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ALTERNATE EYES FOR BLIND
advanced wearable for visually impaired people

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Abstract **-** *According to WHO, 39 million individuals worldwide are predicted to be blind. They face numerous challenges in their daily lives. The primary challenge with dazed people is figuring out how to get everywhere they need to go. This research aims to help the visually impaired to defeat their lack of vision by leveraging senses such as audio along with sense. The framework employs audio and signals of vibration to intimate the user regarding forthcoming problems. The intensity of vibration and intensity of audio increases as the distance between device and the obstacle decreases. This framework provides a low-cost, robust, compact, low-force use, and strong solution for routes with obvious quick reaction times.*

Keywords: Wearables, Obstacle and Object detection, Vibration detection, Machine Learning techniques.

1. INTRODUCTION

For many years, visually impaired have needed to rely on the traditional white cane, which is useful, but has a number of drawbacks. There are many smart technologies and instruments available for blind people for navigation these recent days, but maximum of devices are too much expensive, difficult for usage and transport and need a lot of training to use them. The main feature of this innovation is that the device is inexpensive to everyone and cost less than $25 (1500INR).No device in market is made that can be worn like watch, inexpensive and easy to use it. This prototype will greatly benefit to community if this innovation is implemented in big scale with some minute changes to prototype.. The third eye for dazzle is a wearable device that can let outwardly disabled people move around on their own in an indoor environment. People who are visually challenged can go from one location to another unaided. This device is very beneficial when the individual has to walk around a house or some indoor areas alone the distance of the obstacle in this device is determined by an Ultrasonic module and a Microcontroller. The obstacle distance is measured and notified to the outwardly obstructed individual in the form of buzzer and sound. Using this, they can move in different directions and avoid collisions. The eventual result of the job would be glove with a wearable band attached to the gloves, with each segment connected on a PCB that functions with extreme precision and consistency.

2.MOTIVATION

Vision is the most exquisite and significant gift that God has given to all of his creatures, notably humans. Unfortunately, some people are unable to appreciate the beauty of the world with their own eyes because they lack it. So, the main idea behind this project is to provide [19] virtual vision for blind people. The third eye for blind is a technological advancement that integrates several disciplines, including software engineering, hardware design, and science, and it allows visually impaired people to see and explore the world with confidence and independence by detecting nearby objects with [15] ultrasonic waves and alerting the user with a beep ring or vibration.

This technology could be a game changer for the blind. An ultrasonic sensor is incorporated into a module in this. Using this [12] sensor-module, the user can travel more efficiently and see close items. When it detects an object, this sensor warns the user by beeping or vibrating at any area. In this sense, it becomes a computerized gadget. As a result, the blind will benefit greatly from this technology, which will give them the confidence to roam freely.

3. LITERATURE REVIEW

MVS Arvitha et al suggested system [1] is a specialized invention that, to some level, solves the concerns that are present in previously present methodologies. It is an integrated design with two ultrasonic sensors and two infrared sensors to recognize objects in the way, staircase, and water pits. Sensors will gather data frequently and transfer it to Arduino UNO board for processing of data. Then after processing is done Arduino UNO board plays

message which is a type of notification via a headphone. Whole source of energy for entire system is a power bank. Main advantage of this technology is that it is accessible to everyone. The technology which is existing can't be worn as easily as headset. It enables them to simply move anyplace by assisting them in identifying any obstacles in their path. Water and impediments can be found with the Third Eye for Visually impaired. H Hesham et al. proposed system [2] is a connected framework in IoT-Healthcare for persons with disabilities, which can be easily observed and run via a flexible application and coordinated wearable devices. The combination of the application and wearable technology will make it possible to record a variety of information about the patient's vitals, supports the Alzheimer's community, and help those who are visually, verbally, and audibly impaired. Using an [14] At mega 32 processor, Google Firebase as a database, and Android as the operating system, a proof-of-concept solution was shown. Initial findings indicate the system's potential to assist those with disabilities. Future research will make this contribution applicable to actual patient cases with particular settings.

L. Alb Raheem et al proposed approach [3] in this study is to create an application that uses accessibility capabilities in smart phones and a built-in camera, along with human resources, to provide descriptions of all the images or videos that visually impaired persons have taken. In reality, a lot of work goes into choosing the best technology that can be applied to the creation of the suggested application. In order to help blind persons, identify objects, a thorough assessment of assistive technology is being produced. The previously written study can be used as a springboard for further investigation into the creation of effective assistive software that can support visually impaired persons in recognizing nearby things.

