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Smart Blind Stick Using IoT

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Abstract: *In this paper, a smart blind stick guidance model for visually disabled citizens has been presented. Ultrasonic sensor is added to the transmitter and receiver of the stick. If there is an obstacle in the path buzzer or voice module will alert the blind person. The pulse and spo2 sensor are used to monitor the pulse rate and oxygen level of the blind person. The Global Positioning System (GPS) is a radio navigation system that provides reliable positioning, navigation, and timing services to civilian users on a continuous worldwide basis. For anyone with a GPS receiver, the system will provide location and time information for an unlimited number of people in all weather, day and night, anywhere in the world. GPS based blind man device with user input interfacing (remote controlled based) intellectually finds the current location and gives the alert to the blind man if it was his destination area. Node MCU is the heart of the device. It stores the data of the current location which it receives from the GPS system, so that it can make use if the data stored to compare with the destination location of the user. By this it can trace out the distance from the destination and produce an alarm to alert the user in advance. Here instead of an alarm sound the blind man can directly hear the location recorded by the user itself.*

Keywords: Internet of Things, Ultrasonic Sensor, Obstacle Detection

I. INTRODUCTION

Visually impaired people have acuity 6/60 or the horizontal extent of this visual field with both eyes open less$\leq 20^0$, which means they cannot or face difficulty in identifying objects around them from the research, it has been found that around 10% of blind people from the total world population have no usable eyesight at all to help them move around independently and safely. This electronic device is designed to solve this issues, to record information about the obstacles presence in a road, active or passive sensor can be used.

In this device we use active sensor. So the active sensor, the sensors emits a signal and receives a distorted vision of the reflected responses from objects irradiated with artificial generated energy sources. These kind of active sensor are capable of sensing and detecting far and near obstacles. In addition to it, it can determine the accurate measurement of the distance between the blind and the obstacle. Overall, in the field of obstacle detection, four types of active sensors may be used: infrared, ultrasonic, laser, in addition to radar sensors.

Some advanced systems use GPS (Global Positioning system) integration with the main system. It's also noteworthy that GPS receiver is useful for understanding the current location of the subject and nearby landmarks. Some solutions are already available in the market such as: Ultracane, Isonic, Telecat, etc. These products help blind people by ulthe user. These solutions still have many disadvantages for example: They can't detect obstacles that are hidden but very dangerous for the blind such as downstairs, holes, etc. Usually, the feedback information comes out as either vibration or sound signals. Thus, these systems communicate their recommendations to the user through sound or frequency vibrations

II. METHODOLOGY

- Ultrasonic sensor to detect more obstacles.
- Using node MCU.
- Voice module for conveying the directions to the blind person.
- GPS module- caretakers track the blind persons location.
- Pulse sensor- to detect the heart pulse.
- Spo2 sensor- to monitor the oxygen level of the blind person.

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2.1 Block Diagram

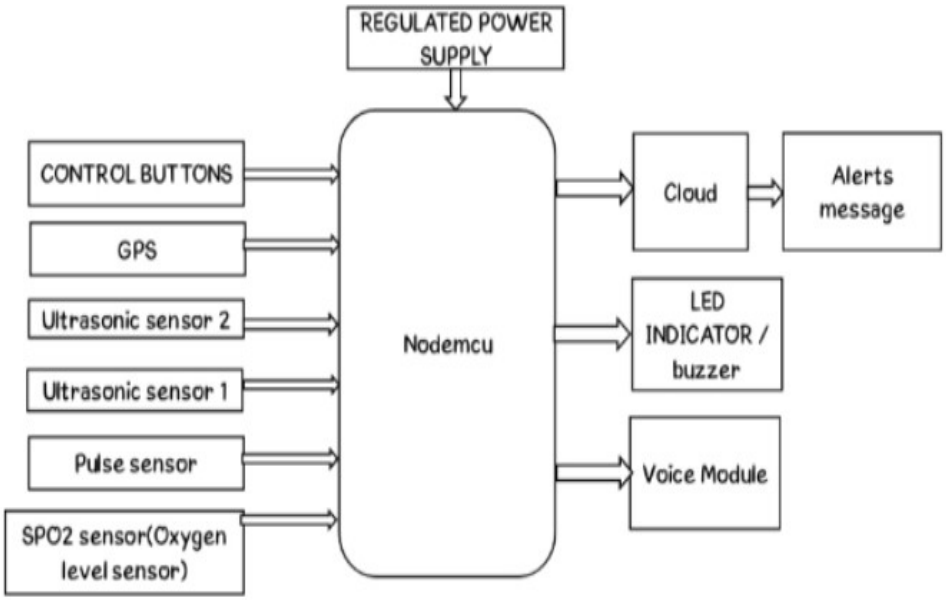

Figure 1: Block diagram

2.2 GPS (Global Positioning System)

The Global Positioning System (GPS) is a space-based radio navigation system that provides reliable positioning, Navigation, and timing services to users on a continuous worldwide basis—freely available to all. The GPS is made up of three parts. Satellites which are orbiting the earth, control and monitoring stations on the earth, the GPS receivers owned by the users.

