A Cap CumEye-like Obstacle Detector System Having GPS Facility For The Blind People

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Abstract— As the world gets more and more technologically advanced, we are in search of new technologieswhich will come to the help of physically challenged persons.Modern technologies have enriched us, eases our life a great deal but it is a high time to think of those people who are completely physically challenged. We shouldproperly utilizeourscience and technology so that all can enjoy equal benefits in the society.As a small step, we are trying to present a modern technology nourished system which hopefully reduces the difficulties of the blind people in their daily life to some extent. In this paper, we are presenting the design and implementation of a simple, low cost and flexible cap-likeObstacles Detector system which basically usesan Ultrasonic Sensor and GPS Module. ThisESP8266 Microcontroller based system which is designed for visually impaired persons can be upgraded in the future in better sophisticated form integrating a navigate system,camera or incorporating voice recognition like facilities. We believe small steps fromall of us can change their life in a big way.

Keywords—Node MCU (ESP8266), GPS (NEO-6m), Ultrasonic Sensor.

I. INTRODUCTION

We have been working on developing a prototype with hardware and software segments with the idea of presenting an external power of Sense for the Visually Impaired People which helps them to Sense Obstacles easily with confidence. With the help of Ultrasonic Waves, Buzzer Sound and Vibration, they will be alerted of the nearby obstacles. Moreover, they can be traced by their relatives using Global Positioning System (GPS). In this project we use anUltrasonic Sensor, GPS,one microcontroller to develop an Ultrasonic based systemwhich basicallyemitsa high frequency signal and receivesan echo after striking an object.

We want to use this concept in a better formfor the benefit of the blind people. With the objective of minimizing the hardships of their daily life to some extent, a cost-effective Ultrasonic based cap-like system has been proposed. They only need to wear a cap (clothes can also be used).

This   system is quite easy to build and can beassembled in future, incorporating some other technologies and components like navigation system and camera etc.

II. DESIGN ISSUES AND CONSTRAINTS

A. NODE MCU (ESP8266)
NODE MCU is an Open Source IoT Platform that has a Wi-Fi module ESP8266. One can program ESP8266 using Arduino, NodeMCU IDE or ESP8266 SDK. It includes firmware which runs on the ESP8266 Wi-Fi SOC (System on a Chip) from Espressif Systems.

B. GPS Module (NEO-6m)
 NEO-6 GPS Module is a widely popular GPS receiver having a data backup battery along with a built-in 25 x 25x 4mm ceramic antenna which has a strong satellite search capability. With the power and signal indicators, the status of the module can be monitored. The module can save data whenever there is any accidental main power failure.

C. HC-SR04 Ultrasonic Sensor
HC-SR04 Ultrasonic Sensor emits short, high frequency sound pulses in the air at regular intervals. If they strike an object, then they will be received back as echo signal to the sensor. It uses sonar to determine object's distance. It offers excellent non-contact range detection with high accuracy and stable readings in between 2cm to 400cm or 1`` to 13 feet.

III. WORKING MODULE

As GPS and Ultrasonic Sensor Related System uses two different platforms of technology solet us firstbriefly discuss themseparately and later we will see how the two can be combined to develop a cost-effective Cap-like system for the benefit of those who visually impaired. We know GPS can be used to locate or navigate something like Airplanes on the ground or in the air. We also use it to locate people in need of assistance [1-5]. On the otherhand,anUltrasonic Sensor emitsshort, high frequency sound pulses in the air at regular intervals. If they strike any object, then they will returnas echo signal to the sensor and the target distance can be computed based on time-span betweenemissions of thetransmitted signal and receiving the echo signal [6-8].

Now for combining the two technologies we use different components like vibrator, buzzer, 3.7V battery, GPS module,amicrocontrolleretc.Here the vibrator vibrates and the buzzer sounds wheneverany obstacles is detected in front of the user. Here we use this technology in a cap so that users can detect all the left-right and upper-lower obstacles.

