

Article

Modern Third Eye Technique for the Blind using Arduino and Ultrasonic Sensors

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A B S T R A C T

Third eye for the visually weakened is an advancement with the assistance of the multidiscipline subjects like software engineering, hardware designing and wellbeing science which causes the visually weakened persons to explore with speed and certainty by identifying the close by obstructions utilizing the assistance of ultrasonic waves and advise them with a ringer sound or vibration. As per WHO 39 million individuals are evaluated as blinds around the world. They are enduring a ton of difficulties in their day by day life. The influenced ones have been utilizing the convention white stick for a long time which although being compelling, despite everything has a ton of inconveniences. This will be a wearable invention for the blinds. One of the fundamental eccentricities of this gadget is that it will be moderate. The Arduino Pro Mini 328-15/16 MHz board is worn like a gadget. This will be outfitted with ultrasonic sensors, comprising of module. Utilizing the sensor, outwardly hindered can identify the articles around them and can travel without any problem. At the point when the sensor recognizes any item it will inform the client by signal or vibration. Hence this is a mechanized gadget. Subsequently this gadget will be of an incredible use for the blinds and assist them with voyaging better places.

Keywords: Arduino, Wearable Band, Buzzer, Blind, People, Compact, Ultrasonic, Obstacles

Introduction

Third eye for blinds is a development which causes the blinds individuals to explore with speed and certainty by distinguishing the close by hindrances used the assistance of ultrasonic waves and inform them with signal sound or vibration. They just need to wear this gadget as a band or fabric.

As showed by WHO 39 million social orders are surveyed as blinds far and wide. They are bearing a lot of harder pontoon in there consistently life. The impacted ones have been using the standard white stick for quite a while which disregarding the way that being amazing, notwithstanding

everything has a huge amount of weights. Another way is, having a pet animal, for instance, a pooch, yet it is very expensive. So the purpose of the endeavor is to develop an unassuming and progressively beneficial way to deal with assistance apparently weakened to investigate with more noticeable comfort, speed and assurance.¹

The objective of this endeavour The Third Eye for the Blind is to structure a thing which is a ton of accommodating to those people who are apparently weakened and the people who consistently need to depend on others. Third eye for Blind undertaking is an improvement which helps the apparently debilitated people to move around and

move amid different spots with speed and assurance by understanding the near to deterrents using the help of the wearable band which makes the ultrasonic waves which advise them with buzz sound or vibrations. It allows the customer the people who are apparently weakened to walk energetically by recognizing the obstructions. They simply need to wear this contraption as a band or texture on their body.

According to WHO or the World Health Organization, 39 million people are evaluated as blinds far and wide. They are bearing a lot of trouble in their step by step life. The really weakened ones have been using the standard way that is the white stick for quite a while which regardless of the way that being effective, notwithstanding everything has a lot of weights and limitations. Another way is, having a pet animal, for instance, a canine, anyway it is very exorbitant. Along these lines the purpose of the endeavor Third eye for the Blind is to develop a humble, sensible and progressively gainful way to deal with help the outwardly debilitated people with exploring with more vital comfort, speed and conviction. This is the wearable development for the blinds which helps settle all the issues of the current advances. Directly a days there are such a noteworthy number of headways, things and smart contraptions for the apparently obstructed people for the course, anyway an enormous bit of them have certain issues for the outwardly hindered people and the critical disservices are that those things need a huge amount of planning and tries to use. One of the standard quality of this headway is, it is sensible for everyone, the hard and fast cost being under \$25 or ~1500 INR. There are no such contraptions available in the market that can be worn like a texture and having such a negligible exertion and ease. With the usage of this improvised device in a gigantic degree, with upgrades in the model, it will benefit the system of the apparently impeded or the outwardly disabled people. The walking stick is a direct and completely mechanical contraption dedicated to perceive the static or the consistent obstacles on the ground, disproportionate surfaces, openings and steps through fundamental material force analysis. This device is light, minimal anyway obliged to its size and it isn't used for dynamic impediment area.⁴

These devices work like the radar and the plan of the contraption uses the ultrasonic waves fascicle to recognize the height, bearing and the speed of the articles. The partition between the individual and the hindrance is evaluated when of the wave travel. Regardless, all the current systems educate the outwardly disabled the closeness with respect to the thing at a specific partition before or near him. These nuances empowers the customer or the outwardly weakened people in recognizing the obstacles and consequently to change the way and stroll in like way. Information about the articles and their place in

the technique for the walking like an impediment and their characteristics can make additional data to overhaul the space appearance and memory of the outwardly debilitated or the ostensibly hindered people. To endure, the recently referenced limitations this work offers a direct, profitable, configurable virtual for the outwardly impeded.