2.3 Ultrasonic Sensor

Ultrasonic sensor is very famous sensor to detect the obstacle. The sender which is attached to the sensor emits the ultrasonic wave which come back after collide by the obstacle and received by the receiver attached to the ultrasonic sensor. Ultrasonic sensor calculate the distance of the object by calculating the time between the emission and receiving of ultrasonic waves by sender and receiver.

2.4 Node MCU

Node MCU is an open-source Lua based firmware and development board specially targeted for IoT based applications. It includes firmware that runs on the ESP8266 Wi-Fi SoC from Empressif Systems, and hardware which is based on the ESP-12 module.

2.5 IoT (Internet of Things)

Internet of Things (IoT) is a type of network in which various physical devices that contains electronics embedded in their architecture connected to the network and are able to communicate with each other and sense interactions amongst each other or with respect to the external environment.

III. Literature Review

3.1 Third eye for the blind people using Arduino and Ultrasonic sensor

In April 2019, M. Narendran Sarasmistha Podhi Aashita Tiweri Dept of Computer Science and Technology SRM Tamilnadu proposed a paper “Third eye for the blind people using Arduino and Ultrasonic sensor.” In this paper they have design a smart wrist for blind people which was a wearable wrist band which is imported with ultrasonic sensor for detecting

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the obstacles on the way of user. This paper has a limitation that, the gadget was made to wear in hand because of which it does not detect the object nearer to the earth surface.

3.2 Smart Walking Stick for Blind People

In April 2019, Sathya S. Nithyaroopa P. Betty G. Santhoshni S. Sabharinath Computer Science and Engineering Kumara Guru College of Technology proposed a paper "Smart walking stick for blind people." In this paper they have design a smart stick for blind people in which they used raspberry PI as the main architecture with the different sensors and buzzer which is not so much listenable.

3.3 Smart Walking Stick for Visually Impaired People

In 2018, Jayakumar, S. Magesh, K. Prasanth, P. Umamageshwari, R.Senthilkumar Dept of EEE, Erode Sengunthar Engineering College proposed a paper "Smart walking stick for visually impaired people." In this paper they have design a smart stick for blind people in which they have use different sensors like temperature sensor and humidity sensors. This paper has a limitation that there is no mechanism to locate the stick if it is misplaced.

3.4 Smart Walking Stick for Visually Impaired Person

In 2018, Dada Emmanuel Gbenga Arhyel Ibrahim Shani Adebimpe Lateef Adekunte Department of Computer Science University of Malaya proposed a paper "Smart walking stick for visually impaired person." In this paper they have design a stick for the blind people using Arduino Atmeg 328 which was impacted with ultrasonic sensor detecting the obstacles. In this paper there is no mechanism for sensing the water in the way of user.

3.5 Smart Stick for Blind People

In 2018, D. Sekar, S. Sivakumar, R. Premkumar, M. Vivekkumar UG Student, Eshwar College of Engineering proposed a paper "Smart stick for blind people." In this paper they have design a smart stick for blind people using microcontroller and imparted with different sensors and GPS for the user convinences. In this paper there is no mechanism for walking in night to indicate the other people about the blind person.

IV. Results and Discussion

A caretaker can trace the blind person via the GPS module when it is connected to the internet. When the internet connection is established, the GPS gets connected to the satellites to find the stick. When the blind man starts his destination, the intelligent stick guides him to find the path avoiding obstacles and danger. His location his traced every second, and his family member can trace him using GPS tracking.

V. Conclusion

It is difficult for blind people to move or live in surrounding without help. So, they usually use white cane to guide them during moving. Although it might be helpful, it doesn't guarantee saving blind people from risks. These traditional ways

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can be used for low level obstacles detection only. The smart stick acts as a basic platform for the coming generation of more aiding devices to help the visually impaired to navigate safely both indoor and outdoor. It is effective and affordable. It leads to good results in detecting the obstacles on the path of the user. The system offers a low-cost, reliable, portable, low power consumption and robust solution navigation with short response time.

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