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Smart shoe for Visually Impaired People

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ABSTRACT
Our eyes are perhaps the most precious gift we have and play a significant part in our daily lives. We are fortunate to have sight, so we can see this universe. However, some individuals struggle to visualise these items. As a result, they will have a lot of difficulty moving around freely in society. Wearable technology should be created with these people's vision impairments in mind. An Internet of Things (IoT)-based smart shoe device for the visually impaired was developed with the aid of ultrasonic sensors and an ESP 32 microcontroller. Making tangible objects talk to other physical objects or even to people is the core idea behind the internet of things. It is an enabling technology that is expanding and developing quickly in the industry.

Keywords: IOT, Detection, micro-controller, Smart shoe, ultra sonic sensor.

I. INTRODUCTION

IOT is all about enabling physical objects to communicate with one another, so this application is the foundation of our endeavor. smart footwear for the impaired. This shoe will be enhanced with a variety of sensors, each with a variety of characteristics that will aid blind people in finding their way. The majority of environmental difficulties were encountered by people who were visually impaired. They do not benefit from using the long Hoover cane when walking and commuting. A smart footwear device is smart shoes. It uses smartphone applications to help with chores that can't be completed in conventional footwear. The uses show the smart phone vibrating to inform users of when and where to turn to reach their location using self-lacing or Google Maps. When wearing smart sneakers, visually impaired individuals can move around independently. The systems we created use vibrators and sensors to sense the environment and provide the blind individual with feedback. It serves both as a navigational aid and a safety mechanism. Users' sneakers will be fitted with electronic hardware. Wearing the shoe will allow the user to move around anywhere, and an attached sensor will detect obstacles close to the shoe's notifications with the aid of people who are blind. The percentage of blind individuals in the world's population is about 21% in India. In a million people, there are about 53 thousand visually impaired people, 46 thousand people with low vision, and about 7000 people who have totally lost their vision. According to estimates, there are 285 million visually impaired people in the globe, of which 246 million have low vision and 39 million are blind. With the aid of an ultrasonic sensor to identify obstacles, smart shoes will enable the blind person to move about freely.

A. Objective

The goal of this initiative is to create an Electronic Traveling Aid (ETA) kit that will assist blind people in navigating clear paths. The shoe is set to this ETA.

- This system includes a buzzer, an ultrasonic sensor, and a microcontroller and is designed to provide overall measures for object recognition, human detection, and real-time assistance.
- In this case, a user-alerting ultrasonic monitor was used to measure the distance between the user and the obstruction.
- The GPS in these smart sneakers makes navigation easier for people who are blind.
- As a result, we present ESP32 microcontroller-based smart shoes in an effort to lessen the difficulties and problems encountered by those who are blind.

B. Scope of the Project

The primary goal of the project is to create an electronic kit that will provide blind people with a route free of obstacles. One ultrasonic sensor installed inside the shoe would transmit a signal if an obstruction were to block the route; this unit would then receive the signal from the microcontroller and produce a buzzer sound.

II. LITERATURE SURVEY

The literature review is the first step in the software development procedure. Before developing any software to address the given issue statement, it is critical to assess the economic strength and time factor. Object detection is a technique that can be useful in many different areas.

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Different kinds of algorithms are very effective at solving problems related to object recognition and image classification.

Title & Author	Input	Method
Ariba Khanam, Anuradha Dubey, Bhabya Mishra ,2018	The ultrasonic sensors that produce high frequency sound waves and analyse the reverberation that is returned to the sensor provide the input string.	To create an intelligent assistive shoe for people who are blind or visually impaired so they can do without a cane and become more autonomous.
Shanthi. M , Madhu Meena. M. K , Kadiravan. R , Kowsalya. R. J , Lokharaj. N , 2019	The info being transmitted through the LED is displayed on the LCD. To modify the data sent through the device, use the 5 keypad.	The controller is programmed with software that plays a warning whenever an obstruction is discovered, so whenever the Ultrasonic Sensor detects one in the route of the shoe, a voice signal is played through the speaker of the controller.
S.D. Asha Mahesh , K..RajSupriya , M.V.S.S.N.K.Pushpa Latha, P.Gowri , T.Sonia , B. Nani , 2018.	The following hardware elements make up the suggested concept for combining two sections into one unit: battery, a microcontroller, and a sonar sensor	Arduboy is a portable gaming system built on the Arduino platform. MIDI controller Arduinome, which resembles the MonomeArduinoPhone, a DIY mobile phone drone hardware and apps such as ArdupilotArduSat is an Arduino-based cubesat.
Ariba Khanam, Anuradha Dubey, Bhabya Mishra ,2018	To identify obstacles using ultrasonic waves, the input interfaces an esp32 microcontroller with an ultrasonic sensor.	The echo pin measures the distance between the foot and transmits that information to the microprocessor, which then uses a few logical statements to activate the buzzers.