F. Carpi et al [4] discussed about set of electroactive polymers for electro mechanical transduction, also known as electro- mechanically active polymers, are materials that respond mechanically to an electrical stimulus while also being light in weight, mechanically compliant, compact in size, simple in structure, acoustically silent in operation, and inexpensive. The article demonstrates how combining fluid-based hydrostatic transmission with dielectric elastomer actuation can be a useful way to create novel devices that enable biomedical and bioinspired systems that would be unattainable with existing technologies. They showed and discussed three examples of applications that our lab is currently working on.

Jinjiang Bai et al proposed system [5] a navigation gadget is given. The basic parts of a navigation system are locating, wayfinding, route following, and obstacle avoiding modules, but it is still difficult to take obstacle avoiding into account during route following because the indoor environment is complicated, variable, and maybe filled with dynamic items. To solve this problem, they have used a novel method that simultaneously directs users to their objective and helps them avoid barriers by employing a dynamic subgoal selection mechanism. This plan is the main element of a comprehensive navigation system that is mounted on a set of wearable optical see-through glasses for the convenience of blind individuals on their everyday walks. The proposed navigation tool has been put to the test on a variety of people and has shown to be successful at activities requiring indoor navigation.

Andres A Diaz et al proposed system [6] construction process for a wearable device with eyesight that helps the blind in navigational challenges in ambiguous indoor settings. The suggested system can recognize objects, barriers, and walkable areas of interest, including, among others, doors, chairs, stairs, and computers planning a route that enables the user to get to the others, and achieving goals safely (purposeful navigation). The device includes six modules, including one for floor segmentation, one for building a grid for occupancy, for avoiding obstacles, for identifying objects of interest, for route planning, and to provide the user with haptic feedback.

4. PROPOSED SYSTEM

This paper's main objective is to use [9] Arduino Nano to help the visually impaired people walk without constraints. For this, Arduino programming is employed. Ultrasonic sensor has also been used to sense the signals. Velcro tape has been used to make it a band (i.e., wearable). Buzzer has been employed to alarm or intimate the user about any obstacle near him. Additionally, as the distance between obstacle and user decreases intensity of buzzer increases

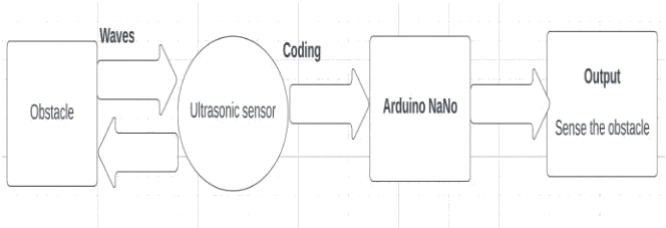


Chart-1: FLOW CHART

4.1 Hardware Components

There are various components which helps to make it complete.

Components Used

- Arduino Nano
- Ultrasonic Sensor (HC-SR04)
- Battery
- Switches
- Hot Glue
- LED Light (green and red)
- Pref Board
- Buzzer sound
- Male Female header pins
- Velcro tape

1.Arduino nano: Arduino is a open source electronic device platform. It is a type of microcontroller with attributes including [11] GPIO pins and a USB connector.

Fig-1: Arduino nano

2.Ultrasonic sensor (HC-SR04):

The ultrasonic sensor is made up:

Transistor -- The transistor converts electrical signals into soundwaves

Receiver – The receiver converts soundwaves from the obstacle into electrical signals

Transceiver – The transceiver, which is generally the receiving item, does both the transistor and receiver job.

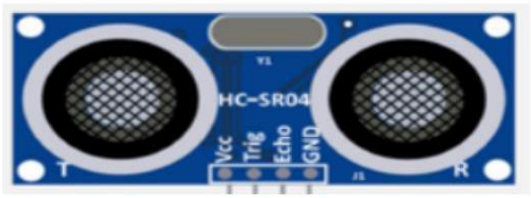


Fig-2: Ultrasonic sensor

3. Perf Board: Perf board, also known as DOT PCB, is a material used for formed of a thin, stiff sheet with suitable drilled at equal intervals of area. A drilled dot is preferable over a square area. It allows for the simple coupling of electronic circuits.

