# INNOVATIVE ULTRASONIC SMART GLASSES: ENHANCING MOBILITY AND SAFETY FOR THE VISUALLY IMPAIRED

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## Abstract-

This article introduces an innovative assistive device designed to empower visually impaired individuals with enhanced mobility and safety. The device, comprising a pair of smart glasses, an obstacle detection module, a processing unit, an output component, and a power supply, offers a comprehensive solution for obstacle avoidance. The obstacle detection module, housing an ultrasonic sensor, collaborates with the processing unit, driven by a control module, to efficiently identify obstacles in the user's path. Subsequently, the output device, a buzzer, communicates obstacle information to the user. This portable, lightweight, and affordable device has the potential to significantly improve the lives of visually impaired individuals by providing them with an accessible, user-friendly means to navigate their surroundings and avoid hindrances.

***Keywords:*** *Arduino Nano, Internet of Thing (IoT), Ultrasonic Sensor, Power Supply, Audio Jack, MP3-TF-16P SD Card Module.*

## I. INTRODUCTION

In this project, these mart glasses will help the visually challenged persons to reach their destination independently. The reason it is more reliable is because it is developed on the Android operating system and Android-based smartphones are very common and highly available almost everywhere [1]. The glass is built using an Adriano microcontroller with sensors and buzzers. The glass warns the user by making noise with the buzzer when he/she walks in front of an obstacle. The walking cane is a portable mechanical device to detect static obstacles only within a specified range. The device range is very limited and it is not flexible for protection from obstacles near the head area [2]. This wearable smart device application helps the users or we can say patients to reduce the number of home visits. This in turn reduces their operational costs. Health parameters recorded by any devices are now updated instantly in the application used by doctors. Physicians could monitor patient conditions remotely and suggest appropriate medicines [3]. Data is secured at higher rate and kept confidential. Doctors can view consolidated reports on each individual without any time delays [5]. Using this wearable technology, the work becomes easier and the following

result or output is displayed faster. The main objective of our present work is to provide a reliable, cost effective, low power solution for a blind people which would help them to move almost like any other normal pedestrian.

The velocity of the sound in air is used to calculate the speed of the sound in air. The distance that sound travels is equal to the speed of sound in the medium multiplied by the time that sound travels [4].With the large number of sensors. Smart Glass for Blind People Available in the market, it is necessary to choose the right sensor. There are certain features which have to be considered when we choose a sensor: Accuracy, Environmental condition, Range, Calibration, Resolution, Cost and Repeatability [5]. But if objects are too far away from the sensor, the signal takes so long to come back that the receiver cannot detect it [6]. The cost of this system makes it affordable for the majority of the society which in turn an effective device for them to spend on, just for once and assures wonderful travel guidance for them.

## II. LITERATURE SURVEY

1. Over the past few years a lot of efforts have been made to help the visually impaired people using the technology. One such attempt is “Low cost ultrasonicsmart glasses for blind” where the main focus is on obstacle detection. It includes ultrasonic sensors. The control unit controls the ultrasonic sensors and gets the information of the obstacle present in front of the man and processes the information and sends the output through the buzzer accordingly.
2. The idea that can be seen is a device in the shape of a pair of eyeglasses. It uses a multi-sensor fusion based obstacle avoiding algorithm which utilizesboth the depth sensor and ultrasonic sensor to solve the problems of detecting small obstacles, and transparent obstacles. In it can be observed that it consists of a video camera on the frame itself as well as a computer processing unit precise enough to get fit in the pocket and the software that provides images of objects close by to transparent displays on the eyepieces. The major limitation of this device is that it is not at all suitable for completely blind people. It is recommended only for people with low vision or night blindness.
3. The Smart Guiding Glasses for Visually Impaired People in Indoor Environment To overcome the traveling difficulty for the visually impaired group, this paper presents a novel ETA (Electronic Travel Aids)-smart guiding device in the shape of a pair of eyeglasses for giving these people guidance efficiently and safely. Different from existing works, a novel multi-sensor fusion based obstacle avoiding algorithm is proposed, which utilizes both the depth sensor and ultrasonic sensor to solve the problems of detecting small obstacles, and transparent obstacles, e.g. the French door. For totally blind people, three kinds of auditory cues were developed to inform the direction where they can go ahead. Whereas for weak sighted people, visual enhancement which leverages the AR (Augment Reality)

technique and integrates the traversable direction is adopted.

4. The Blind Assistant Navigation System This paper presents the architecture as well as the implementation of a system that helps blind person navigate independently within an enclosed environment such as the home. The system uses a wireless mesh network to provide the first level localization. It also incorporates additional components to provide more refined location and orientation information. Optimal path planning is done by a server that communicates wirelessly with the portable mobile unit that can be pushed by the blind person. The blind person issues commands and receives direction responses using audio signals.

5. The Ultrasonic Stick for Blind Currently the most widespread and used by the visually impaired people is the white stick, however it has limitations. With the latest technology, it is possible to extend the support given to people with visual impairment during their mobility; this paper proposes an economical ultrasonic stick for visually challenged people, so as to gain personal independence and free from external help. A portable user friendly device is developed that can identify the obstacles in the path using ultrasonic sensors and Camera. Ultrasonic sensors can scan three different directions (at 180 degree). Camera can be used as an alternative tool in the places that surround it with the low signal coverage, a microcontroller, buzzer and vibrating motor. The buzzer and vibration motor is activated when any obstacle is detected. The GPS system provides the information regarding his current location. SMS system is used by the blind to send SMS messages to the saved numbers in the microcontroller in case of emergency. These vital parameters can be done and under risk situations conveyed to the parents with an alarm triggering system to initiate the proper control actions.

