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Third Eye for Visually Challenged

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Abstract—The millions of people in the world whose vision is not perfect and they wear glasses. But for those hundreds or thou- sands who are blind, existing methods that merely assist them are not just enough. What they need are alternative methods by which they can navigate with greater comfort, speed, and confidence. By taking these into consideration, a wearable prototype is designed using Echolocation Technology which can resolve the problems of the existing methods. Sensors like Ultrasonic Sensors and IR sen-sors are used for obstacle detection and water detection. All the sensors are interfaced with Arduino UNO for processing pur- poses. Thus, there is hope for the visually challenged people to traverse without a stick. They can simply wear the designed pro-totype as a headset or a cap which can work very accurately and the only thing required is some training to use it.

Index Terms—Echolocation, Ultrasonic sensor, IR sensor, Detection

INTRODUCTION

Vision is a significant part of life. Individuals get a large portion of the data or information about nature by sight. The Visually Challenged individuals, without this perspective, face difficulties consistently for protected and free versatility. As indicated by the insights given by the World Health Organiza- tion (WHO), worldwide at least 2.2 billion individuals are blind or facing a vision impairment. Among at least 1 billion individuals have a vision impairment problem that could have been forestalled or presently can't seem to be addressed.

Numerous individuals with genuine visual impairments can travel freely by utilizing a wide scope of apparatuses and strategies. Orientation and mobility masters are experts who are explicitly prepared to show or train individuals with visual impairments how to travel securely, unhesitatingly, and freely in the home and the general public. Instruments for example the current or conventional techniques like white cane and guide dogs may help the visually challenged individuals for route. However, there are issues for this route upholds. The white cane may effortlessly break or split or stall out at the pavement splits. Orientation and mobility masters are experts who are explicitly prepared to show or train individuals with visual impairments how to travel securely, unhesitatingly, and freely in the home and the general public. Concerning guide dogs are costly, requires preparing and coordination with the dogs for the visually chal-lenged individual may become troublesome. However, the cur- rent or existing techniques can't sufficiently see all the vital data like, can't identify the obstacles that are shrouded or hid- den which might be risky for the visually challenged individu- als, for example, upward or downward stairs, water puddles and so on. So this will be very difficult to them to walk it will be risky. So the proposed system will help them to navigate without others help.

The proposed system is the wearable innovation that settles the issues looked at by conventional or existing techniques up to some extent. It is incorporating the pair of ultrasonic sensors and infrared sensors to identify hindrances in front, staircases, and water puddles. The sensors gather the real-time data or the constant information and send it to the Arduino UNO board for processing. After processing, the buzzer will give sounds which is considered a warning. The complete system is fuelled by a power bank. The primary quirk of this advancement is, it is moderate for everybody. Existing gadgets can't be worn like a headset or a cap and having such ease and effortlessness. At the point when utilized for a huge scope, with enhancements in the model or prototype, it will profit the network.

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LITERATURE SURVEY

It is observed that over years there is a vast development of devices or technology that are made available to visually challenged people. Right from the traditional methods that areexisting like the white cane, trained dogs, etc. to the latest in- novations using simple sensors when interfaced with either mi- crocontroller or Arduino, have benefited the visually chal- lenged. Apart from them, even the advanced devices which useaugmented reality glasses for bringing more reality to the blind, are also present.

There has been innovations and development of various techniques and devices or gadgets guiding visually impaired people, thus towards attaining their independent or free move- ment around the surroundings without any other individual's support. Few parameters are there but they are having some limitations and restrictions.

M.A Ungar S He proposed methods for the unsighted peo- ple of urban areas. But they didn't consider the people who cannot afford equipments of high cost. This drawback over- comes in Third eye for blind. Ms.Pooja Sharma She analysedthat objects can be detected, but there are drawbacks in terms of angles and distance. On the other hand, third eye for blind has a wide angle for the detection which can be widened withrespect to the range of the sensor.

