SMART EYE FOR VISUALLY IMPAIRED USING EMBEDDED C

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ABSTRACT

The intention of creating a smart system that can help persons who are visually impaired with their daily routines is presented in this paper. The group of visually impaired persons are undergoing an inconvenient daily life without the assistance from their family or friends. They need an approach to get to know about the life outside their home and they desire to have access to internet and mobile services as a normal one. Through our device visually impaired will be

able to detect people and items in front of them with this method, allowing them to acquire a feel of their surroundings. Our System aims to ease their lives,

increase their independence so they don't always rely on others, and bring some normalcy into their existing life. Our system combines many technologies that are currently on the market and incorporates them into a single, multifunctional gadget that the blind can use.

Keywords: Sensors, voice module, detection & visually impaired

INTRODUCTION

Every human's ability to see is crucial throughout their lifespan. The World Health Organization estimates that 2 billion people worldwide are blind or visually impaired. Thus, having a source to help the visually challenged people have become an essential need. Arduino-based third eye or extra vision for the blind has a project that combines both hardware and software work. The third eye or "extra vision" provided by Arduino Bases allows blind persons to navigate obstacles while travelling across places, with the aid of ultrasonic waves that are produced by an ultrasonic sensor. Arduino is an open-source electronics platform based on easy-to-use hardware and software. Arduino boards can read digital & analog inputs from the sensors. An obstacle detection system with Arduino can be implemented using ultrasonic sensors. These sensors emit ultrasonic waves and measure the time it takes for the waves to bounce back to the sensor. The device range is very limited and it is flexible for protection from

obstacles near to head area. Additionally, an infrared sensor can also be used for obstacle detection, which emits infrared light and detect the reflected beams. Both these sensors can be interfaced with Arduino using its digital or analog pins and programming the Arduino using C/C++ like Arduino programming language.

LITERATURE REVIEW

The basic need of this project is security, and for security some project also implemented previous different method as they such are PIR motion sensor based security system, arduino based security system. In our project a new advancement simple technique is used, in this project aN APR module is added as the output module which helps the user to learn about the obstacles ahead of him In which one relay is used for when object is within 30 - 35 cm range then it   can be detected and transmitted to the sensors. In 1790, Lazzaro Spallanzo was first whose discovered the BAT movement with the help of hearing for movement not seeing forward. Jean-Dawel Col- ultrasonic security system discovered sonography 1826 using an underwater bell, and determine the speed of sound in liquid. Therefore further study and research work proceed slowly on time to time. In 1881, when Pierce Curie's design the modern ultrasound transducer and he

concluded that the relationship between electrical voltage and pressure on any crystalline material, and on that time TITANIC tragedy influences to take more interest to work in this field and as a consequences Paul Langevin search the hydrophone to detect the iceberg and that device was the first ultrasonic transducer.

