SMART ASSISTIVE STICK FOR VISUALLY IMPAIRED PEOPLE WITH EMAIL ALERT IN PANIC SITUATION

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Abstract : Evolution of technology has always been endeavored with making daily life simple. With a fast paced life everybody today is harnessing the benefits of technology except some parts of the society. One of them is the visually impaired who have to rely on others for travelling and other activities. This project aims at providing one such practical model which incorporates the latest technology to provide efficient and smart electronic aid to the blind. This project describes about implementation and deployment of system which provides voice assistance to visually challenged people so that they do not rely on others for travelling. This project uses ARM11 based microprocessor for providing voice assistance based on hurdle detected by Ultrasonic Sensors which are embedded on blind stick. Along with voice assistance for travelling, smart blind stick provides an email alert to the registered smart phone when user in panic situation. The objective of email alert is to provide information about location of person to relatives, and to provide GPS Co-ordinates and captured image of the location. For accessing GPS Co-ordinates the system uses GPS module and for capturing image of location camera is used. The complete system uses Raspberry Pi build around using ARM1176JZF-S Microprocessor. This project has interface devices such as camera, Ultrasonic Sensor, GPS, Speakers to microprocessor. This basic goal of the project is to provide a convenient and easy navigation aid for visually challenged person which helps in artificial vision by providing information about static and dynamic object around them.

IndexTerms **– GPS, IoT, Ultrasonic sensor, Raspberry Pi, Speakers.**

I. INTRODUCTION

Blind stick is an innovative stick designed for visually disabled people for improved navigation. We here propose an advanced blind stick that allows visually challenged people to navigate with ease using advanced technology. The blind stick is integrated with ultrasonic sensor along with light and water sensing. Our proposed project first uses ultrasonic sensors to detect obstacles ahead using ultrasonic waves. The main motivation behind this project is to help blind people. As we all know that blind people are facing so many problems nowadays like moving from one place to another place. Blind and visually impaired people find it difficult to travel in unfamiliar places because they do not receive enough information about their location with respect to traffic and obstacles on the way which can be easily seen by people without visual impairment. And blind people always depend on others to move one place and to deal with their needs and all. Blind people or low vision people often have a difficult time self-navigating outside well-known environments. In fact, physical movement is one of the biggest challenges for blind people, explains World Access for the Blind. Traveling or simply walking down a crowded street may pose great difficulty. Because of this, many people with low vision will bring a sighted friend or family member to help navigate unknown environments. As well, blind people must learn every detail about the home environment. Large obstacles such as tables and chairs must remain in one location to prevent injury. If a blind person lives with others, each member of the household must diligently keep walkways clear and all items in designated locations.

Our project "Smart Assistive Stick for Visually Impaired People with Email Alert in Panic Situation" provides so many applications which are very useful to blind people. Our blind stick can help the blind people to overcome their obstacles like moving from one place to other place. This blind stick guides the blind people to move by providing voice assistance and it can also be useful when the blind people are in panic situation by accessing the location and send it to the registered Email IDs.

II. LITERATURE SURVEY

Email alert concept is taken from "IOT based smart home security system with email alert and remote door access" by Shaik Anwar [1] the system is about remotely managed Door accessibility and voice alerting through Smart Phone and receive captured image of visitor at Door as Email alert. Smart home security control system has become indispensable in daily life. The design and development of a home security system, based on human motion detection and remotely monitoring technology, to confirm visitor identity and to control Door accessibility has been reported in this paper. This paper describes about the implementation and deployment of wireless control system and accessibility in to a home environment people only. A PIR motion sensor and Camera module are used to detect motion and capture images respectively are dedicatedly make the security system alive as per the request. Voice operated outdoor navigation system for visually impaired persons done by Somnath and Ravi[2]Use a stick equipped with ultra-sonic sensors, GPS and audio output system. The stick contains GPS which will have SD memory card which used to store different locations. The user can set the location by voice and the GPS will guide the person to his/her distention. This system will also provide the speed and the remaining distance to reach the distention. When the ultra-sonic sensors detect any obstacle directly the voice system will activate the caution voice. This system can be classified as a low cost system affordable by the user. In addition to that, it can provide a voice guide for the user with greatest possible accuracy. The system uses the ARM processor which has more memory space, so that the operating speed is high. However, this system cannot operate indoors

because there will be no signal for the GPS system. The accuracy of the GPS signal need to being proved because it only can be controlled within 5 meters radios. Finally, the blind person needs to be trained on the system so that he or she can use it effectively.

