Sense Cap Using Internet of Things (IoT)

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ABSTRACT

The Internet of Things (IoT) is one of the most prominent technologies, which primarily deals with inter-connecting, controlling and managing digital and electronic devices that are connected to the internet through an IP address. The evolution of high speed network technologies like Long Term Evolution (LTE) and upcoming 5G network technology had already led the path to simulate the whole electronic and digital services and applications at the finger tips. However, the physically challenged people especially the visually challenged people could not utilize the whole of technologies and yet this makes them feel more distressed about themselves. Braille is vital for communication and education purposes for the visually challenged persons. The solution for this problem is to handle the distance between the obstacle and the person. The aim of this project is to develop a smart cap, which has the distance measurement system. Device that will be useful who are visually impaired. This device primarily allows its user to scan their surroundings for obstacles. The device which has sensors (Lidar) for detecting the obstacles. It is connected to the smart phone via Bluetooth or any other means. It will notify and guide the user if there is any obstacles stairs or potholes around. It is based on ToF (Time of Flight) principle and integrated with unique optical and electrical designs, so as to achieve stable, precise, high sensitivity and high-speed distance detection. Features: Operating Range: 0.3-12m maximum operating range at 10% reflectivity. "Share live location" feature allows the user's can share their live location to their personal contacts.

Keywords : React Native, NodeMCU, Firebase

I. INTRODUCTION

We being normal people can see and judge all the aspects of the environment it could be hurdle, obstacles, hole or pit. This is not possible in case of physically disabled people but they are given god gifted some great sensing ability. So for this we are creating a new IoT based Sense Cap, which will help the blind people to get known about the hurdles, obstacles and holes or any moving objects beside them. It will be very beneficial for them as it will alert them for each and every aspect which they are going to face in their day to day life with the help of buzzer or voice Assistant. Our system will also track the live location of blind person. Our main motivations are they blind who need to suffer a lot

while travelling from place to place. We noticed that normal blind canes used by blinds have certain limitations like detecting potholes, stairs, distant objects, above knee obstacles, etc. We feel very bad about the blind and disabled people so we came up with the idea of developing a economical sensor equipped cap capable of assisting blind to navigate easily.

II. Literature Survey

An Intelligent Walking Stick for the Visually Impaired People [1], Blind stick or white cane is introduced to blind people after the First World War as a mobility tool to detect the obstacles in the path of the user. This paper proposes an Arduino Nano based obstacle finding stick for visually impaired people, which helps a blind person by detecting the obstacles using Ultrasonic sensors and android mobile application. As they didn't give any pictorial view of the stick, so according to device description it seems to be pretty heavy. Besides that, there was no information about how long the buzzer & vibrator would be in ON condition. This project is all about a simple hat which can sense the obstacles, potholes etc. So the main idea is developing a simple circuit using NodeMCU and sensors and attaching it to the hat. So the sensor (Lidar) is responsible for detecting the obstacles. If obstacles are detected then the vibrator will alert the blind person by vibrating. Using NodeMCU location of the blind person will upload to the cloud for every time interval. An Electronic Walking Stick For Blinds [2], A blind user walking with an electronic stick. Two ultrasonic sensors are mounted on the stick having range from 20-350cms (set to different ranges). Two Infrared sensors are also implemented on the lower side of stick for avoiding small obstacles ranging from 2- 10cms. An IR sensor is an electronic device that emits and/or detects infrared radiations in order to sense some aspect of its surroundings. When an object is close to the sensor, the light from the IR transmitter led bounces off the

object and received by receiver led. IR sensor might malfunction during the daylight because of bright day light from sun might make the IR receiver to unable to detect bounced back IR rays. Since this stick uses sonar results won't be much accurate, to overcome that our project will be using Lidar. Design and Implement Smart Blind Stick [3], This project is done using radio frequency waves wherever there's a radio frequency receiver circuit on the stick and a separate radio frequency transmitter circuit that triggers an alarm on pressing a pushbutton. A traditional walking cane forms the main frame of the device Furthermore it has water sensors to detect water within the path of the user. The proposed system has been divided into two parts. The first part was about designing the smart stick using software that allows the user to design product in 2 and 3 dimensions in simple and almost cost-free methods. The electronic system has been controlled using Arduino UNO when the signal impacts the level surface it reflects back to the sensor`s receiver. Therefore, the Arduino will send a pulse to the actuators (in this case, the vibrating motor and the buzzer) to work as the uploaded code. Radio frequency waves might not give accurate results, so in our project that is replaced by Lidar sensor. Effective Fast Response Smart Stick For Blind People [4], In this smart stick is mounted with infrared sensor to detect stair-cases and pair of ultrasonic sensor to detect any other obstacles in front of the user, within a range of four meters. Moreover, another sensor is placed at the bottom of the stick for the sake of avoiding puddles. Speech warning messages and the vibration motor are activated when any obstacle is detected. This proposed system uses the microcontroller 18F46K80 embedded system. The stick is capable of detecting all obstacles in the range 4 meter during 39 ms and gives a suitable respect message empowering blind to move twice his normal speed because she/he feels safe. The smart stick is of low cost, fast response, low power consumption, but sensors that used in this will not

detect obstacles like traffic poles, gates etc, to overcome that our project will be using sensors that is capable of detecting obstacles that are thin in shape. Smart Blind Stick Using SONAR [5], This project uses SONAR to determine the distance of an object just like the bats do. The stick has a buzzer which beeps and alerts the user when obstacles are detected. And it also contains a Panic Button which can share the alert message to the loved ones with the person's location. It is effective and affordable. It leads to good results in detecting the obstacles lying ahead of the user in a range of 50 cm but not more than that, and feedback given to the user is audio which might be annoying in a long run. To avoid that our project uses vibration module for the feedback which is silent. This project is all about a simple hat which can sense the obstacles, potholes around the user who is wearing it. One of the advantage is it has vibration module instead of speaker. Because as mentioned earlier speaker might be annoying in the long run.