PROPOSED METHODOLOGY

Any device aimed at assisting the visually challenged should be handy and easy to use. In our proposed system, the blind people have sensor enabled smart glass to examine which object it is. There is also a need for addressing the users through voice modules to help them in better understanding of the environment. The design of this system includes various components like Arduino UNO, PIR, PIR sensor, microcontroller, Ultra Sonic Sensor attached to the user's spectacles which is formulated using the embedded C. Through the APR module (Auto Playback Recorder), the expected output is transmitted to the user's ears as virtual voice. 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.
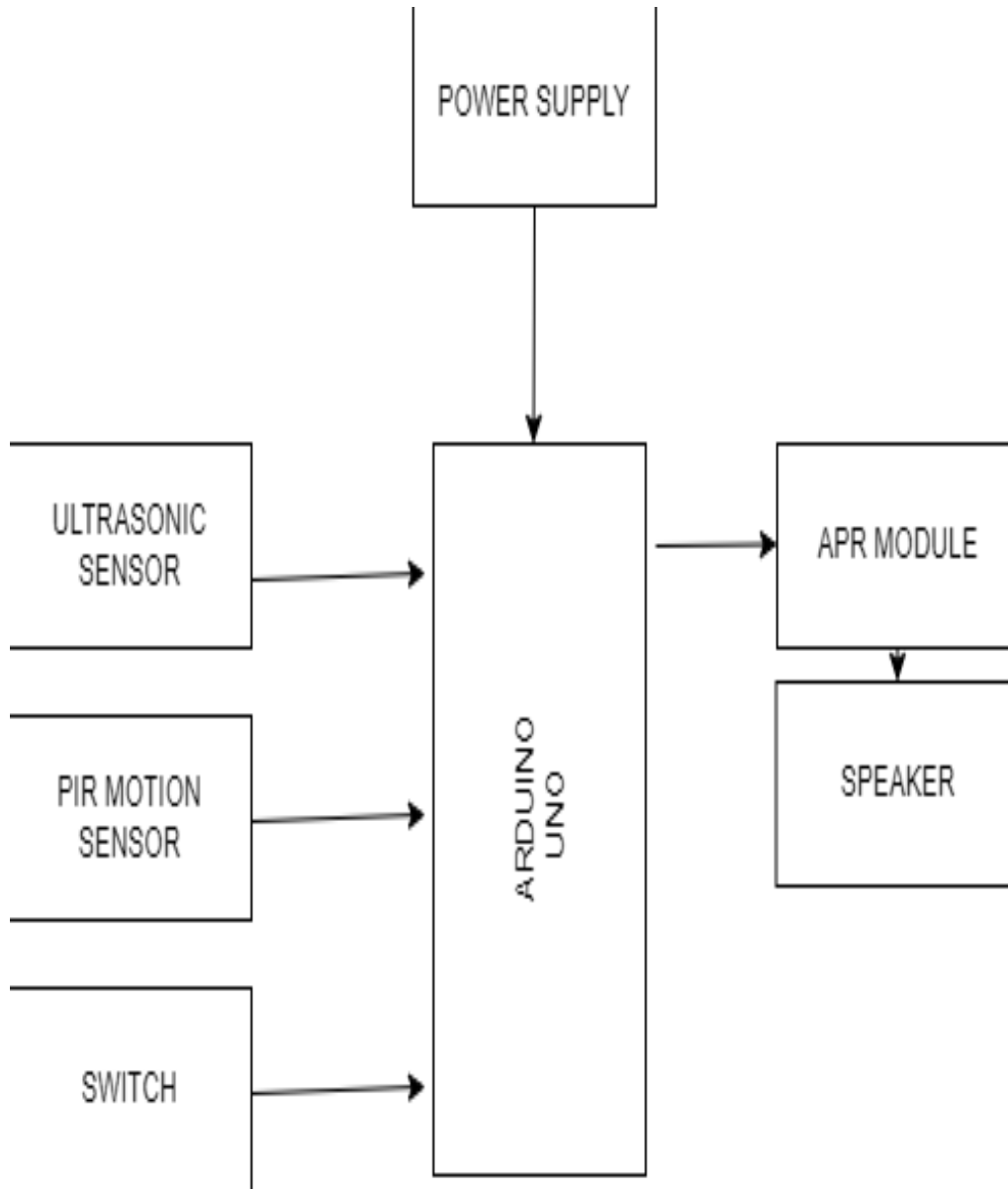
PROPOSED BLOCK DIAGRAM

SYSTEM SPECIFICATIONS
HARDWARE REQUIRMENTS

ARDUINO

Arduino Uno is an open-source microcontroller board based on the processor ATmega328P. There are 14 digital I/O pins, 6 analogy inputs, a USB connection, a power jack, an ICSP header, and a reset button. It contains all the necessary modules needed to support the microcontroller. This board contains a USB interface i.e., USB cable is used to connect the board with the computer and Arduino IDE (Integrated Development Environment) software is used to program the board. The unit comes with 32KB flash memory that is used to store the number of instructions while the SRAM is 2KB and EEPROM is 1KB.

The operating voltage of the unit is 5V which projects the microcontroller on the board and its associated circuitry operates at 5V while the input voltage ranges between 6V to 20V and the recommended input voltage ranges from 7V to 12V. Arduino UNO is easy to program and a person with little or no technical knowledge can get hands-on experience with this board. The Arduino UNO board is

programmed using Arduino IDE software which is an official software introduced by Arduino.cc to program the board. The Arduino program is called a sketch which you need to unload into the board. The sketch is nothing but a set of instructions that allow the board to perform certain functions as per your requirements. Each Arduino sketch comes with two main parts:

void setup () – this sets up the things that need to be done once and they don't happen again in the running program.

void loop () – this part comes with the instructions that get repeated again and again until the board is turned off.


