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Smart IoT and Assistive Technology for Independent Navigation of the Blind

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Abstract – ***The Blind Navigator is a system designed to assist visually impaired individuals in navigating their environment using earphones. The system uses a combination of GPS, obstacle detection, and audio cues to provide real-time navigation information to the user. The user wears a pair of earphones connected to a smart phone app that receives the GPS location and provides audio cues to guide the user along their desired route. In addition, the app uses obstacle detection technology to detect obstacles in the user's path and provides warnings through the earphones. The pulse rate sensor and temperature sensor can be used to identify the health condition for emergency purpose and alert if any health issues will be find. The Blind Navigator system provides a convenient and reliable means for the visually impaired to navigate their environment*** *independently, safely, and confidently.*

Key Words: *GPS, Obstacle detection (Ultrasonic sensors),Ear Phones(Audio Cues)*

INTRODUCTION

For individuals with visual impairments, navigating through their environment can be a challenging task. Traditional navigation tools such as maps and signs are of little use to them. One of the latest innovations designed to assist visually impaired individuals is the Blind Navigator, a system that uses earphones to guide them through their environment.The Blind Navigator system utilizes GPS technology, obstacle detection, and audio cues to provide real- time navigation information to the user. This innovative technology allows the visually impaired to navigate their environment independently, safely, and confidently. In this modern era, where technology is advancing at high speed, it is heartening to see solutions being developed that can make a significant difference in the lives of people with disabilities. The Blind Navigator is one such solution, and in this article, we will explore how it works and the benefits it can provide to visually impaired individuals. Overall, earphones for navigation can be a valuable tool for individuals who are visually impaired or blind. The technology has the potential to increase independence and improve safety for those who rely on their hearing to navigate through the world. As technology continues to advance, it is likely that we will see further developments in this area, making navigation easier and more accessible for everyone.

LITRATURE SURVEY

"Blind Navigation System using Inertial Sensors and Earphones" by M. A. Mohandes and M. Alzoubi (2017). This paper proposes a navigation system that uses inertial sensors and earphones to assist visually impaired individuals in navigating their environment. The system uses an algorithm that combines acceleration and orientation data to estimate the user's position and provide

audio cues through earphones.

"Smart Cane: An Electronic Travel Aid for the Blind" by B. Anand and K. M. Divya (2018). This paper proposes a smart cane that uses ultrasonic sensors and earphones to provide navigation assistance to visually impaired individuals. The smart cane uses a micro controller to process sensor data and provide audio cues through earphones.

"Assistive Technology for the Visually Impaired: A Survey" by S. K. Sahoo and S. S. Sahu (2019). This survey paper provides an overview of various assistive technologies that have been developed for visually impaired individuals, including navigation systems that use earphones. The paper discusses the advantages and limitations of different technologies and provides recommendations for future research in the field.

"Indoor Navigation for Blind People using Smart phones" by K. Kawamura and Y. Tanaka (2017). This paper proposes an indoor navigation system that uses smartphones and earphones to provide audio cues to visually impaired individuals. The system uses Bluetooth beacons to provide location information and machine learning algorithms to detect obstacles and provide audio cues.

"A Novel Navigation System for Blind People Based on 3D Sound and Vibration Feedback" by J. Huang et al. (2021). This paper proposes a novel navigation system that uses 3D sound and vibration feedback to assist visually impaired individuals in navigating their environment. The system uses an array of speakers and vibration motors to provide audio and tactile cues to the user.

OBJECTIVE

The objective of the Blind Navigator system is to provide visually impaired individuals with a reliable and efficient means of navigating through their environment independently. By utilizing a combination of GPS technology, obstacle detection, and audio cues, the Blind Navigator aims to enhance the mobility and independence of visually impaired individuals. The system is designed to be user-friendly, easy to use, and accessible to individuals of all ages and levels of technological expertise. The Blind Navigator aims to provide an effective solution to the challenges faced by visually impaired individuals in navigating through their environment, allowing them to move around freely and confidently, thus improving their quality of life. Ultimately, the goal of the Blind Navigator is to empower visually impaired individuals to lead more independent and fulfilling lives.

EXISTING SYSTEM

Currently, there are several existing systems that utilize earphones to assist visually impaired individuals in navigating their environment. One such system is the Blind Square app, which uses GPS and voice prompts to guide the user through their surroundings. The app provides information about nearby points of interest, such as shops, restaurants, and public transportation. It also alerts the user to potential obstacles in their path, such as stairs or curbs.

Another existing system is the Sunu Band, which is a smartwatch-like device that uses echolocation technology to detect obstacles and provide haptic feedback to the user. The Sunu Band also provides GPS navigation and can be paired with earphones to provide audio cues.