Hugo Fernandesc, Joảo Barroso "Blind Guide: an ultra- sound sensor based body area network for guiding blind peo-ple". The research introduces supportive formula for sensing obstacles for the sightless persons who generally take help of white-cane or the pet dog, thus for the detection of obstacles by using this device provides a proper solution to the blinds. Based on the Body Area Network of ultrasonic sensors that generate sound-based response, this solution is given. The Body Area Network can be inserted inside cloth fabric, eman-cipating sightless person from utilizing the seeing-eye dog or that white-cane.

Today's Innovative world is providing many solutions tothe visually impaired for example; white-cane having a tip forassisting the movement of the blind people. The cane has dif-ferent types used in today's technological world in the form ofwhite cane, laser cane and smart cane. Dogs trained for this purpose are too expensive and unaffordable for certain people.The study discovered that the remote guidance system being very hard to move hence this device will act as most optimized version.and also serves as a useful consumer device for the visually challenged to journey safely.

The main objective of this paper is to understand the work-ing of all the current techniques used for assisting the visuallychallenged through the literature survey and the prototype came into the process. In this paper, one of the ideas is to re- move the monotony that a blind person has to wear spectacles. This led to the idea of making a headset that works similarly to any other blind assistant device.

PROPOSED SYSTEM

The proposed system gives enhancements to the existing techniques. It attempts to make the existing techniques more productive, advantageous, and easy to use. An Infrared prox- imity sensor and a pair of HC-SR04 ultrasonic sensors are usedfor the detection of obstacles, staircases, and water puddles. The sensors are interfaced with Arduino UNO for processing purposes. If the mentioned obstacles are detected by the sensors then buzzer will give sounds which can be heard through when sensors detection.

A. Hardware Components

B. HC – SR04 Ultrasonic Sensor: In the proposed system, a pairof HC-SR04 ultrasonic sensors shown in Fig. 1 are utilized. The HC-SR04 is a sort of ultrasonic sensor which utilizes so- nar to discover the distance or separation of the object from the sensor. It gives a remarkable range of about 2 cm to 400 cm of non-contact identification with stable readings and highexactness. The HC-SR04 ultrasonic sensor incorporates a transmitter (Tx) and a receiver (Rx). The estimation of exact distance is accomplished by interfacing the HC-SR04 sensor with an Arduino UNO board. This sensor module will produceand transmit eight 4 MHz frequency waves of high sonic pulseshots consecutive from the transmitter. At the point when these waves collide or crash the obstacle, it reflects and the Echo pinwill activate until these waves are gotten by the receiver. The

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time will be estimated with the assistance of an Arduino UNOboard.

Fig. 1. HC-SR04 Ultrasonic Sensor

The distance or the separation of the obstacle can be esti- mated as Distance = (time x speed)/2, Here time is the time term for which the ultrasonic waves have voyaged and speed is the speed of sound in air i.e., 340 m/s. (NOTE: The result i.e. product of time and speed is divided by 2 because the time is the complete time taken to arrive at the obstacle and return