MohdHelmyabdWahab and Amirul A. Talibetal[3] developed a cane could communicate with users through voice alert and vibration signal). Ultrasonic sensors are used to detect obstacle in front, since ultrasonic sensors are good in detecting obstacle in few meters range and this information will be sent in the form of voice signal. This voice signal is send via speaker to the user. Here blind people might find it difficult in travelling without any emergency alert rather than having only ultrasonic sensors.

Alejandro R. Garcia Ramirez and Renato Fonseca Livramento da Silvaetal[4] designed an assistive technology device called the electronic long cane to serve as a mobility aid for blind and visually impaired people .The author implements the cane with an ergonomic design and an embedded electronic system, which fits inside the handle of a traditional long cane. The system was designed using haptic sensors to detect obstacles above the waistline. It works in such a way when an obstacle is detected; the cane vibrates or makes a sound. However this system only detects obstacle above the waistline.

Our project "Assistive Stick for Visually Impaired People with Email Alert in Panic Situation" provides so many applications which are very useful to blind people. Our blind stick can help the blind people to overcome their obstacles like moving from one place to other place. This blind stick guides the blind people to move by providing voice assistance and it can also be useful when the blind people are in panic situation by accessing the location and send it to the registered Email IDs.

III. BLOCK DIAGRAM

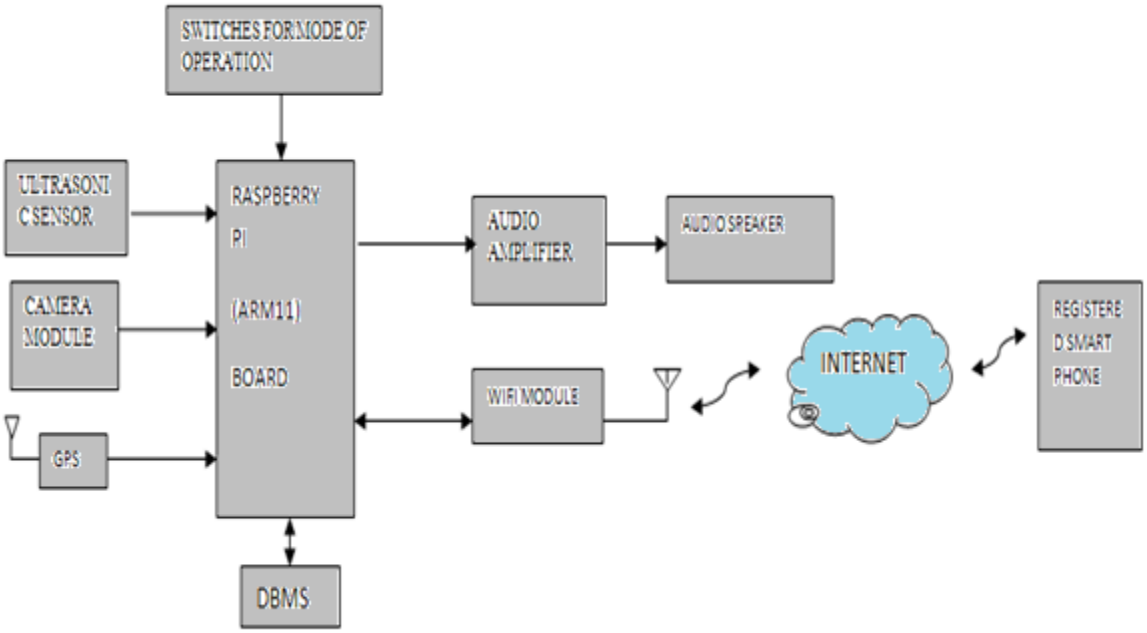

Fig 1 Block diagram

This project describes about implementation and deployment of system which provides voice assistance to visually challenged people so that they do not rely on others for travelling. This project uses ARM11 based microprocessor for providing voice assistance based on hurdle detected by Ultrasonic Sensors which are embedded on blind stick. Along with voice assistance for travelling, smart blind stick provides an email alert to the registered smart phone when user in panic situation. The objective of email alert is to provide GPS Co-ordinates and captured image of the location. For accessing GPS Co-ordinates the system uses GPS and for capturing image of location camera issued.