6. Author-Chaudhuri et al. (2014) examined fall detection devices for persons of all ages from a variety of viewpoints, including background, objectives, data sources, eligibility criteria, and intervention approaches. A total of almost 100 papers were chosen and examined. The studies were separated into groups based on a variety of factors, including the age of the individuals, the technique of evaluation, and the equipment employed in detecting systems. They pointed out that the majority of the research was based on made-up data.

7. Author -Zhang et al (2015) conducted another survey that focused on vision-based fall detection systems and their corresponding benchmark data sets, which have not been covered in previous evaluations. Individual single RGB cameras, infrared cameras, depth cameras, and 3D-based systems using camera arrays were classified as vision based approaches to fall detection. Because such systems rely on a large number of cameras positioned from

various angles, occlusion issues are often mitigated, resulting in lower false alarm rates. Depth cameras have grown in popularity because, unlike RGB camera arrays, they do not require extensive calibration and are less obtrusivein terms of privacy.

## III. EXISTING SYSTEM

There are several existing frameworks that were designed in such a way that they stood out when it came to assisting the blind in moving from one place to another. Not merely do these systems help in traveling but additionally in distinguishing proof of objects that we use in daily life. They likewise provide the facility of voice to text conversion and vice versa to allow for a better interaction with the device. A few of them are briefly described below:

One application that allows for ease of wandering about is Google Maps. There is an element that furnishes individuals with the capacity to get progressively particularized voice direction and new types of verbal declarations for on foot trips. Google Maps proactively announces the correct route, the distance until the next turn and the direction one is walking in. As the individual approaches large intersections, a heads-up notification is received to cross with added caution. Also, if they accidentally depart from their route, they get a spoken notification that they're being rerouted.[3]

A company which helps in assisting the blind using the most advanced technologies is an organization called Be My Eyes.[4] The manner in which this application works is that sighted volunteers offer their vision to solve tasks to assist the blind and low-vision people. There are numerous ways a visually impaired can look for help through this platform. It helps them identify packages, identify color, food, reading recipes, setting up gadgets, navigating, coordinating an outfit, getting support with Gmail, troubleshooting Skype, etc

## IV. PROPOSED ARCHITECURE

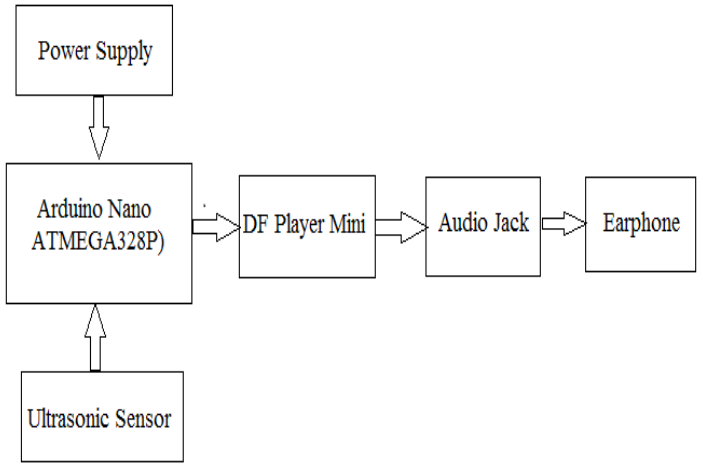


Fig.1 Complete block diagram of a system

The ultrasonic sensor is used to detect the obstacle in front of a person using the sound waves for a particular distance. The Ultrasonic sensor here used as a transceiver. The ultrasonic waves are emitted by the transmitter when the objects are detected. Both the transmitter and receiver represent the ultrasonic sensor. We calculate the time interval between the transmitted and received signal. The distance between the object and sensor is calculated using this.

We have used a customized Arduino uno board which is the controlling unit of this design. The Arduino helps in sensing and controlling the objects in the real time situations and environment. The Arduino Uno is programmed using the Arduino

Software (IDE), our Integrated Development Environment common to all our boards and running both online and offline. If the ultrasonic sensor detects the objects using the sound waves the Arduino gets an input which will immediately alert the person with a vibration. For this process the vibration motor is used. In case if the person couldn't speak, we have inserted a toggle switch with a speaker in order to ask the surrounding persons for help. The voice will be repeated till the switch is moved to off position.

## V. ACKNOWLEDGMENT

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## VI. CONCLUSION

The objective of this project is Third Eye for the Blind is to design a product whichis very much useful to those people who are visually impaired and those who often have to rely on others. It is an innovation which helps the blind person to move around and go from one place to another with speed and confidence by knowing the nearby obstacles using the help of the wearable band which produces the ultrasonic waves which notify them with buzz sound or vibrations. It allows the user those who are visually impaired to walk freely by detecting the obstacles. They only need to wear this device as a band or cloth on their body. Thus, this project Arduino based obstacle detector for blind people is a new method to resolve their problems. A less complex portable, cost efficient, easy to manage an effective system with many more amazing properties and advantages are proposed to provide support for the blind. The system will be very easy to find the distance between the objects and the sensor. It can detect objects in every direction to the blind person. Without the help of others, the blind person can move from one placeto other and lead their regular lives independently.

## VII. FUTURE SCOPE

In the future we can enhance this project with a few more ideas like monitoring the person's health condition like heart beat etc and with different sorts of applications.

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