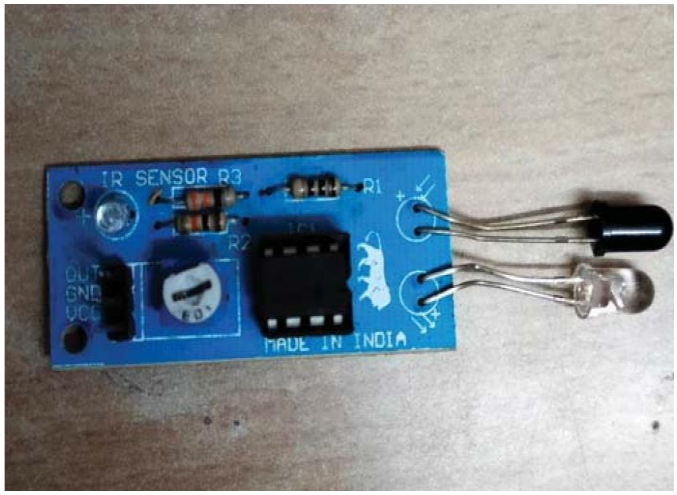

Fig. 2. IR Proximity Sensor

Infrared (IR) Proximity Sensor: In the proposed system, the IR proximity sensor shown in Fig. 2 is utilized. It identifies thepresence of an object by producing a beam of infrared light. Itcan detect little obstacles however with less exactness or accu-racy. It can recognize obstructions in a range inside 50 cm at an edge of ±45 degrees precisely. The onboard variable poten-tiometer assists with fine-tuning the range of operation (to cal-ibrate the distance). The IR proximity sensor incorporates a transmitter and a receiver. The estimation is accomplished by interfacing the IR proximity sensor with the Arduino UNO board. The IR transmitter is an IR Light Emitting Diode (LED)and the receiver is an IR photodiode which is delicate to IR light of a similar frequency as that radiated by the IR LED. At the point when IR light falls on an obstacle, it reflects and fallson the photodiode and correspondingly its output voltagechange with respect to the extent of the IR reflected light and obstacle LED gleams. This is the standard of working of infra-red sensors.
In the case of obstacles present in front of the IR sensor, the IR waves transmitted from the transmitter reflects and is re- ceived by the IR receiver. In such a case IR sensor outputs byof logic 1. While, if there is no obstruction present in front of the IR sensor.

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Fig. 3. Arduino UNO Board

Then the IR waves transmitted from the transmitter will not bereflected by the IR receiver and the IR sensor outputs logic 0.

1) Arduino UNO Board: In the proposed system, an Ar- duino UNO board shown in Fig. 3 is utilized. Arduino UNO isa microcontroller board dependent on the ATMEGA328P. It has 14 advanced digital I/O pins (of which 6 can be utilized asPWM yields), a 16 MHz quartz crystal, a power jack, 6 analog inputs, a USB association, a reset button, and an ICSP header. It contains all that expected to help the microcontroller for pro-cessing reasons. The operating voltage is 5V, just can be asso-ciated with a PC with a USB link or power it with an AC-to- DC adapter or battery to begin.

C. Software Components

1) Arduino IDE: Arduino IDE where IDE represents Inte- grated Development Environment official programming pre- sented by Arduino.cc, which is predominantly utilized for com-posing, gathering, and transferring the code in the Arduino de-vice. Practically all Arduino modules are viable with this prod-uct that is open-source and is promptly accessible to install andbegin compiling the code just as transferring machine code to the microcontroller.

2) Source to generate audio message (Arduino talkie soft- ware): It is a speech library for Arduino. Talkie accompanies more than 1000 expressions of speech information or data that can be remembered for undertakings. It is a product executionof the Texas Instruments speech synthesis architecture (linear predictive coding) from the last part of the 1970s mid-1980s. The voice is natural from the Texas Instruments Speak and Spell group of educational products.

D. Block Diagram of the Proposed System

The block diagram of the proposed system along with allcomponents used is shown in Fig. 4. It contains an Arduino module, IR sensors, ultrasonic sensors, power source, and theoutput which is the audio instruction.