LCD APR 33A3

It is a single chip voice recorder and playback device with 8 channels. Each channel can store up to 1.3 minutes speech message and total 11 minutes speech can be recorded and stored in all the channels (Fig-6). It takes the input from Arduino mega2560 and gives the voice as

output. You can make a voice recording and playback circuit using the easily available IC APR 9301. The circuit can record and playback the voice up to 30 seconds. It can be used in automatic answering devices, door phone, etc. The IC APR 9301 is provided with the circuitry capable of storing and reproducing the sound without using any microcontroller or some other software. No external ICs are required in the operation of the voice recording. If we use all this kind of software the device may suffer from some virus, so by avoiding the use of microcontrollers and additional software we can able to operate the device free from errors. This process is based on Single-chip, and having high-quality voice recording & Playback solution There are some numerous remunerations in using a voice recording which helps give us security when we wish to protect ourselves, it works as a prompt, and this application includes the processes like the recording of conversation through different techniques through which they can record hours of conversations. The IC APR 9301 performs two modes of operations-Recording and Playback modes. The IC gets the recording voice signals through the Mic connected to its pins 17 and 18. During the recording mode, the Speaker driver will be in the mute position. Required operating current is 25mA (typical, no load). When the

20 cycles are over with the last

memory, the recording process automatically terminates. The recording time can be increased to 30seconds by changing the value of theOscR resistor R1 connected to its pins 6 and 7. If the value of R1 is 52K, 20 seconds recording will be obtained. If it increases to 67K, then the time can be increased to 24 seconds. A maximum time of 30 seconds can be obtained using an 89K resistor as R1.During the Playback mode, the input section will mute automatically. By closing the switch S2, the recorded message will start to come from the speaker from the beginning of the message. After completing the Recording or Playback function, the IC enters into the Standby mode. Closely check the pin connections before powering the circuit. By closing the switch S2, Playback starts and the recorded message will be heard through the speaker.
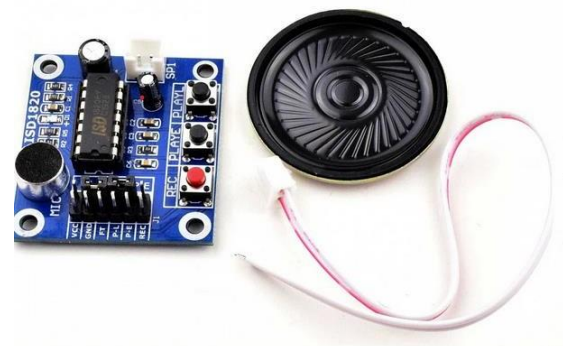
PIR SENSOR

PIR (Passive Infrared) sensor is an electronic sensor that measures

infrared (IR) light radiating from objects in the field of view. PIR sensors detect general movement, but don't give information as to who or what moved sensors are commonly called simply "PIR" or sometimes "PID" for "passive infrared detector. "The term passive refers to the fact that PIR devices don't radiate energy for detection purposes. They work entirely by detecting infrared (radiant heat) emitted by or reflected from objects. PIR sensor is used to build a robot that can seek out heat sources not evident to the human eye. In the case of PIR sensors in burglar alarms, a relay comprises part of a circuit that runs across twin contacts. When the PIR sensor detects motion, it opens the relay, breaking the circuit and triggering the alarm. At a basic level, PIR sensors operate using positive differential change. Two IR-sensitive slots sit in front of the lens, with their field of "vision" determining the range of detection. While 'idle', the ambient level of infrared detected in the room (naturally emitted by all objects) is the same on both slots. The minute an object, person or animal move through the detecting area, it is sensed by one of the slots before the other, causing a positive differential as it passes by, and a negative differential change as it leaves the area.


ULTRASONIC SENSOR

An ultrasonic sensor is an instrument that measures the distance to an object using ultrasonic sound waves. An ultrasonic sensor uses a transducer to send and receive ultrasonic pulses that relay back information about an object's proximity. Ultrasonic sensors work by sending out a sound wave at a frequency above the range of human hearing. The transducer of the sensor acts as a microphone to receive and send the ultrasonic sound. Our ultrasonic sensors, like many others, use a single transducer to send a pulse and to receive the echo. The sensor determines the distance to a target by measuring time lapses between the sending and receiving of the ultrasonic pulse. The working principle of this module is simple. It sends an ultrasonic pulse out at 40kHz which travels through the air and if there is an obstacle or object, it will bounce back to the sensor. By calculating the travel time and the

speed of sound, the distance can be calculated. To detect transparent and other items where optical technologies may fail, ultrasonic sensors are a reliable choice.
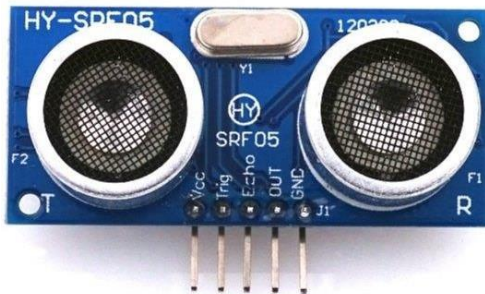
MICROCONTROLLER