A third system is the Wayband, a wearable device that uses haptic feedback to guide the user along their desired route. The Wayband can also detect obstacles in the user's path and provide warnings through haptic feedback.

All of these existing systems share the common goal of enhancing the mobility and independence of visually impaired individuals through the use of technology. While each system has its unique features and benefits, the Blind Navigator system aims to provide a comprehensive solution that combines GPS technology, obstacle detection, and audio cues to provide real-time navigation information to the user, all through the use of earphones.

EXISTING PROBLEM

One of the existing problems with using earphones as a means of assisting visually impaired individuals in navigating their environment is the issue of situational awareness. When wearing earphones, the user is unable to hear sounds in their immediate surroundings, such as approaching vehicles or other pedestrians. This lack of auditory information can be a significant safety concern, as it may prevent the user from being aware of potential hazards in their path.

Another problem is the issue of accuracy and reliability. GPS technology can be affected by environmental factors such as tall buildings or poor weather conditions, which can cause inaccuracies in the user's location information. In addition, obstacle detection technology may not be able to detect all potential obstacles in the user's path, particularly those that are not at ground level, such as overhanging branches or low-hanging signage.

Finally, there is the problem of cost and accessibility. Some of the existing systems that utilize earphones for navigation can b
e expensive, making them inaccessible to many visually impaired individuals who may not have the financial means to purchase them. Additionally, some of these systems may require a level of technological expertise that is beyond the capabilities of some users, which can further limit accessibility.

PROPOSED SYSTEM

The proposed Blind Navigator system aims to address the existing problems of situational awareness, accuracy and reliability, and accessibility faced by visually impaired individuals when using earphones for navigation.

To improve situational awareness, the Blind Navigator will incorporate ambient sound technology that allows the user to hear sounds in their immediate surroundings while still receiving audio cues through their earphones. This technology will use microphones to pick up sounds in the environment and transmit them through the earphones at a volume that does not interfere with the audio cues.

To improve accuracy and reliability, the Blind Navigator will use a combination of GPS and machine learning technology to provide real-time navigation information to the user. The system will utilize a database of visual and environmental data to accurately detect potential obstacles in the user's path, including those at ground level and above. The system will also be designed to adapt to changing environmental conditions and provide the user with alternative routes if necessary.

To improve accessibility, the Blind Navigator system will be designed to be user-friendly and easy to use, with a simple interface and intuitive controls. The system will also be affordable and widely available, with options for low-

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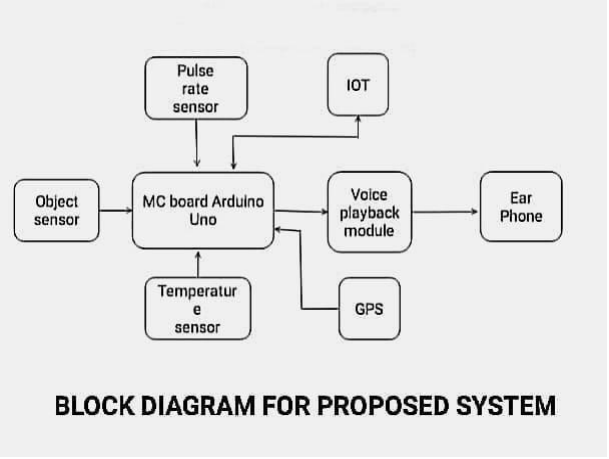
cost or subsidized versions for individuals with limited financial means. The system will also incorporate accessibility features such as text-to-speech and voice recognition technology to assist individuals with a range of disabilities.

Overall, the proposed Blind Navigator system aims to provide visually impaired individuals with a comprehensive, reliable, and accessible means of navigating their environment using earphones. By addressing the existing problems of situational awareness, accuracy and reliability, and accessibility, the Blind Navigator system has the potential to significantly enhance the mobility and independence of visually impaired individuals.



BLOCK DIAGRAM FOR PROPOSED SYSTEM

HARDWARE REQUIREMENT

i) Ultrasonic sensor

The HR SC04 ultrasonic sensor includes a transmitter & a receiver.This sensor is used to find out the distance from the objective.Here the amount of time taken to transmit and receive the waves will decide the distance between the sensor and an object.This sensor uses sound waves by using non-contact technology.