Fig-3: Perf Board

4. Buzzer: It converts audio signals to sound signals. Buzzer can be mechanical, electromechanical or [17] piezoelectric

Fig-4: Buzzer

5. Battery: A battery is the power source of our prototype. In battery chemical energy is converted to electric energy by means of electrochemical oxidation. Positive terminal is cathode and negative terminal is referred as anode. In our prototype we use HW battery.

Fig-5: Battery

6. *Arduino software:* Arduino UNO is one of the programming software that we used for the project. Software is written in C++ programming language with some added unique functions.

5. SYSTEM ARCHITECTURE

The [18] Arduino nano is made to connect to the ultrasonic sensor. The input signal from the ultrasonic sensor is carried to Arduino which has some coding instructions to perform the next actions. the output of Arduino is connected to a buzzer which helps the blind person recognize the obstacles near him or her. LED, battery and jump wires are included in the system design of the device. These jump wires helps to connect various hardware components of the prototype like an ultrasonic sensor, buzzer and an LED.

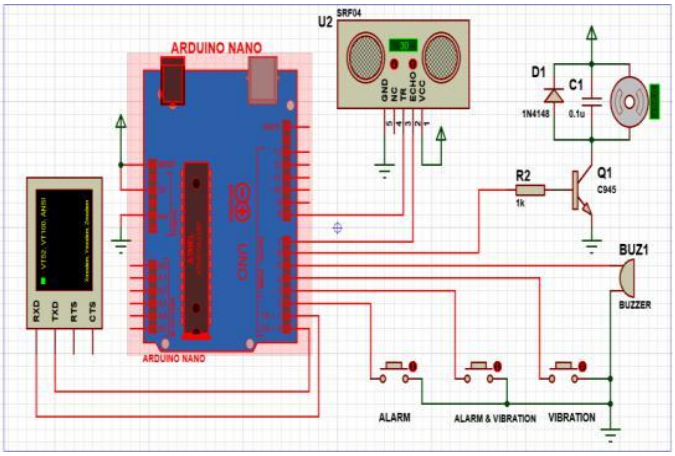


Fig (a)-Simulated Circuit

6.WORKING PRINCIPLE

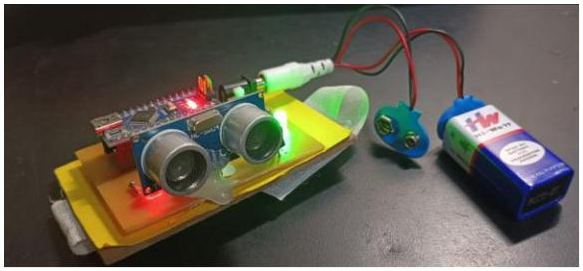
Our whole project is designed with ultra-sonic sensors. Five prototypes are made which are connected to different parts of the body such as 2 for shoulders, 2 for knees and 1 for hand. Visually impaired people can use our device for moving around and to detect objects in five-dimensional environment. When the person wearing device nears any obstacle. He/she is notified by vibrations and sound beeps.

The ultrasonic sensor includes a transmitter, receiver and circuit board. Transmitter sends out a ultra-sonic wave of 40 kilo hertz. Pulse is reflected by surrounding objects and received by microphones i.e. receiver on the sensors. Then the buzzer is turned on and beep sound will be started along with vibration. As the distance between obstacle and device decrease intensity of sound increase.

7. RESULTS & DISCUSSIONS

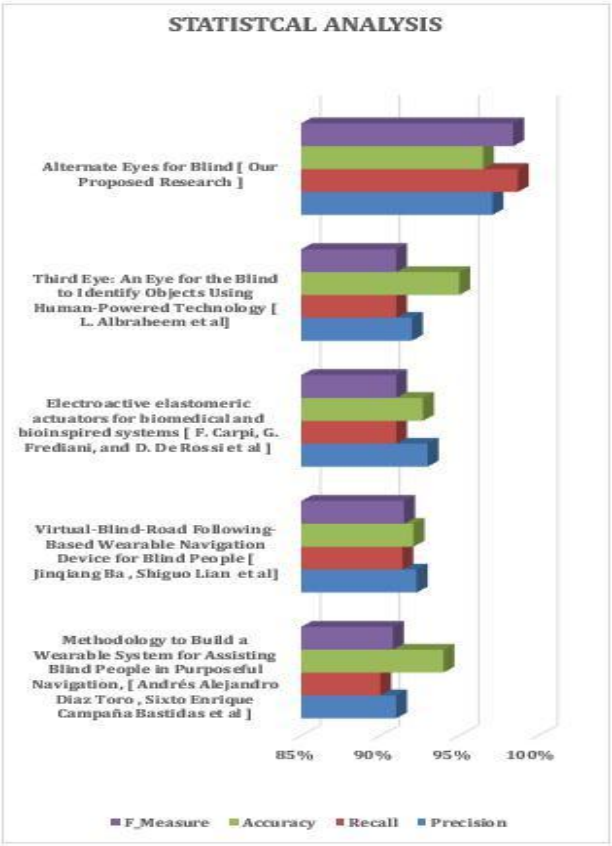
The [10] Arduino Nano is interfaced with an ultrasonic sensor, which is tested individually. According to the person's age, the findings that are required for the suggested system are seen and recorded. Through the buzzer sound, an audio signal is activated to alert the user. The prototype changes the intensity of the audio output when it detects a potential objection. Overall, the proposed system can meet the needs of those with visual impairments.

