion batteries are known for their high energy density, long lifespan, and low selfdischarge rate. They are commonly used in portable electronic devices such as smartphones, laptops, and cameras, as well as in electric vehicles and renewable energy storage systems.

Fig. No. 5

1.6. JUMPER WIRE

A jumper wire is a short length of insulated wire with connectors at both ends. Jumper wires are used to create connections between electronic components on a breadboard or other prototyping.

Fig. No. 6

V. ADVANTAGES

1. Improved Safety: Smart shoes equipped with sensors can detect obstacles and alert the wearer through vibrations or auditory cues. This can significantly reduce the risk of falls and other accidents.
2. Enhanced Mobility: By providing real-time feedback about the surrounding environment, smart shoes can help blind individuals navigate unfamiliar places with greater ease and confidence.
3. Increased Independence: With the help of smart shoes, blind individuals can perform daily tasks such as walking to work, shopping, or traveling without the need for constant assistance.
4. Customization: Smart shoes can be customized to suit the needs and preferences of individual users, such as adjusting the sensitivity of sensors or changing the type of feedback.

VI. METHODOLOGY

The development of smart shoes for the blind involves a multi-disciplinary approach that integrates sensor technology, machine learning, and human-computer interaction. The sensors used in these shoes typically include a combination of ultrasonic, infrared, and pressure sensors, which are mounted on the sole of the shoe and used to detect obstacles in the user's path. The sensor data is then analyzed using machine learning algorithms, which are trained to identify and classify potential obstacles, such as curbs, stairs, and obstacles on the ground. The user interface for the smart shoes is designed to be intuitive and easy to use, with simple controls for adjusting the volume and customizing the audio signals. The interface may also include features such as GPS tracking and voice-activated commands, which further enhance the user's mobility and independence.

Fig.No.7

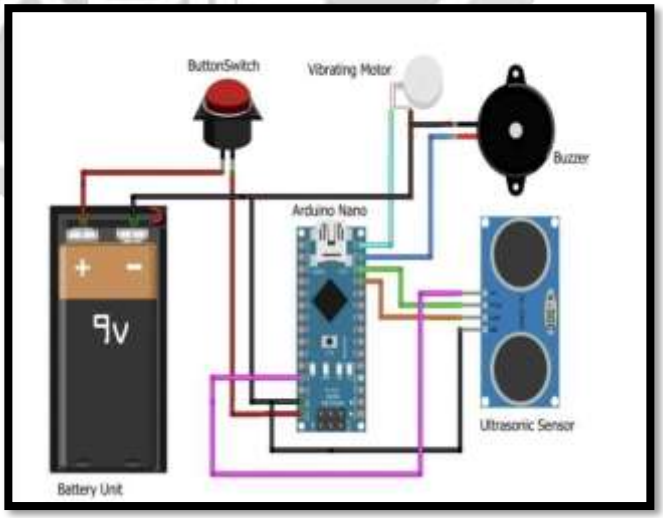

Fig. No. 8

VII. APPLICATION

It is used for indoor navigation in public buildings such as hospitals, shopping centers, and airports. They can also be used for outdoor navigation in urban environments, where there are more complex and dynamic obstacles to navigate.

VIII. CONCLUSION

Smart shoes for the blind are a game-changer for the visually impaired. The technology allows them to navigate their surroundings more easily and with greater confidence. As the technology continues to evolve, we can expect to see even more advanced features that will further enhance the wearer's experience. Overall, smart shoes for the blind have the potential to transform the way the visually impaired move through the world, making it a safer and more accessible place.

IX. REFERENCES

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