A microcontroller is a compact integrated circuit designed to govern a specific operation in an embedded system. A typical microcontroller includes a processor, memory and input/output (I/O) peripherals on a single chip. It is so called because this device comprises of transistors which are small in size (micro-meter). The word micro is used in electronics and in science generally, to mean One- millionth or 10^{-6}. It has also used to denote something very small like a very small processor or micro controller.

SOFTWARE REQUIREMENTS
EMBEDDED C

Embedded C is a set of language extensions for the C programming language by the C Standards Committee to address commonality issues that exist between C extensions for different embedded systems. An embedded system is a combination of computer hardware and software designed for a specific function. C is a high-level programming language. Embedded C is just the extension variant of the C language. This programming language is hardware independent. On the other hand, embedded C language is truly hardware dependent. Embedded systems have limited memory resources compared to general-purpose computers. Therefore, Embedded C is optimized for memory usage, and it provides features to control the memory usage of the system. In contrast, C is not optimized for memory usage, and it assumes that memory resources are plentiful. Much like other microcontrollers, the AVR microcontrollers housed in Arduino

boards are programmed in a subset of C. A general term for such subsets is "Embedded C" because they apply to programming embedded controllers. Embedded C Program has five layers of Basic Structures. They are:

Comment: These are simple readable text, written in code to make it more understandable to the user. Usually comments are written in // or /* */.

Pre-processor directives: The Pre-Processor directives tell the compiler which files to look in to find the symbols that are not present in the program.

Global Declaration: The part of the code where global variables are defined.

Local Declaration: The part of the code where local variables are defined.

Main function: Every C program has a main function that drives the whole code. It basically has two parts the declaration part and the execution part. Where, the declaration part is where all the variables are declared, and the execution part defines the whole structure of execution in the program.

ARDUINO IDE

Arduino Integrated Development Environment (IDE) is an open source IDE that allows users to write code and upload it to any Arduino board. Arduino IDE is written in Java and is compatible with Windows, macOS and Linux operating systems. This technology does not utilize a database as data generated by this technology is saved to the user's local drive. The Arduino IDE is an open-source software, which is used to write and upload code to the Arduino boards. The IDE application is suitable for different operating systems such as Windows, Mac OS X, and Linux. It supports the programming languages C and C++. The

Arduino hardware and software was designed for artists, designers, hobbyists, hackers, newbies, and anyone interested in creating interactive objects or environments. Arduino can interact with buttons, LEDs, motors, speakers, GPS units, cameras, the internet, and even your smart-phone or your TV.

PROPOSED SYSTEM WORKING

The Arduino board is connected to a computer via USB, where it connects with the Arduino development environment (IDE). The user writes the Arduino code in the IDE, then uploads it to the microcontroller which executes the code, interacting with inputs and outputs such as sensors, motors, and lights. In our code, we have dumped the necessary inputs like default distance into the microcontroller. Then Connecting the PIR sensor to the Arduino is really simple. Power the PIR with 5V and connect ground to ground. The PIR acts as a digital output, so all you have to do is listen to the output pin. So, connect the output to Arduino's digital pin #8. The PIR sensor measures the person only within the range of 35 cm which has been already dumped inside the microcontroller. The ultrasonic sensor has 4 pins. VCC and GND go to 5V and GND pins on the Arduino, and the Trig and Echo go to any digital Arduino pin. Using the Trig pin we send the ultrasound wave from the transmitter, and with the Echo pin we listen for the reflected signal. It calculates the distance up to the given condition and does not detect obstacles greater than that distance. The APR33A3 Voice Recorder & Playback Module has 8 output pins from M0-M8. One of the pins can be connected to Arduino. The digital low input will activate the module pin and can be used to playback the recorded voice message. I selected M1 & connected it with Arduino D8 pin. Our module has a prerecorded voice with "OBJECT

DETECTED "and "PERSON DETECTED" as the voice output. This recorded voice will be transmitted to the user's ears, through the speaker attached. These multiple components integratedcombines as a whole and helps to give the ultimate goal of indulging everything within the spectacles worn by the visually impaired.

