A SMART WEARABLE GUIDING DEVICE FOR THE VISUALLY IMPAIRED PEOPLE

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Abstract:

The goal of the "Smart Wearable Guiding Device for the Visually Impaired People" is to allow blind people to navigate their environment with the aid of their other senses, such as hearing and touch, rather than their eyes. It uses sound and vibration to warn the blind user of impending danger. The World Health Organization estimates that thirty-nine million people worldwide are blind. They have significant challenges in conducting their regular activities. Because of this, the project's primary objective is to develop a low-cost, high-efficiency approach to aiding the visually impaired in traveling with a modicum of comfort, swiftness, and confidence. This Arduino-based device will help the visually impaired find their way around without having to rely on a stick, which can be a hindrance. They may just wear it as a band or piece of cloth on their wrist, and it will give them accurate results with no or no training. The system also has a ringer that may play an alarm or vibrate to draw attention. The user is alerted to potential threats through aural and tactile alerts. The sound and vibration messages are more frequent the closer the elastic glove is to the barriers. The device may deliver alerts to the relevant person in the case of an emergency and has a buzzer that makes an auditory alarm and a motor that provides vibration signals. The purpose of this research is to develop a cost-effective strategy for facilitating independent travel for the visually impaired. For paths where a fast response time is obvious, this design offers a low-priced, sturdy, transportable option.

Keywords:*Arduino, Visually Impaired People, Elastic Glove, Buzzer, Reaction Time*.

INTRODUCTION

Think about how a problem with the eyes, the main sense organs, may hinder one's ability to respond to the information presented by the external environment. As the global population ages, vision impairment is becoming a more pressing problem. Assistive technology is essential for those who are blind or visually impaired. In today's technologically advanced and competitive world, independence has risen to the top of everyone’s list of life goals. There are now around thirty-nine million blind persons in the world, out of a total of 285 million afflicted by visual impairment [1]. Improved conditions have led to a greater emphasis on health care innovation in recent years. Blind folks have a tough time finding their way around. They cannot go about without someone helping them. Several methods exist to aid the visually impaired. Thanks to these developments in hardware and software, many ingenious alternatives have been developed to allow the blind greater mobility. Finding their way to their desired destinations is a huge challenge for the visually impaired. These people need the backing of those who can see the big picture. The limitations of current options, such as white sticks, guide dogs, and human guides, have rendered them ineffectual. Among the many mobility aids available to the blind and visually impaired, the white cane is by far the most widely used. Unfortunately, the effectiveness is inadequate [2]. Helpful tools for people with disabilities have been created in recent years. If technology keeps improving, low-cost assistive devices will be available to low-income disabled people in the near future. Despite the fact that several frameworks have been created to aid the visually impaired, many of them are limited in their applicability. Increased adoption and refinement of this innovative technology will unquestionably benefit the community of people who are blind or visually impaired. Our primary objective is to provide information to the visually impaired so that they can navigate the streets safely and freely, avoid dangerous situations, and make informed choices. In this article, we provide a similar guiding device for the visually handicapped to demonstrate the development of such technology. As a consequence, this project used Arduino to create a smart glove for the visually impaired. There is a strong international need to improve blind people's quality of life. The proposed intelligent glove can detect obstacles, giving blind people greater confidence while walking in public. Range sensor technology might be used by obstacle monitoring systems to monitor road conditions with a longer detecting range, providing users with advance warning of potential dangers. To achieve this objective of making adaptable, lightweight, and reasonably priced clothes, the Arduino microcontroller is used. If the ultrasonic detector picks up anything. It would turn on the vibrating motor, letting the blind know about potential roadblocks and sending out alerts to the right people in case of an emergency. There is currently no other consumer electronics product that can be worn like an article of clothing. Getting a tool that works for all blind people is the primary objective. The device's low price is one of its most appealing features.