Now someone can keep an eye on the user using GPS and the user can detectobstacles by feeling the vibration and hearing the buzzer sound.This concept is exceptionally helpful for blind persons when they go out from the home. This tracking and sensing System willreduce walking difficulties of blind peoplein their daily life to some extent. They do not need any electronic sticks or any dog which are of high cost [9-10]. They only need to wear this cap (Fig.2).
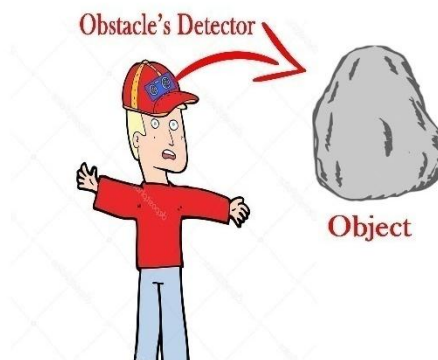

Fig 1: Block Diagram of overall module

Fig. 2 Proposed Cap-like Obstacle Detector

a) Circuit Description
The circuit of this project utilizes the GPS module, Ultrasonic Sensor, Vibrator, Buzzer and Microcontroller for making a tracker and as well as obstacle detector. GPS module, as the name suggests, deals with the signals of GPS satellite. Using the Wi-Fi moduleof Node MCU (ESP8266) which is a self-Contained SOC having integrated TCP/IP Protocol stack that allows a microcontroller to access one's Wi-Fi Network,signals are sentto theGPS satellites from the GPS module. The GPS receiver/Smart-phones of the relatives of that particular blind personwill receive signal from three satellites in the sky. Based on the information sent, GPS device/Smart-phone will determine the exact location of the user.

AnUltrasonic Sensor has also been used in this system. Ittransmits a signal and receives itself in the form of echo. This Circuit is designed to Demonstrated the Detection of an Object ahead of the Ultrasonic Transducer. An Ultrasonic Transducer consist of a Transmitter and Receiver. The Transmitter produces 40 KHz sound wave while the receiver detects the 40 KHz sound wave and Convert it to Electrical Signals which are fed to Microcontroller.

This Circuit is designed with an ESP8266 Microcontroller, an Ultrasonic Sensor and GPS. The Sensor Transmits the Ultrasonic Sound Waves of 40 KHz. When an object or Obstacles comes in front of the Sensor, the Sound waves are Reflected. Then the Receiver Detects the 40 KHz Sound Wave. The Circuitry converts the sound signal to Electrical Signals which are fed to the NodeMCU Interface and then Microcontroller transfer that Electrical signal to the vibrator or Buzzer (Fig.5,6) (can be selected by switches).Using the Wi-Fi Module of MCU and GPS module(Fig.7) ,tracking is possible as discussed earlier.

b) Circuit Components
In the circuit, we are using
- A Perf board.
- GPS module (NEO-6)