The third eye for blind is a technological advancement that integrates several disciplines, including software engineering, hardware design, and science, and it allows visually impaired people to see and explore the world with confidence and independence



Fig(b)-Implementation

8. STATISTICAL ANALYSIS



Statistical Analysis	Precision	Recall	Accuracy	F Measure
Methodology to Build Wearable System for Assisting Blind People in Purposeful in Purposeful Navigation, [Andrés Alejandro Diaz Toro, Sixto Enrique Campaña Bastidas et al]	91%	90%	94%	90.80%
Virtual-Blind Road Following Based Wearable Navigation Navigation Device for Blind People [Jinqiang Ba, Shiguo Lian et al]	92.30%	91.40%	92.10%	91.50%
Electroactive elastomeric actuators for biomedical a bioinspired systems [F. Carpi, G. Frediani, and D. De Rossi et al]	93.00%	91.00%	92.70%	91.00%
Third Eye: An Eye for the Blind to Identify Objects Using Human Powered Technology [L. Albraheem et al]	92.00%	91.00%	95.00%	91.00%
Alternate Eyes for Blind [Our Proposed Research]	**97.10%**	**98.70%**	**96.50%**	**98.40%**

9. CONCLUSION

As a result, the project that our team created completely explains the model and architecture of an Arduino-based third eye or additional vision for blind persons. An electronic guidance system with proper and simple usage guidance, easy configuration, and manageable hardware helps to provide the amazing properties so that it helps the needy blind people. Its simple architecture, effectiveness in use, affordability, portability, and ease of handling makes it a great device. Speaking of this project, it has a feature to measure object distance, which is a significant problem for blind people. As distance decreases, intensity of sound increases. With our given task guidance assuming it is made as exact as we were appearing in our examination paper that helps the visually impaired individuals to move toward any path without taking the third individual assistance it additionally makes somebody autonomous from the others and in the event that they have some work so they do without help from anyone else. Our undertaking is effectively eliminating the issue of existing route procedures like convey the stick with us while strolling, utilization of someone else while moving one spot to one more and a lot more issue was effectively settled by this task. This task, whenever utilized on a more extensive scale and conveyed to every one of the visually impaired individuals it truly has a greater effect to the general public also, the local area.

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BIOGRAPHIES

Padmatej Gajula is a dedicated computer science student at Vellore Institute of Technology. With a strong passion for the Internet of Things (IoT), He has focused his studies on this emerging field of technology. Alongside his academic pursuits, He had also showcased his expertise by publishing a research article in the field.

Jayasri Jallipalli is a dedicated student currently pursuing her Bachelor of Technology (B.Tech) degree in Computer Science and Engineering (CSE) with a specialization in Internet of Things (IoT) at Vellore Institute of Technology (VIT). With a keen interest in emerging technologies, Jayasri focuses on exploring the potential of IoT applications and their impact on various domains.

Malladi Revanth is a dedicated student currently pursuing her Bachelor of Technology (B.Tech) degree in Computer Science and Engineering (CSE) with a specialization in Information Security (IS) at Vellore Institute of Technology (VIT). . He possesses a strong foundation in programming, data analytics, and networking, which he applies to his IoT projects and research.

Sujith Reddy is an ambitious and motivated student currently pursuing his Bachelor's degree in Computer Science Engineering at Vellore Institute of Technology (VIT) with specialization in Internet of Things (IOT). He has been an active member of the IoT club at VIT, where he contributes to projects and engages in discussions on the latest trends and research in the field