LITERATURE SURVEY

Researchers have spent the better part of the past several decades developing modern technologies in an effort to provide the blind with a reliable system that can detect barriers and warn them of impending danger. Several programs have been developed over the years to aid the visually impaired. Some of the most prevalent techniques are object detection, global positioning system, ultrasonic sensor utilization, and audio conversion. Multiple systems exist, each with their own set of constraints. There are already ETAs on the market that rely mostly on ultrasonic sensors. Canes and Head Mounted Devices are the two primary product types in the market for ultrasonic sensor-based mobility aids for the visually impaired. Therefore, it is essential to create a more efficient and rewarding paradigm for the blind, so that they can better manage day-to-day challenges and move forward with greater confidence. Akhila S. et al. proposed using a Raspberry Pi-powered device to identify landmarks and provide real-time directions to a desired location using GPS. The system's end objective is to provide low-cost, effective aid with navigation and obstacle detection for visually impaired people, giving them the feeling of artificial vision [3]. The article Real-time Object Detection for 360-degree Panoramic Image using CNN [4] was also a delightful read. This approach employs a convolutional neural network (CNN) to enable instantaneous detection of 360-degree panorama features. They have also employed a convolutional neural network (CNN) based method for object detection, which involves a post-processing step to establish accuracy. For the visually handicapped, D. Sekar et al. introduced a gadget that acts as an intelligent walking stick and alerts users to potential hazards [5]. They may make it on their trip with this information. It consists of an ordinary walking stick outfitted with sensors that report on the surrounding environment. The optimal route is calculated using a combination of GPS and previously entered locations. The Navel, developed by Shoval et al. [6], is a wearable, tiny computer with collision avoidance designed specifically for indoor navigation. Similar to the electrical signals sent to the motor controllers of a mobile robot, audible signals may guide a visually impaired traveller around obstacles or provide an "acoustic view" of the environment. Partha: An Aid for the Visually Impaired [7] - The technology comprises of a smart glove and a mobile phone, which will be utilized for object recognition and obstacle avoidance. This device not only reveals the blind person's location in the open, but it also keeps them safe. The proposed method can be relied upon, is cheap, useful, and easy to implement. Smartphone users who are blind or visually handicapped may utilize the Dijkstra technique for obstacle avoidance and route planning [8]. The Bluetooth module in this device allows for instant feedback to the user whenever an obstacle is detected by the Ultrasonic sensor. With the use of three photodiodes and three laser diodes acting as receivers, Benjamin et al. developed an optical triangulation laser cane. In all three directions, the barrier is picked up by the laser cane. The laser cane does not have a way to pinpoint its exact location or orientation [9]. Przemyslaw Baranski et al. proposed the basic framework for a remote guidance system for the visually impaired. The system consists of a mobile terminal for the visually impaired and a remote operator's terminal. A mobile terminal is a small computer that can take photos, track your location, and play music all in one convenient package. The two devices are wirelessly connected over GSM and the Internet [10]. By using auditory signals and haptic feedback, the technology proposed by V. Ramya et al. helps the visually handicapped find their way about and improve their mobility. The device also provides the user with aural feedback, such as instructions, lighting, and temperature [11]. Anushree Harus et al. proposed a Raspberry Pi-based system to assist the sight handicapped in navigating unfamiliar environments. In this navigational aid, audio cues were used to direct the user to their destination. The whole thing is worn on a belt around the user's waist [12]. The technique for blind remote navigation was first studied by M. Bucks et al. [13]. The idea is that an administrator may provide vocal instructions to a visually impaired person through a video stream from a camera worn by the individual. Abhishek Choubey and Dattatray Patil proposed a simple and inexpensive answer by integrating RFID technology, a sensor, and a cognitive device into an embedded system. According to the plan, RFID tags with individual identity should be permanently put in pedestrian thoroughfares. The sensor in the cane reads the tag ID while the blind person is moving about, allowing the individual to navigate their environment. The cognitive algorithm of the cognition device deciphers the location of the associated data message [14]. System described by Prashant Bhardwaj and Jaspal Singh employs an infrared-based detecting device to identify the barrier and then provides vibrotactile or sound (buzzer) feedback to the user to indicate the position of the barrier. A sensor module attached to a featherweight headgear provides the wearer with information on potential obstacles and the most efficient route to take [15]. USB was proposed by Anush Goel and co-workers as a means of interfacing with ARM microprocessors. Once the user presses the button, the acquired image is processed by OpenCV, and the text is recognized by OCR. Using optical character recognition (OCR) technology, images of printed text or symbols can be converted into editable text or information in a computer program [16].

PROPOSED MODEL

People who are blind or have low vision have a harder time navigating the increasingly complex urban world because of this. This idea was developed to make life easier for those who are visually impaired. The development of this technology was motivated by a desire to help the sight impaired navigate their environments more safely and independently. Improve the walking experience for the visually impaired, we considered removing the need for canes from the very beginning of the design process. If they utilize this gadget, they will not need the white stick or anything like it again. The gadget will function well whether they wear it as a band or a cloth. Because of how easy it is to operate; they will not require any training. An Arduino UNO, ultrasonic sensor, preference board, vibrating motor, buzzers for obstacle detection and alerting the user, a GSM Module for use in an emergency, a red LED, jumper cables, a mobile battery, and some elastic and stickers are all part of the proposed system. These parts make up the whole of the gadget:

Arduino UNO
Ultrasonic Sensor
Buzzer
Mini vibration motor
GSM Module
5mm Red LED
Jumper wires
Battery
Wearable Gloves
Arduino Software

When building a complete hardware model, the range value is determined by the application, and the model's purpose is to detect an obstacle or item within that range. In order to identify potential hazards along a path, sensors are strategically placed. When someone comes across them, a siren and vibrating motor turn on to warn them off. As the standard of life of humans has increased, we have grown so comfortable that we have lost sight of the difficulties faced by those with special needs. The suggested system is meant to serve as a high-performance, low-cost obstacle detecting method. Because of its portability, the Smart Wearable Guiding Device for the Visually Impaired People will improve the user experience of navigating and recognizing obstacles while on the go. The Arduino is a free and open-source hardware and software development platform. This microcontroller-based device enables real-world item identification and manipulation. The ultrasonic sensor consists of a transceiver, a transmitter, and a receiver. The transmitter transforms electrical impulses into audible vibrations. The sound waves are received by a receiver, which then transforms them back into electrical impulses. The transceiver serves as both a receiver and a transmitter. There are also crystal oscillators built in. A beeper or buzzer is an audible signalling device that may be either mechanical or electromechanical, or even piezoelectric. The primary goal here is to make a noise signal out of an audio stream. Small coreless DC motors can be used to generate vibrations that alert users to a signal without making any audible noise. The Global System for Mobile Communications (GSM) module is a piece of hardware that establishes a wireless data connection to a network.

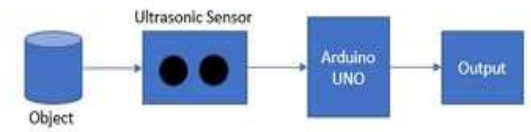

Figure 1: System Module

Figure 2: System Flow Chart of Smart Wearable Guiding Device

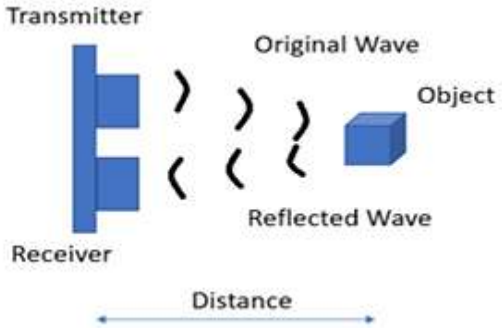

Figure 3: working of Ultrasonic Sensor

Figure 4: GSM Module

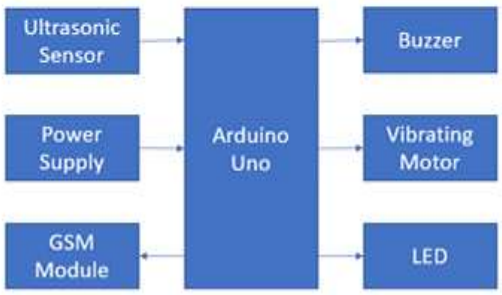

Figure 5: Block Diagram of Smart Wearable Guiding Device

RESULTS

The primary objective of this paper, which was the development of an ultrasonic vibrator glove for the visually impaired, has been accomplished. Those with visual impairments can use the proposed scheme as an aid. It helps them spot any kind of obstacle, so they can go where they need to go without any trouble. It is a fantastic tool for the visually impaired, and it does not break the bank. Recognizing impediments using a sensor module

is limited to stationary or slow-moving objects. This means it may be adjusted to provide a more user-friendly guiding system by better recognizing fast-moving items. The ultimate purpose of the technology is to allow persons with visual impairments to solve their own daily difficulties independently and safely. It helped the visually impaired go about by alerting them to obstacles in their route and naming people who were coming their way in real time. If the planned engineering is developed with all factors precisely examined, the visually impaired will be able to go from one place to the next without the aid of others.