- HC-SR04 Ultrasonic sensor
- Buzzer/Vibrator
- A 3.7V battery used as power supply.
- Slide switch for Buzzer and Vibrator.
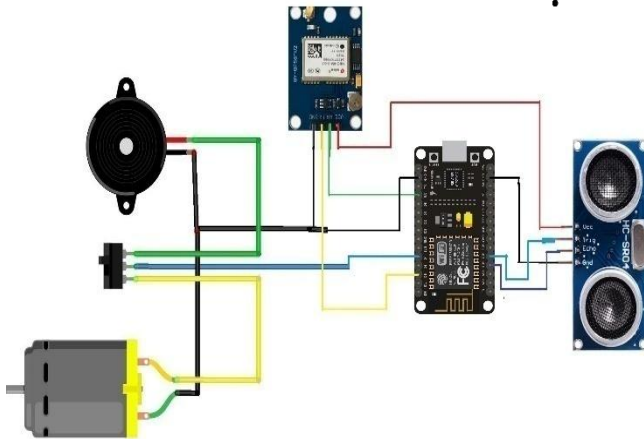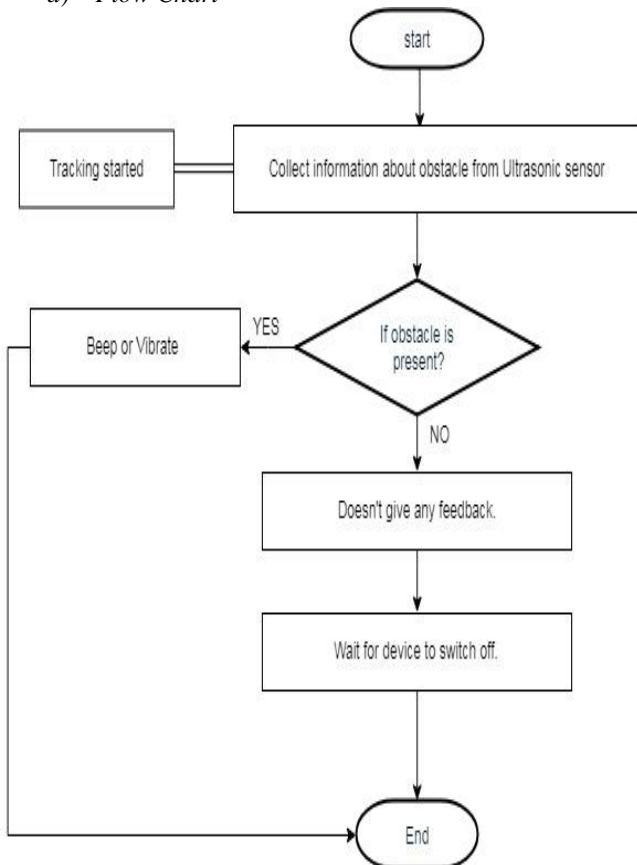- Node MCU(ESP8266)

c) Circuit Diagram

Fig 3.Circuit diagram of the overall module
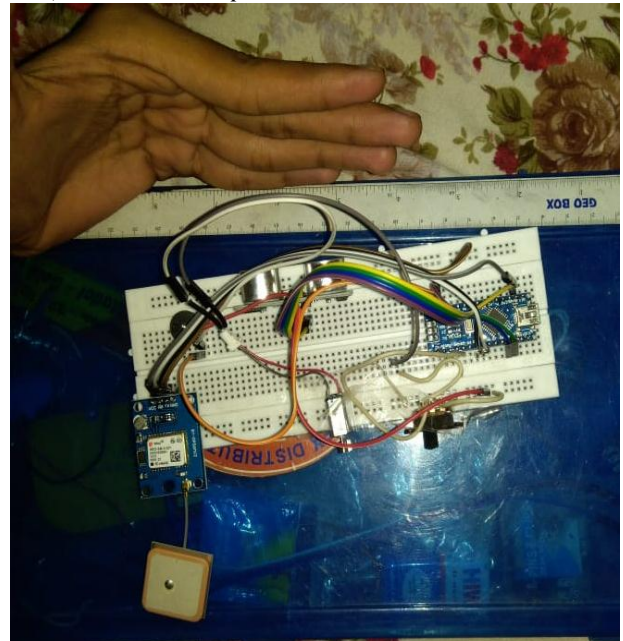
d) Flow Chart