IV. HARDWARE IMPLEMENTATION

Raspberry Pi board [5] is a miniature marvel, packing considerable computing power into a footprint no larger than a credit card. The processor at the heart of the Raspberry Pi system is a Broadcom BCM2835 system-on-chip (SoC) multimedia processor. This means that the vast majority of the system's components, including its central and graphics processing units along with the audio and communications hardware, are built onto that single component hidden beneath the 512MBmemory chip at the centre of the board. It's not just this SoC design that makes the BCM2835 different to the processor found in your desktop or laptop, however. It also uses a different instruction set architecture (ISA), known as ARM. The Raspberry Pi, by contrast, is designed to run an operating system called GNU/Linux Raspbian. Here after referred to simply as Linux. Unlike Windows or OS X, Linux is open source: it's possible to download the source code for the entire operating system and make whatever changes you desire.

Features of the Raspberry Pi

- Model B+ Raspberry Pi with Mounting Pointsand
- 512MBRAM.

- Broadcom BCM2835 ARM11 700MHz
- Integrated Video core 4 Graphics GPU capable of playing
- Full 1080p HD Video.
- 4 x USB Ports (Max Output 1.2A).
- Board Power Draw:600mA.
- HDMI Video Output.
- 10/100Mb Ethernet Port for Internet Access.
- Micro SD Flash Memory Card Slot.
- 40-pin 2.54mm Header Expansion Slot (Which allow for peripherals and expansion boards)Dimensions 85 x 56 x 17mm.
- The Raspberry Pi is boot by external memory card with RaspbianJessie images.