V. CONCLUSION

It is a lot of work to restore someone's sight who was born blind. Today's society may be challenging for anybody with any kind of disability, blindness included. People who are blind often face discrimination. The visually impaired face a number of challenges in their day-to-day lives. Some examples of such activities are reading nutritional information on a product label and discriminating between objects that seem similar. This study presents and develops a new Guidance System for the Visually Impaired. It is an inexpensive and easily accessible project based on the Arduino platform. This technology delivers an artificially directed vision system that is both adaptable and effective. This lightweight and convenient suit can identify barriers of any size or shape, everywhere you go. This technology improves the independence of people who are blind or visually impaired by facilitating their movement in a variety of settings. Patients who are unable to use their senses to detect impediments would benefit from this study since it will lead to the development of a paradigm that can be thought of as a virtualized eye. This glove will pave the way for the next generation of mobility aids, allowing people with visual impairments to safely explore their environments both inside and out. The current state of this endeavour is implemented entirely in a single glove, which limits the functionality available to users since more complex components cannot be stored in such a tiny device. There will be further updates and improved sensor-equipped software updates in the future. In addition, we will provide a sophisticated navigation system so that the visually impaired may easily move around and go anywhere they like without resorting to cumbersome and time-consuming map-reading. Finally, we introduced the Third Eye, a device that can help the visually impaired experience more of the world around them through the use of vibration. There is room for development in order to boost the efficiency of this project.

REFERENCES

[1] World Health Organization (WHO) 10 Facts About Blindness and Visual Impairment, [Online] 2012, Available: http://www.who.int/features/factfiles/blindness/index.html (accessed 05 March 2013).

[2] J.M. Batterman, V. F. Martin, D. Yeung, and B.N. Walker, connected cane: Tactile button input for controlling gestures of iOS voiceover embedded in a white cane, Assistive Technology, 30(2), 2018, 91–99.

[3] Akhila S, Disha M. Rani, Divyashree D, and Varshini S. S. Smart Stick for Blind using Raspberry Pi. International Journal of Engineering Research & Technology, 4(22), 2016.

[4] Yiming Zhang, Xiang Yun Xiao, Bubo Yang, "Real-time Object Detection for 360-degree Panoramic Image using CNN", 2017 International Conference on Virtual Reality and Visualization (ICVRV), 2017.

[5] D Sekar, S Sivakumar, P Thiyagarajan, R Premkumar, and M. Vivek Kumar. Ultrasonic and Voice Based Walking Stick for Blind People. International Journal of Innovative Research in Electrical, Electronics, Instrumentation and Control Engineering, 4(3):223–225, 2016.

[6] S. Shoval, J. Borenstein, Y. Koren, (May 1994) Mobile robot obstacle avoidance in a computerized travel aid for the bl in, Proceedings of the IEEE International Conference on Robotics and Automation.

[7] Devashish Pradeep Khairnar, Rushikesh Babasaheb Karad, Apurva Kapse, Rd. Geetanjali Kale, and Prathamesh Jadhav, "PARTHA: A Visually Impaired Assistance System", 2020 3rd International Conference on Communication System, Computing, and IT Applications (CSCITA), 2020.

[8] Md. Ashraf Uddin; Ashraful Huq Suny "Shortest path finding and obstacle detection for visually impaired people using smartphone" ,2015 International Conference on Electrical Engineering and Information Communication Technology (ICEEICT).

[9] J. M, Benjamin, N. A. Ali, and A. F. Schepis (1973), A laser cane for the blind, Proceedings of San Diego Medical Symposium.

[10] Przemyslaw Baranski, Maciej Polanyi and Pawel Stromile, "A Remote Guidance System for the Blind", IEEE Transactions on Remote Guidance, Vol. 4, No.1, pp. 386- 390, June 2010.

[11] V. Ramya, Laxmi Raja, and B Palaniappan, "Voice Assisted Embedded Navigation System for the Visually Impaired", International Journal of Computer Applications, Vol.64 No.13, pp. 42-48, February 2013.

[12] Anushree Harus and Chitra M. Voice Based Navigation System for Blind People Using Ultrasonic Sensor. International Journal on Recent and Innovation Trends in Computing and Communication, 3(6):4117–4122, 2015.

[13] M. Bucks, P. Baranski, M. Moranski, P. Stromile, and A. Matera, "Remote Guidance for the Blind- A proposed teleassistance system and Navigation trails", IEEE transactions on Remote Guidance, pp. 888-892, May 25-27, 2008.

[14] Abhishek Choubey and Dattatray Patil, "To Design RFID Based Cognition Device for Assistance to Blind and Visually Challenged Personal for Indoor Use", International Journal of Engineering and Innovative Technology (IJEIT), Vol.1, No.6, pp. 70-72, June 2012.

[15] Prashant Bhardwaj and Jaspal Singh, "Design and Development of Secure Navigation System for Visually Impaired People", International Journal of Computer Science & Information Technology (IJCSIT), Vol 5, No 4, pp. 159- 164, August,2013.

[16] Anush Goel, Akash Sherawat, Ankush Patil, Prashant Choogle, and Supriya Khatavkar. **Raspberry Pi Based Reader for Blind People. International Research Journal of Engineering and Technology, 5(6):1639–1642, 2018.**