Literature Survey

Over the span of the latest couple of years or we can say throughout the latest decades, research has been guided for new devices and advancements to design a fair and strong and gainful system for amaze or apparently debilitated people to perceive the tangles and alert or caution them in danger places or the blocks. There are a couple of structures which has a couple of obstructions and clampdown.

Shoval et al. in¹ developed a Navbelt, an impediment evading wearable helpful PC which is only for indoor course. Navbelt was outfitted with two modes, in the principal the system information was implied sound in different sounds. One sound to no end for development heading and other for blocked, it was difficult for the person to isolate the sounds. Other issue was the structure would not have the foggiest thought regarding the customer blazing position.

D. Yuan et al. in² have discussed the virtual white stick distinguishing contraption subject to dynamic triangulation that can check partitions at a pace of 15 estimations/second. An outwardly debilitated individual can use this device for identifying nature, pointing it like it was a burst light. Near assessing partitions, this contraption can perceive surface discontinuities, for instance, the foot of a divider, a phase, or a drop-off. This is obtained by separating the range data assembled as the customer swings the contraption around, following planar fixes and finding discontinuities. Benjamin et al. in³ present a laser stay with three photo diodes and three laser diodes fill in as gatherer making an optical triangulation. The laser stay all things considered perceives the tangle in three decided manners. One is 45° to the ground for overhanging hindrances, the ensuing one is comparing to the ground and third one is for sharp significance. The laser stick has no data or development or we can say structure for choosing the zone and the circumstance of the obstacle, rather it is a lot of equivalent to a hit and primer procedure. J. Na proposed a shrewd guide structure for indoor arranging of this, which cannot perceive the blocks and impediments. The structure isn't fitting for the outside activities. Sabarish. S in⁴ have portrayed the progression of a course help to help shock and apparently blocked people to investigate viably, safely and to recognize any preventions. The structure relies upon a microcontroller with produced talk yield. Similarly, the device includes two vibrators, two ultrasonic sensors which is mounted on the customer's shoulders or some other body part and another joined into the stick. M.A Ungar

S.⁵ has proposed procedures for the ostensibly debilitated people for the urban networks. In any case, they didn't considered about the people who can't endure the expense of costly rigging and devices. This control is overpowered by the device third eye for the outwardly impeded. Ms. Pooja Sharma⁶ has discussed that the impediments can be perceived, anyway it has various repressions on the edges and the detachment. On inverse, this endeavor will have a wide plot for the recognizable proof where the sensors range will be wide.

These days of improvements, there are various headways for the ostensibly debilitated people like the white stick with the stick with a red tip for helping the advancements of the outwardly disabled people. There are a wide scope of kinds of sticks used these days with creating developments, for instance, as the white stick, the quick stick,⁷ and the laser stick.⁸ The cost of the readied mutts is also extraordinarily high and isn't sensible option.⁹ A survey found¹⁰ that the far off bearing system is difficult to pass on and in this manner the wearable band will be further developed structure.

In like way Guide Cane, this advancement furthermore has a control button on the handle, and the catch has four particular direction. This production of the Third eye for shock has undefined insufficiencies or limitations from the Guide Cane where there will be a difficulty to save space for the stick or to put the smart stick like the other. Other than that, cost is moreover an issue in this errand as it uses ultrasonic sensors and various servo motors. In case the cost is high, customers will in all probability be not able to deal with the expense of for it considering the way that the ordinary pay of the apparently debilitated people is commonly less. Splendid Cane has been organized by understudies from Central Michigan University where this creation uses Radio Frequency Identification (RFID). RFID is used to recognize things or obstacles before the customer and perceives the RFID mark that has been set in a couple of zones to investigate the customers. This development is a lot of equivalent to a run of the mill stick yet is outfitted with a sack, which the customer to wear. The pack gives electrical ability to the creation and enlightens the customer through speakers inside the sack. For customers who can't hear, there are one of a kind gloves that will vibrate at each finger, where different vibrations in each finger have different ramifications. Nevertheless, this creation has a couple of insufficiencies and is simply fitting for little locales. This is in light of the fact that it just recognizes the district with RFID name regardless this advancement just fills in as a standard outwardly hindered stick.¹¹⁻¹⁷

System Architecture

The gadget or the wearable band is circuited with the Arduino. The LEDs and the signal are associated with the Arduino and correspondingly the ultrasonic sensors are

likewise associated with the Arduino board. The binding is finished concurring in the Arduino and the associations are set up. Figure 1 and 2.

