IoT based Band for Blind Peoples using ESP32 with GPS

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Abstract - *Nowadays there are many cases of eye injuries and in certain injuries people suffer from long term recovery and in certain cases they suffer from permanent damage. In these situations they face a lot many problems in daily life and one of the major problems they face is moving around. So i tried to solve this problem by proposing a system consisting of ultrasonic sensors and ESP32 which detects and analyses the obstacles and generates the alarming signals according to the distance of the object. The proposed system makes use of mobile GPS in order to get the location of a person by uploading the parameters like coordinates to the cloud which can be easily accessed.The proposed system is very light,compact and affordable.*

Key Words: Blind, Ultrasonic sensor, ESP32, GPS, Light, Compact, Affordable.

1. INTRODUCTION

There are a very high number of cases of visual impairment because of which people face many problems in day to day life especially in normal movement. Because of this there is a very high risk of injury for people with visual impairment. It becomes very difficult for them to move freely. Most of the time they are dependent on others. In this modern era of electronics there is much research that has been done related to this but most of them are very costly and very complex to use. So i tried to design a system that is very easy to use, compact and budget friendly so that everyone can afford it. The proposed system makes use of ultrasonic sensors to measure the distance and ESP32 gives indication either by switching on the buzzer or by sending data to mobile in which specific app converts the text into speech which is very easy to understand. The device makes use of a GPS system of mobile which has very high accuracy and continuously uploads it to the cloud so that it can be used to track the person in case of emergency. As the device makes use of mobile's GPS system it reduces the size upto greater extent.

2. Hardware

2.1 Ultrasonic sensors

These sensors make use of ultrasonic waves generated by the oscillators. They produce waves ranging from 30kHz to 500 kHz. They emit ultrasonic waves and when these wave return after reflecting from object they measure the time between emission and detection of ultrasonic waves and then calculate the distance accordingly.
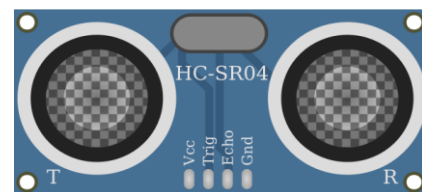
2.2 ESP32

ESP32 is a kind of microcontroller with inbuilt wifi and bluetooth connectivity. It has all the interfaces like UART, SPI, I2C etc. It can be programmed with the help of an Arduino IDE. It is used to record sensor data, process it, and generate output accordingly.
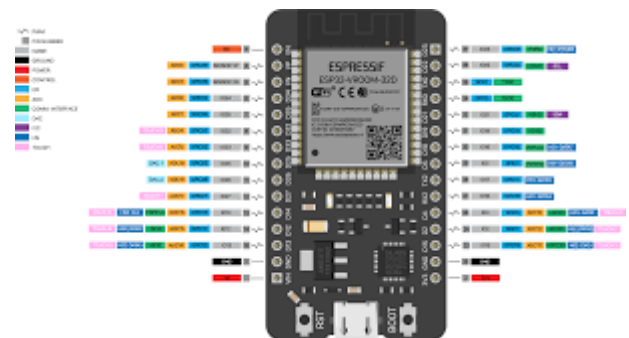

2.3 Buzzer

It is a piezoelectric device which produces sound when it receives input in the form of electrical signals. It produces the sound when the sensor detects the obstacle and ESP32 sends the signals to the buzzer which makes the person alert. It works when the device is not connected to the phone.

3. Software and Apps

3.1 Blynk

Blynk is an iot based platform which provides a graphical interface and connectivity with various devices through many different connections like WIFI, Bluetooth, USB etc. It has many widgets with a very broad range of functions which makes it very user friendly.
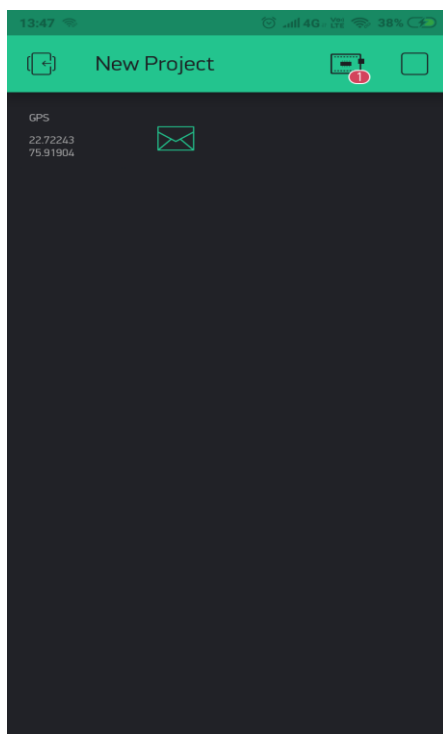
3.2 Bluetooth text-to -speech converter

This app receives data from devices via bluetooth through serial communication and converts the text received from the device into audible speech.

3.3 Arduino IDE

It provides an environment for writing and uploading the desired code to the boards. It is a java based application and uses the subset of C language for programming of boards. It has many options for different development boards. It also has many different types of programmers based on the type of board.

4. Working

The ultrasonic sensor produces a beam of ultrasonic waves of frequency of about 40 kHz which reflects back from the objects it strikes with. The ultrasonic sensor measures the time between emission and detection of the ultrasonic waves which acts as the time of flight. This calculated time is usd by the ESP32 to calculate the distance of the object by using the speed of sound in air using formulae (velocity x time)/2. Now when the ESP32 records the distance of the objects it first checks the pre-calibrated threshold distance and then checks whether the device is connected with mobile or not. If the device is not connected to mobile then it triggers the buzzer once threshold distance is reached. If the device is connected with mobile then it will send the message to the android device via bluetooth which with the help of the app will

convert the message to speech. The device continuously receives the GPS coordinates from the mobile which are very accurate and uploads them to the cloud which can be easily accessed by the family members of the person in case of any kind of emergency.

5. Results

The device is able to detect the obstacles and alert the person with good efficiency. The ultrasonic sensor is working fine and is able to detect the object efficiently with the help of ESP32 and the GPS coordinates received form the mobile phone have very less error. Both the systems of creating alerts are working fine. If a device is not connected to the mobile buzzer is creating sound when object is detected and also the speech messages are generated when device is connected to the mobile.

6. Conclusion

The proposed device helps visually impaired peoples to move freely and reduce their dependence upon others. The proposed device is very compact and easy to use as it uses minimum hardware components and makes maximum use of features of mobile devices which reduces its size and overall cost. Also the device helps the family members to easily trace the location with help of GPS data uploaded to the cloud which is highly precise and accurate as it is obtained from mobile GPS.

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