Table 2.2 Literature Survey

A. Problem Statement

The main problem is that after wearing alarm-equipped shoes for several days, blind persons may occasionally experience low alarm sounds or alarm faults. Instead of attempting to find a solution to this problem, we have a fix by changing the vibrator in shoes. It is reasonably priced and small, and by using a vibrator rather than an alert, we can address the issue with the shoes themselves and ensure that the user is not inconvenienced when it vibrates. It is helpful for the blind as well because a deaf person cannot hear a warning.

III. PROPOSED METHOD

- This project aims at the development of an Electronic Travelling Aid (ETA) kit to help the blind people to find obstacle free path.

This ETA is fixed to the shoe.

- This system is intended to provide overall measures object detection, human detection, and real-time Assistance system consist of microcontroller, ultrasonic sensor and a buzzer.
- Here ultrasonic sensor has been used to detect the distance between the user and the obstacle and alerts the user.
- This smart shoes also have GPS to help the visually impaired to navigate.
- Therefore, we introduce ESP32 microcontroller based smart shoes

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- shoes with the goal that aims to reducing the problems and issues faced by visually impaired people

A. Architecture

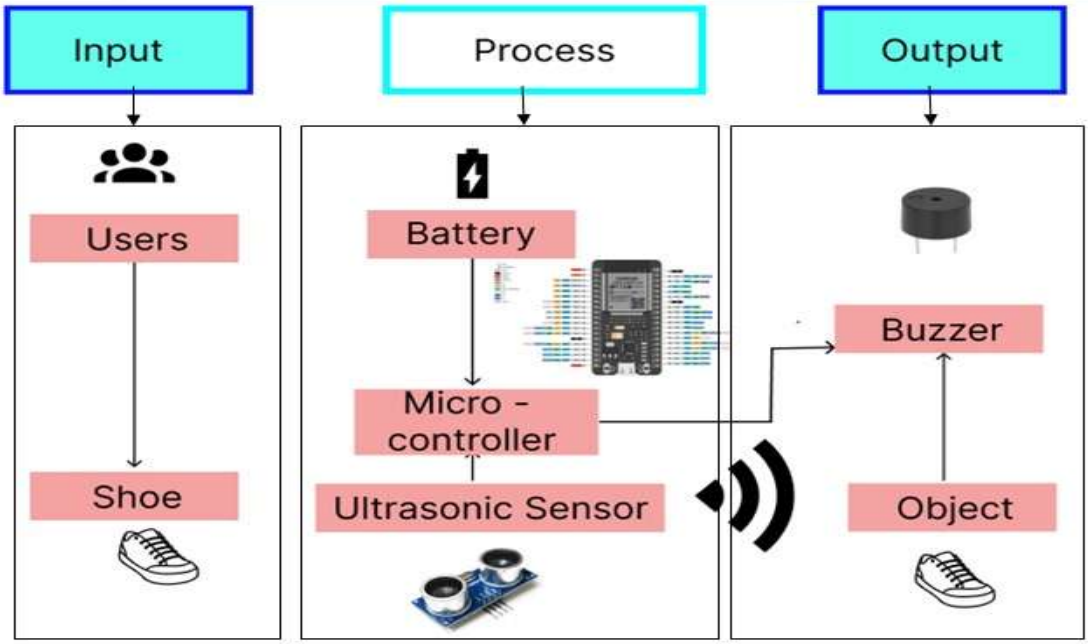

Fig - 1 SYSTEM ARCHITECTURE

B. Methodology

• An ultrasonic sensor and Esp32 microcontroller were interfaced to identify obstacles using ultrasonic waves.
• The buzzer (sounds) warns people with vision impairments about obstacles in their path and may help them move less carelessly.
• The obstacle detection system uses a microcontroller, two ultrasonic sensors to identify obstructions on the ground, and buzzers to notify users of obstacles that are close by.
• These buzzers will sound a warning based on how far away the obstacles are.