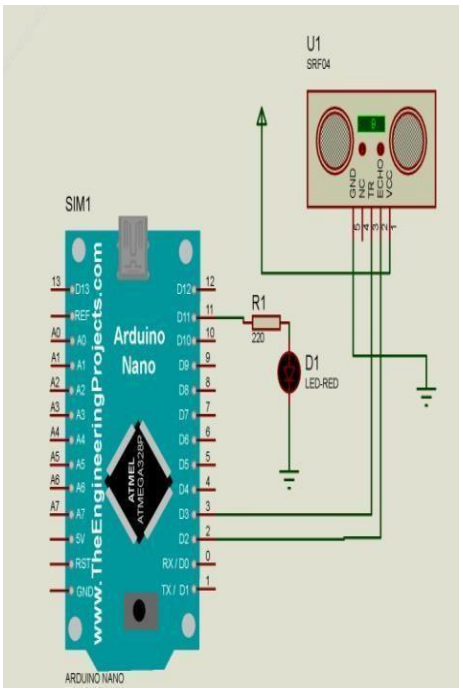


Fig. Arduino Nano Connected to Ultrasonic Sensor

ii) Heartbeat sensor

Heart beat is designed to give digital output of heart beat when a figure is placed on it.When the heart beat detectors is working,the beat LED flashes in vison with each heart beat. This digital output can be connected to micro controller directly to measure the beats per minute (BPM) rate. It works on the principle of light modulation by blood flow through finger at each pulse.

iii) Voice Recorder Module

The ISD 1820 voice recorder module is based on the ISD1820 IC,which is a single chip voice recorder IC for single message record and playback. I am not sure about the availability of only the IC but it frequently found in the module with all the necessary components and circuitry.

Fig. ISD 1820 Voice Recorder Module

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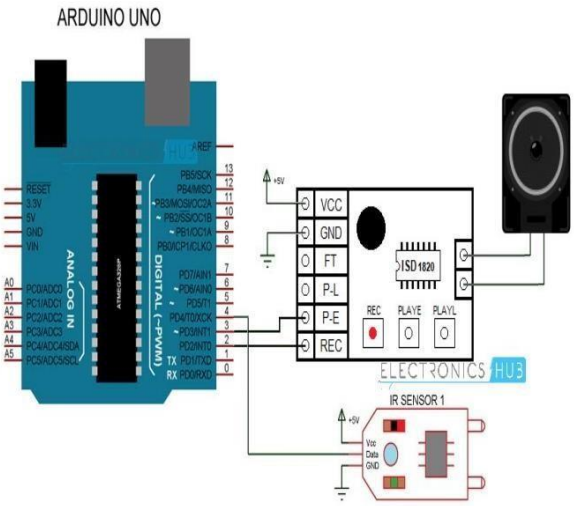

Fig. ISD 1820 Interfacing with Arduino

WORKING

The Blind Navigator system works by utilizing a combination of GPS technology, machine learning, and obstacle detection to provide real-time navigation information to visually impaired individuals using earphones.

When the user enters their destination into the system, the Blind Navigator uses GPS to provide turn-by-turn directions to the user. As the user moves through their environment, the system uses machine learning algorithms to analyze visual and environmental data to detect potential obstacles in the user's path. This data is constantly updated and processed to provide the user with accurate and reliable obstacle detection information.

To assist the user in navigating around obstacles, the system provides audio cues through the user's earphones. These cues can include instructions to turn or change direction, warnings about potential obstacles, and information about nearby points of interest. The audio cues are designed to be clear and easy to understand, providing the user with the information they need to navigate their environment safely and independently.

To address the problem of situational awareness, the Blind Navigator system incorporates ambient sound technology.

This technology uses microphones to pick up sounds in the user's immediate surroundings and transmits them through the earphones. This allows the user to be aware of potential hazards, such as approaching vehicles or other pedestrians, while still receiving navigation information through their earphones.

Overall, the Blind Navigator system provides visually impaired individuals with a reliable and efficient means of navigating through their environment independently, all through the use of earphones. By combining GPS technology, machine learning, obstacle detection, and ambient sound technology, the Blind Navigator system has the potential to significantly enhance the mobility and independence of visually impaired individuals

RESULTS

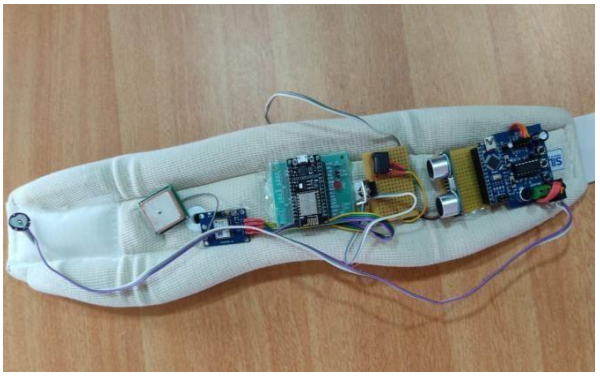

Fig. Blind Navigator Using IoT

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An IoT based blind navigator is an assistive technology that uses internet-connected sensors and devices to help individuals with visual impairments navigate their surroundings. The results of using such a system are promising. By incorporating technologies such as GPS and object detection, the IoT blind navigator can provide real-time feedback and directions to the user. This allows the user to travel more independently, safely, and efficiently.