e) Hardware Implementation
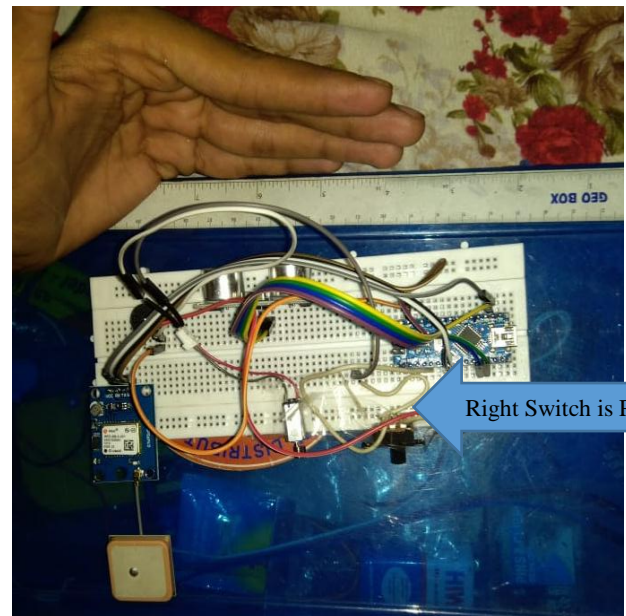

Fig.-4Basic Hardware

Right Switch is Pressed

Fig.-5.Aftergiving the power supply to Ultrasonic Sensor and GPS Module when the Right switch is pressed, the Buzzer Beeps.
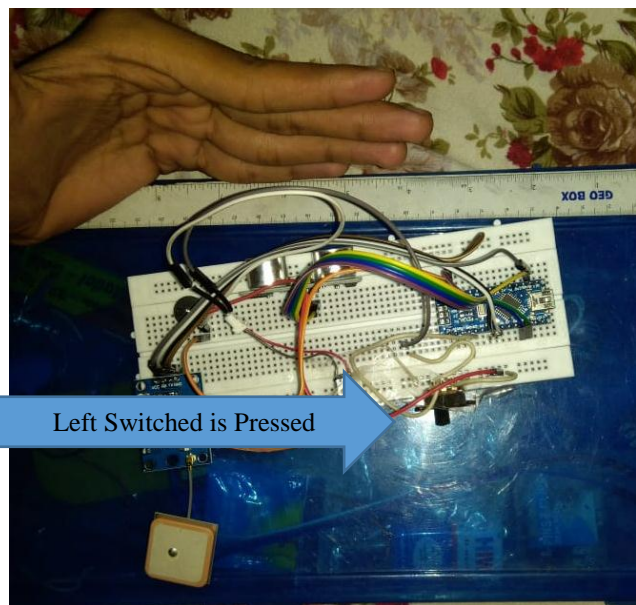
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Fig.-6.After giving the power supply to Ultrasonic Sensor and GPS Module when the Left switch is pressed, theVibratorVibrates.
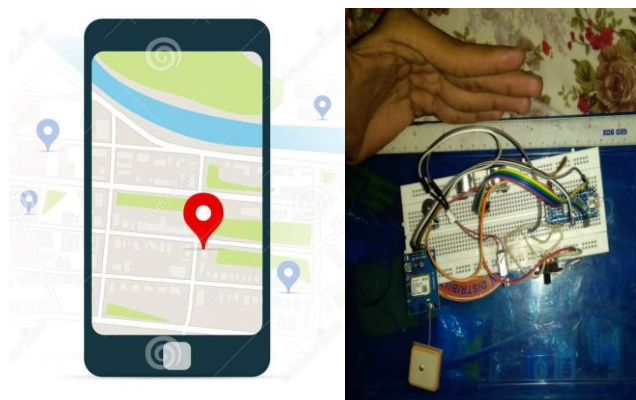

Fig.-7.After Giving Power Supply to Both Ultrasonic Sensor and GPS Module, we keep an eye on the user by using Smartphone.

IV. CONCLUSION

In this paper we have proposed a low cost, flexible cap-like obstacle Detector System having GPS facility to help Blind People. This unique Obstacle Detector device having tracking facility will hopefully reduce walking difficulties of blind people in their daily life to some extent. Instead of using any electronic sticks or any dog which are of high cost, they only need to wear this proposed cap-like instrument which can Detect Obstacles from anywhere around the 2cm-400cm or 1`` to 13feet periphery. Moreover it is very much compatible & easy to handle by physically challenged persons of any age. In future it can be modified incorporating speech or voice recognition facilities through android phones.

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