The complete integrated system
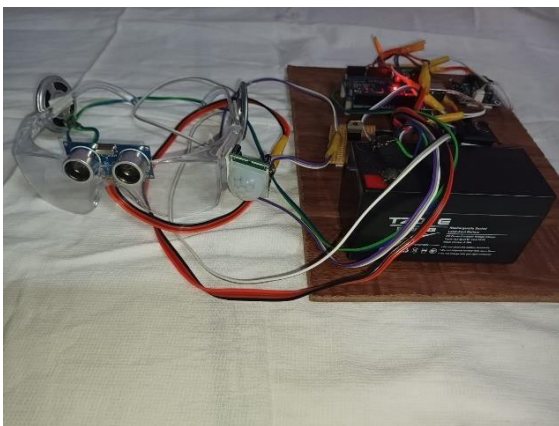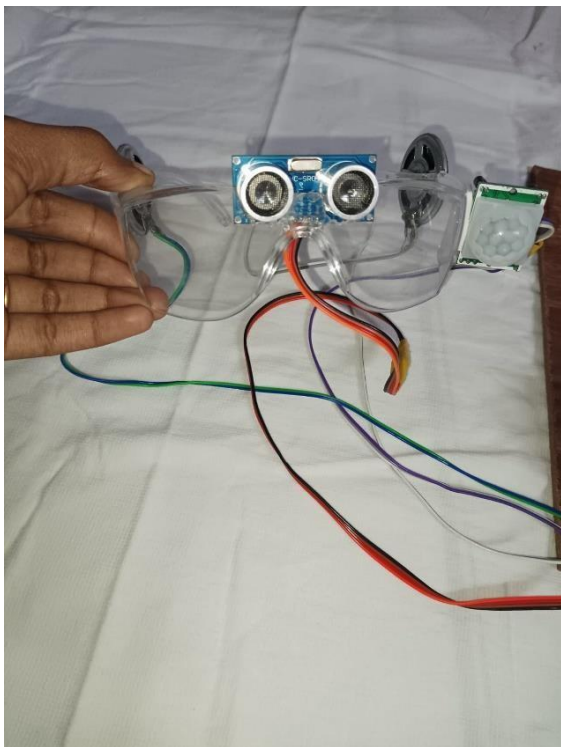
Proposed view of only the smart spectacles

CONCLUSION

Thus, this project which is built by our group totally tells us about the architecture and model of Arduino based third eye or extra vision for blind people. A simple architecture device, efficient in use, cheap in cost, easy to carry with us, easy configurable, easy to handle electronic guidance system with proper and easy usages guidance and various effective hardware helps to provides the amazing properties so that it helps the needy blind people. Our problem successfully removed the need for a third person assistance for the blinds as they can now easily detect the obstacles around them.

FUTURE SCOPE

This project can be further improved and developed by indulging a Raspberry Pi into it, which will help to recognize the people and objects to the user. It can be a great tool for the visually impaired people which can completely make them independent from the human assistance. Additionally, we can further develop this model by detecting the texts andconverting it to the to voice module and transmitting the outcome to the user. This will help the blind to fetch data by their own and read books or any other sources by their own.

REFERENCES

JM. Benjamin, A, Ali, AF. Schepisi. ARDUINO BASED THIRD EYE FOR BLIND PEOPLE,Proceedings of San Diego Medical Symposium, 1973, 443-450.

[1] S. Sabari's. \"ARDUINO BASED THIRD EYE FOR BLIND PEOPLE\", International Journal of Engineering and Advanced Technology (IJEAT), 2013; 2(4):139- 143

[2] S. Sabari's. \"Navigation Tool for Visually Challenged using Arduino\', International Journal of Engineering and Advanced Technology (IJEAT), 2013; 2(4):139-143.

[3] Y. H. Lee and G. Medioni, "Wearable RGBD indoor navigation system for the blind," ECCV Workshops (3), 2014,pp. 493-508.

[4] V. C. Sekhar, S. Bora, M. Das, P. K. Manchi, S. Josephine and R. Paily, "Design and implementation of blind assistance system using real time stereo vision algorithms," in 2016 29th Int. Conf. VLSI Design and 2016 15th Int. Conf. Embedded Syst. (VLSID), Kolkata, 2016, pp. 421- 426