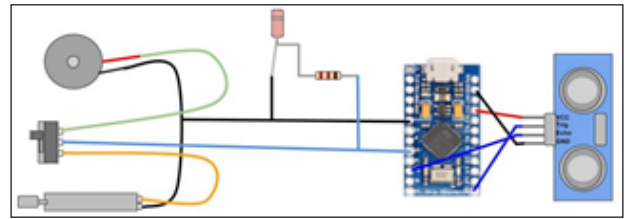


Figure 1. Circuit Diagram of the device

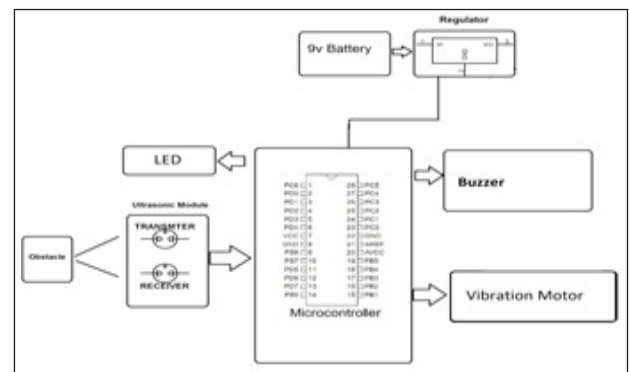


Figure 2. Architecture of System

Existing System

The current framework comprises of the gadgets or the backings like white stick for helping them to recognize the obstructions and travel to places, pet canines, and brilliant gadgets like vision a light for blinds. In any case, there were numerous confinements and issues in these current frameworks like in the white stick, it might effectively break or split. The white stick may stall out at the asphalt breaks of the various items. Though the pet canines' cost is colossal and need a great deal of preparing.

Proposed System

The structure depends on an exceptional wearable gadget dependent on the Arduino board which can be worn like a fabric for blinds or a band. This gadget is outfitted with five ultrasonic sensors, comprising five modules which are associated with the various pieces of the body.

Among them, two for both the shoulders, another two for both the knees and one for the hand. It's the decision of the outwardly impeded individuals, they can either utilize one band or put it anyplace on their body any place they are agreeable. With the utilization of these five ultrasonic sensors in the gadget and by wearing it on the body, the visually impaired can recognize the articles in a five-dimensional view around them and can undoubtedly travel anyplace by identifying the impediments. At the point when the ultrasonic sensor recognizes snag the gadget will tell the client through vibrations and sound signals. The force of vibrations and the pace of signalling increments with

decline in separation and this is a completely computerized gadget, Figure 3.

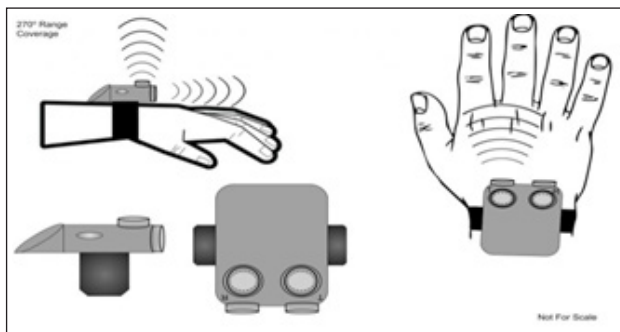


Figure 3. Position of the modules

The highlights of the Third Eye for Blind will help the externally impeded persons from various perspectives. By wearing this gadget, they can completely maintain a strategic distance from the utilization of the white stick and such dissimilar gadgets. This gadget will assist the visually impaired with circumnavigating without holding a stick which is somewhat irritating for them. They can wear the gadget as a band or like a material and it can work precisely and they just need an almost no preparation to utilize it as it is very straightforward, effective and simple to work and wear. The wiring of the gadget is done in an after way. The Ground of LED, bell and vibration engine are associated with GND of the Arduino. The +ve of the LED and the centre leg of switch is associated with the Arduino pin 5.



Figure 4. Module for hand

Working Operations

This proposed framework comprises the hardware like Arduino smaller than expected genius, ultrasonic sensor, pref board, vibrating engine, ringers for recognizing the hindrances and telling the client about the deterrent, Red LEDs, Switches, Jumper link, power bank, Male and female header pins, 3.3 volt old portable battery which is unused or disposed of, some versatile and stickers to make the gadget wearable as a band for wearing for the clients. The wiring of the gadget is done in an after way. The Ground of LED, bell and vibration engine are associated with GND of the Arduino. The +ve of the LED and the centre leg of switch is associated with the Arduino pin 5. The +ve of the

Buzzer is wired to the principal leg of the switch and the +ve of the Vibration engine is wired to the third leg of the switch, Figure 4.

The Ultrasonic sensor are wired as needs be. The Ultrasonic sensor pin VCC is associated with the Arduino pin VCC, Ultrasonic sensor pin GND is associated with the Arduino pin GND, Ultrasonic sensor pin Trig is joined to the Arduino pin 12, Ultrasonic sensor pin Echo is associated with the Arduino PIN 12. The switch utilized here is for choosing the mode.