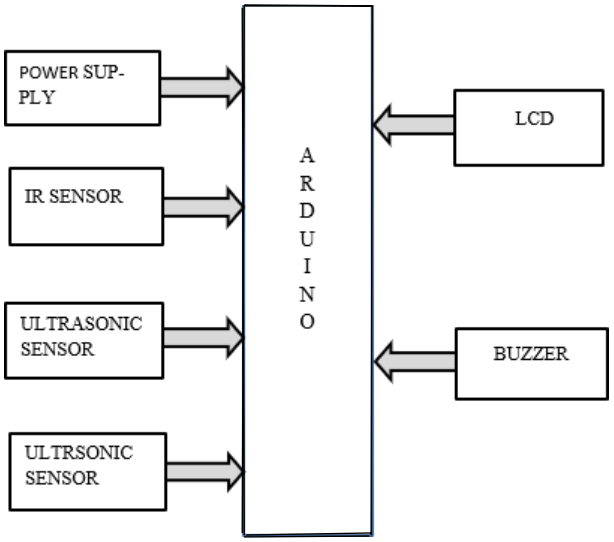

Fig. 4. Block diagram of the Proposed System

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E. Working of the Prototype

When power supply is given to circuit, if sensors detects then the required parameters will get displayed in the LCD with the help of sensors. These sensors are connected success- fully to the Arduino. When any stair cases, water puddles or pits detected at front side or obstacles detected at back side then it will be detected by ultrasonic sensor. When obstacles with in small range are there then it will be detected by IR sen- sor.When obstacles or water puddles dectected buzzer will give sounds by which user can alert.

RESULTS AND DISCUSSIONS

Ultrasonic sensor and IR sensor are interfaced with Arduino and tested separately. The results that are necessary for the pro-posed system are observed and noted down according to the person's height. Later, all the components are placed on the headset as mentioned in the working and the testing is done ina blindfold manner.

Assemble the circuit on the board as shown in Fig.6 After assembling the circuit on the board, check it for proper con- nections before switching on the power supply. When power supply is given to circuit then the required parameters will getdisplayed in the LCD with the help of sensors. These sensors are connected successfully to the Arduino.

When any stair cases, pits, water puddles detected at front side and any obstacles at back side by ultrasonic sensor then LCD will display Object detected:1 and Object detected:2 re-spectively sounds by which user can. When obstacles detectedby IR sensor then LCD will display IR detected and buzzer will give sounds by which user can alert. Overall, the Pro- posed System is able to satisfy the needs of Visually Chal- lenged People

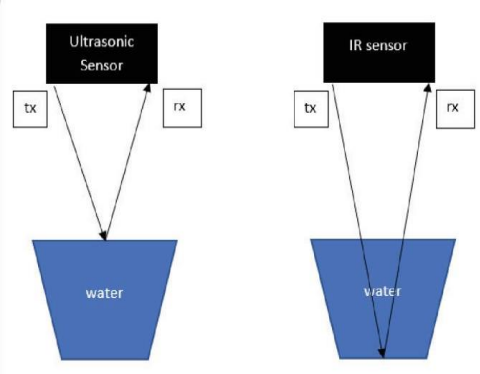

Fig. 5. Working of Ultrasonic Sensor an IR sensor

FINAL PROTOTYPE

The final working prototype) is shown in Fig.6. The buzzerwill give sounds when any obstacles or water is detected.

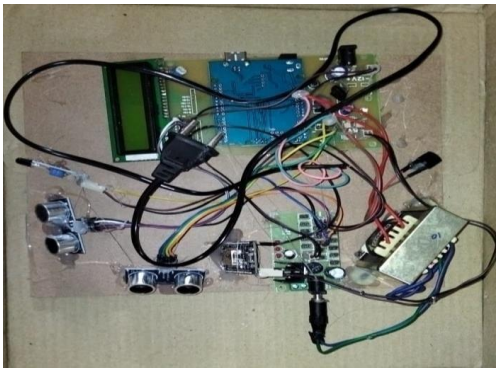

Fig. 6. Final Prototype

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Initially when power supply is ON the LCD will look like this.

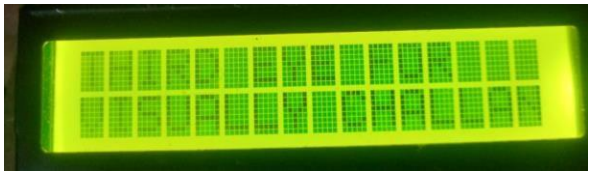

Fig. 7. When no obstacles detected

When any stair cases, water puddles, pits detected at front side or any obstacles at back side by ultrasonic sensor then LCD will display Object detected:1 and Object detected:2 re-spectively and buzzer will give buzz sounds by which user canalert.