C. Hardware's Used

i. ESP 32 MICROCONTROLLER

A series of low-cost, system-on-a-chip microcontrollers called ESP32 has dual-mode Bluetooth and Wi-Fi built in. A dual-core or single-core TensilicaXtensa LX6 microprocessor, a dual-core Xtensa LX7 microprocessor, or a single-core RISC-V microprocessor are all used in the ESP32 family. Aside from integrated antenna switches, RF baluns, power amplifiers, low-noise receive amplifiers, filters, and power-management modules, the ESP32 line also includes these components. Espressif Systems, a Shanghai-based Chinese company, developed and made the ESP32, which is manufactured by TSMC using their 40 nm process.

• An ultrasonic sensor and Esp32 microcontroller were interfaced to identify obstacles using ultrasonic waves.
• The buzzer (sounds) warns people with vision impairments about obstacles in their path and may help them move less carelessly.
• The obstacle detection system uses a microcontroller, two ultrasonic sensors to identify obstructions on the ground, and buzzers to notify users of obstacles that are close by.

• These buzzers will sound an alarm based on the size of any identified obstacles.

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Fig - 2 ESP 32 MICROCONTROLLER

An ultrasonic sensor is a device that uses ultrasonic sound waves to calculate a distance to an item. An ultrasonic sensor transmits and receives ultrasonic pulses from a transducer to determine the proximity of an item. Boundaries refract high-frequency sound waves, creating distinctive echo patterns. In order for ultrasonic sensors to function, a sound wave above the range of human perception must be sent out. The sensor's actuator serves as a microphone for receiving and transmitting ultrasonic sound. A single transducer is used by an ultrasonic sensor to both transmit and receive pulses. By measuring the amount of time that passes between transmitting and receiving an ultrasonic pulse, the sensor can calculate the distance to a target. IoT ultrasonic sensors are made to identify solid and liquid objects without making contact. These sensors serve a wide range of purposes, including checking the amount of water in a tank, identifying and measuring fluid concentration, and sensing the proximity of objects.

Fig - 3 ULTRASONIC SENSOR

ii. BUZZER

An auditory signalling tool is a buzzer. There are many different buzzer kinds, and here we use a 5V passive buzzer that can be mechanical, electromechanical, or piezoelectric. (piezo for short). Buzzers and beepers are frequently used as alarm clocks, timers, and to validate user input like a mouse click or keystroke. An electromagnetic squeaker called a passive buzzer is used to produce sound messages with various frequencies. Instead of automatically producing a tone, it needs an AC signal, where a changing input signal creates the sound. Connect one pin of this 5 volt buzzer to ground and the other to a microcontroller that has been set up to produce a square wave or a timerIC.

Fig - 4 BUZZER

iii. LITHIUM BATTERY

Lithium batteries are those that use lithium as their electrode. During charging, the charge travels from cathode to anode, and during discharge, it reverses. The 1980s and 1990s saw the introduction of lithium batteries. The market for portable electronics, including cellular phones and laptop computers, has been totally revolutionized by these batteries. The newest technology battery, the lithium battery, has five advantages, including a twofold lifespan, 100% charging efficiency, light weight, and no upkeep. The electronics industry uses lithium-ion, or Li-ion batteries, which are a form of rechargeable battery used in many different applications. Electronic devices like mobile phones, laptops, and tablets are powered by Li-Ion batteries, which provide portable energy.

Fig - 5 LITHIUM BATTERY

D. Software Used

i. ARDUINO IDE

The open-source programme known as the Arduino IDE is used to create and upload code to Arduino boards. For various operating systems, including Windows, Mac OS X, and Linux, the

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IDE application is appropriate. The computer languages C and C++ are supported. Integrated Development Environment is referred to in this sentence. Sketching is a common term for writing a programme or piece of code in the Arduino IDE. To upload the sketch created in the Arduino IDE software, we must link the Genuinoand Arduino board with the IDE. The sketch is stored with the.ino file extension.

Fig - 6 ARDUINO IDE

IV. OUTPUT

Fig - 7 OUTPUT

V. CONCLUSION

The main focus of this paper is to implement various technology in the smart shoes for visually impaired people. The smart shoes use the most reliable source, light, to communicate data to the visually impaired. In future work we will be focused on the enhancing the better performance of the system and to reducing the load on the users**.**

VI. FUTURE ENHANCEMENT

This work can be improved in many ways to increase usefulness and reduce false alarms. For instance, other sensors that increase measurement accuracy as well as sensors that monitor a patient's vital signs after a fall, like heart rate sensors, are both highly suggested. Additionally, it is highly desirable to test this prototype on a bigger population in order to pinpoint any system flaws and improve performance in later versions. Some of these gadgets can also output sound or speech, but doing so runs the risk of obstructing outside noises. This involves speaking through speakers to warn users of the presence and proximity of obstacles as well as wet floors.

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