III. System Requirement

A. NodeMCU

Fig 1 : NodeMCU

The **NodeMCU ESP8266 development board** comes with the ESP-12E module containing ESP8266 chip having Tensilica Xtensa 32-bit LX106 RISC microprocessor. This microprocessor supports RTOS and operates at 80MHz to 160 MHz adjustable clock frequency. NodeMCU has 128 KB RAM and 4MB of Flash memory to store data and programs. Its high processing power with in-built Wi-Fi / Bluetooth and Deep Sleep Operating features make it ideal for IoT projects.

B. Lidar

Fig 2 : Lidar

Lidar technology is similar to radar and sonar technology which used radio and sound waves. However, Lidar technology is more precise compared to them as they are only able to plot the location of an object from a distance while Lidar is able to generate precise digital 3D representations. This makes them suitable for up close and personal dynamics in various applications like autonomous vehicles.

C. Vibrator Module

Fig 3 : Vibrator Module

Vibration sensor module is good at detecting the small vibrations in the environment. It is widely used in vibration detection products such as car alarm system, motorcycle alarm, theft alarm, etc. This module uses HT45F56 MCU to detect the small output signal from the magnetic type vibration sensor.

D. Ultrasonic Sensor

Fig 4 : Ultrasonic Sensor

Ultrasonic transducers and ultrasonic sensors are devices that generate or sense ultrasound energy. They can be divided into three broad categories: transmitters, receivers and transceivers. Transmitters convert electrical signals into ultrasound, receivers convert ultrasound into electrical signals, and transceivers can both transmit and receive ultrasound.

E. GSM Module

Fig 5 : GSM Module

A GSM modem or GSM module is a hardware device that uses GSM mobile telephone technology to provide a data link to a remote network. From the view of the mobile phone network, they are essentially identical to an ordinary mobile phone, including the need for a SIM to identify themselves to the network.

F. Push Button

Fig 6 : Push Button

A push button is a simple type of switch that controls an action in a machine or some type of process. Most of the time, the buttons are plastic or metal. The shape of the push button may conform to fingers or hands for easy use, or they may simply be flat. It all depends on the individual design. The push button can be normally open or normally closed.

G. React Native Software Application

Expo is a framework and a platform for universal React applications. It is a set of tools and services built around React Native and native platforms that help you develop, build, deploy, and quickly iterate on iOS, Android, and web apps from the same JavaScript codebase.

H. Firebase Cloud Application

Google Firebase is a Google-backed application development software that enables developers to develop iOS, Android and Web apps. Firebase provides tools for tracking analytics, reporting and fixing app crashes, creating marketing and product experiment.
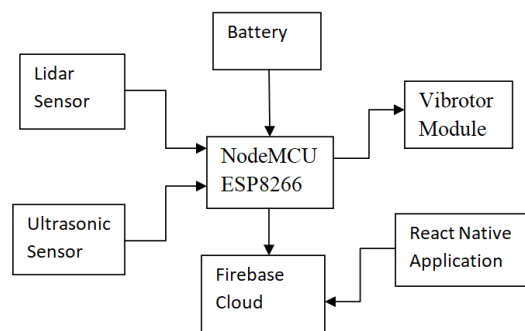
IV.   System Implementation

Fig 7 : Block Diagram

5v chargeable battery is connected to NodeMCU (ESP8266), then remaining battery percentage is calculated and uploaded to the cloud. This module is attached to the cap, then sonar is attached to the left and right side of the cap for obstacle detection of smaller size. Also 4 vibrator modules are fixed to cap at each side. Similarly 2 Lidar sensors are attached front and back side of cap for detect obstacles in 360 degree. Along with this mobile application

development for fetching data from firebase cloud is developed. This is for guardian of blind person. One emergency button is connected to the cap. Alert message sent to the guardian while pressing the button. Using GSM module current location of the blind person will be uploaded to the cloud. Guardian can access the location through mobile application.
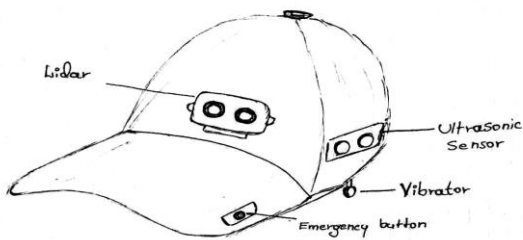
V. RESULT

Fig 8 : Sense Cap

Above figure shows the outcome of the sense cap project. Lidar and ultrasonic sensor will detect the obstacles and potholes. For every object detection vibrator will run. Out of 4 vibrators one vibrator will vibrate, which is in the direction in which obstacle is detected. Like this, cap will ensure the good way for blind person. Along with this guardian can monitor the blind person by accessing his GPS location through mobile application. Also, guardian can monitor battery capacity of the cap for charging purpose. Cap has Emergency button, which can used by blind person in the emergency situation. While this moment alert message will be sent to the guardian.

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Cite this article as :