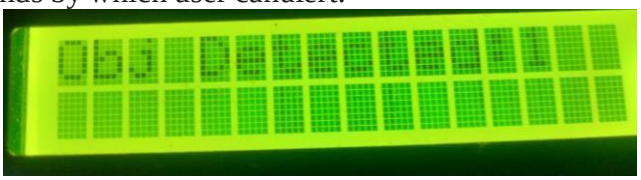

Fig .8. Object detected at front side

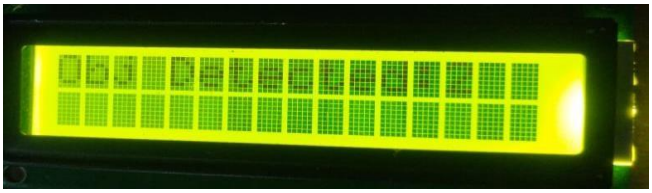

Fig .9. Object detected at Back side

When obstacles detected by IR sensor then LCD will dis-play IR detected and buzzer will give sounds by which user can alert.

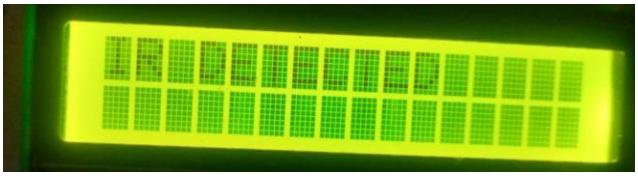

Fig .10. IR detected

And then the data will be sent to ThingSpeak

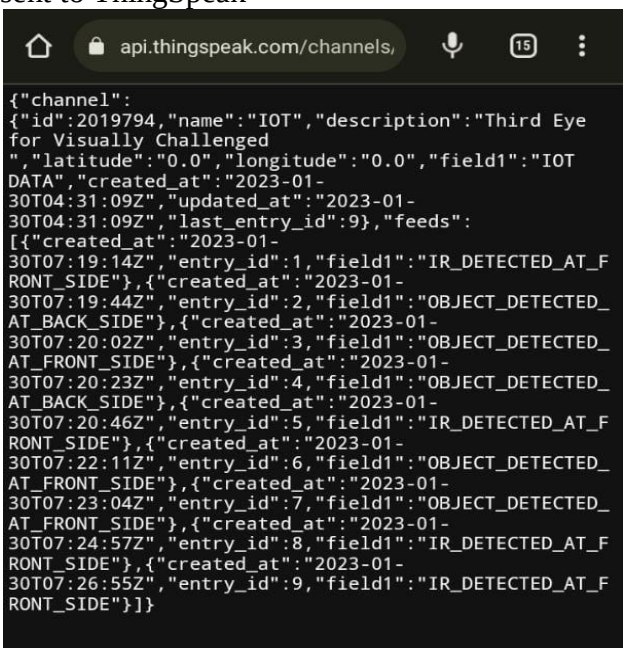

Fig. 11. Data in ThingsSpeak

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VI. CONCLUSION

The proposed system is an assistant device for visually challenged people. It helps them in detecting all kinds of hin-drances in their way which helps them move easily anywhere.The Third Eye for Visually Challenged helps in the detection of water and obstacles. It will give audio instructions to the person if any danger is faced by them. It is a sterling blind assistant device that can be affordable for middle-class people.It is not complicated to use. It can be used properly by just knowing small instructions.

VII. FUTURE SCOPE

In the future, the prototype device will be developed us-ing artificial intelligence with the help of camera it will capture the image of surrounding. It will classify the multiple object present in captured image and distance of object will be ca- lculated by HC - SR04 sensor and all information will be pro-vided to by earphone to user.

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