We originally cut the pref board in 5 X 3 cm measurement and patch the female headers for the arduino to the board. At that point fastening of the signal is done. At that point utilizing the paste associate the vibrating engine and weld the wires to it. At that point association of the LED is finished. At that point associate the switch. Associate the header pins for ultrasonic sensors and for the battery input. At that point weld all the things and interface the arduino and ultrasonic sensor to the board. Likewise interface the flexible band to all the modules. For causing the module for the hand, to interface the ultrasonic sensor to the board by utilizing 4 jumper links. At that point interface a 3.7-volt portable battery to this module. At that point subordinate the flexible band. At long last after all the connections are done to the Arduino board, transfer the code to each arduino board and force the 4 different modules utilizing a force bank. The US sensor is a transducer and is utilized in pair as Trans receiver. The transmitter produces the US waves and if impediments are available in the way, the US waves hits the obstructions and gets reflected, the reflected wave is gotten by the recipient. The US sensor is a mix of one transmitter and collector. The time stretch among sending and getting of the US signal is determined, this time span is utilized to figure the separation among sensor and the hindrance.

The condition for the separation computation between the sensor and the item is as per the following $D = \frac{(HPTW * SV)}{2}$

Where, D = Distance in cm. HPTW = High time of pulse width. SV = Sound velocity in cm/s.

The sensors which are put in midsection belt are in such a way, that the Ultrasonic beats of sensors must not be covered one over the other. Sensors has a field of view (inclusion) of around 60 degrees for 4 feet separation, as the good ways from the sensor builds, the inclusion edge diminishes.

Along these lines, the goal is to cover a wide point to differentiate the impediments with the assistance of the ultrasonic sensors to support the visually impaired and make it simple for them to change everywhere efficiently with no problem.

Consequently, the separation count is determined and the sensor distinguishes and the further method of the buzz sound to the client is completed, Figure 5.

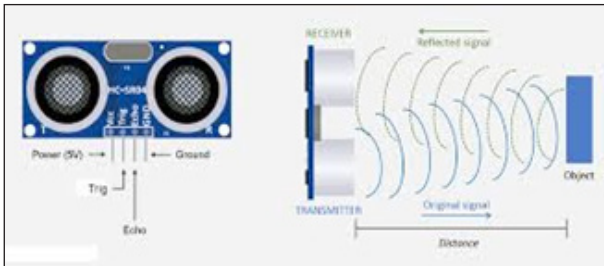


Figure 5. Angle of field of detection

Therefore, laterally these lines Third Eye for Blind will be intended for the outwardly disabled persons and will make it exceptionally modest and beneficial as it will be a wearable gadget and therefore will help the client in voyaging and distinguishing the impediments while strolling without any problem.

Results and Discussion

The introduced framework is structured and designed for the utilization of the visually impaired and externally incapacitated persons. This gadget can deal with a few expresses that the outwardly disabled persons face. This gadget reacts to the client in all the conditions which is looked by the visually impaired individuals with the assistance of the utilization of the Ultrasonic sensors and the Arduino Board, Figure 6.



Figure 6. Circuit Connention

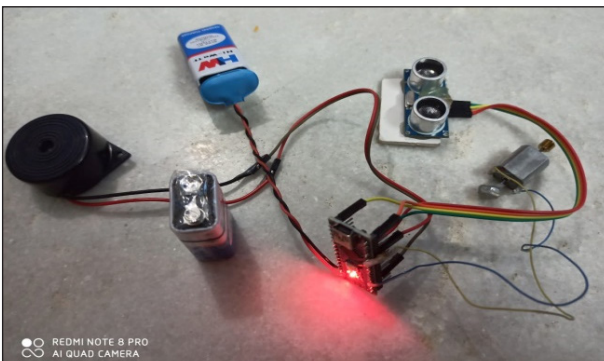


Figure 7. Circuit Connention

Case 1: When the obstacle or the object is in the left it will tell the user that: The obstacle is in left

Case 2: When the obstacle is in right it will say: The obstacle in right.

Case 3: When the obstacle is in front, the device will say: the obstacle is in front.

Similarly for all the directions like left, right, back etc it will notify the user wearing it, Figure 7.

Conclusion

Thus, this paper proposed the design and architecture of a new concept of Arduino based Virtual Eye for the blind people. A easy, cost effective, efficient, handy, installable, easy to handle electronic guidance system with numerous amazing properties and advantages is proposed to provide constructive assistant and support for the blind and visually impaired persons. The system will be efficient and unique in its capability in specifying the source and distance of the objects that may confront the blind. It is able to scan and detect the obstacles in the areas like left, right, and in front of the blind person regardless of its height or depth. With the proposed architecture, if constructed with at most accuracy, the blind will be able to move from one place to another without others help.

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