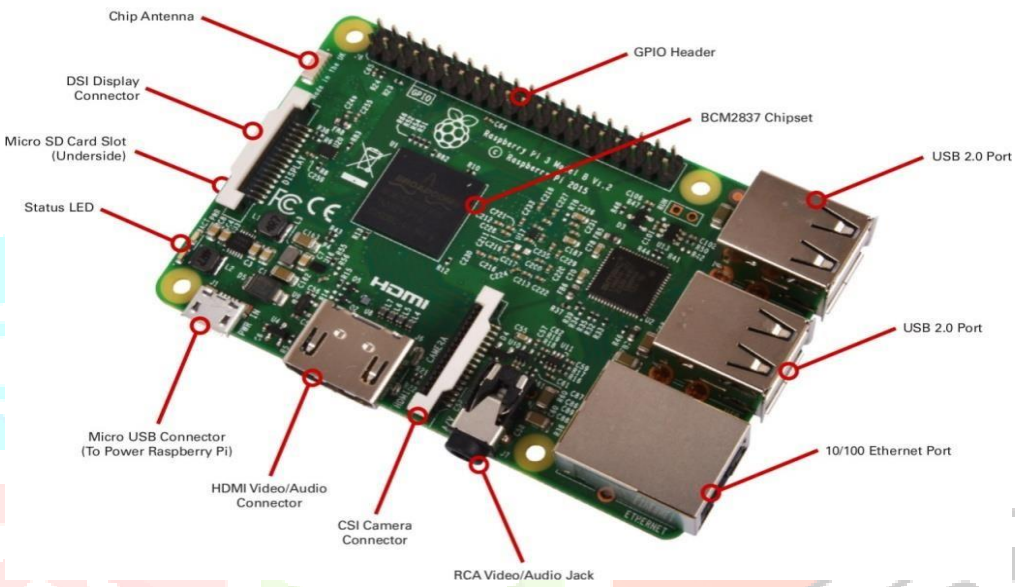

Fig 2 Raspberry Pi3

Raspberry Pi Camera Module

The Raspberry Pi Camera Module is a custom designed add-on for Raspberry Pi. It attaches to Raspberry Pi by way of one of the two small sockets on the board upper surface. This interface uses the dedicated CSI interface, which was designed especially for interfacing to cameras. The CSI bus is capable of extremely high data rates, and it exclusively carries pixel data. The board itself is tiny, at around 25mm x 20mm x 9mm. It also weighs just over 3g, making it perfect for mobile or other applications where size and weight are important. It connects to Raspberry Pi by way of a short ribbon cable. The camera is connected to the BCM2835 processor on the Pi via the CSI bus, a higher bandwidth link which carries pixel data from the camera back to the processor. This bus travels along the ribbon cable that attaches the camera board to the Pi. The sensor itself has a native resolution of 5 megapixels, and has a fixed focus lens onboard. In terms of still images, the camera is capable of 2592 x 1944 pixel static images, and also supports 1080p30, 720p60 and 640x480p60/90 video. The camera is supported in the latest version of Raspbian, Raspberry Pi's preferred operating system.

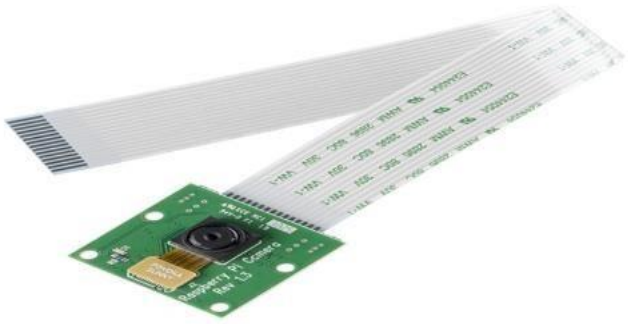

Fig 3 Raspberry Pi Camera Module

Ultrasonic Sensor

Ultrasonic transducers are transducers that convert ultrasound waves to electrical signals or vice versa. Those that both transmit and receive may also be called ultrasound transceivers; many ultrasound sensors besides being sensors are indeed transceivers because they can both sense and transmit. These devices work on a principle similar to that of transducers used in radar and sonar systems, which evaluate attributes of a target by interpreting the echoes from radio or sound waves, respectively. Active ultrasonic sensors generate high-frequency sound waves and evaluate the echo which is received back by the sensor, measuring the time interval between sending the signal and receiving the echo to determine the distance to an object.

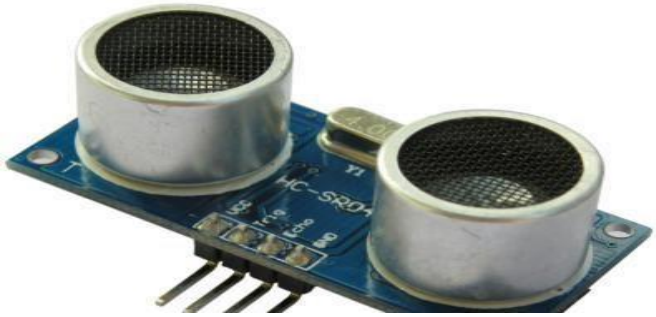

Fig 4 Ultrasonic sensor

WIFI Module

ESP8266 was designed by the Chinese company Espressif Systems for uses in Internet of Things (IOT) systems. ESP8266 is a complete Wi-Fi system on chip that incorporates a 32-bit processor, some RAM and depending on the vendor between 512KB and 4MB of flash memory. This allows the chip to either function as a wireless adapter that can extend other systems with Wi-Fi functionality, or as a standalone unit that can by itself execute simple applications. Depending on the specific module variant (ESP-1 to ESP-12 at the time of this thesis) between 0 and 7 General Purpose Input/output (GPIO) pins are available, in addition to Rx and Tx pins of the UART, making the module very suitable for IOT applications. The Software Development Kit (SDK) provided by Espressif contains a lightweight implementation of a TCP/IP control stack (lwIP) for Wi-Fi communication.

GPS

GPS is primarily a navigational system, so a background on navigation will give insight as to how extraordinary the Global Positioning System is People first navigated only by means of landmarks - mountains, trees, or leaving trails of stones. This would only work within a local area and the environment was subject to change due to environmental factors such as natural disasters.

Class D Amplifier LM384

A Class D audio amplifier is basically a switching amplifier or PWM amplifier. This class of amplifier is the main focus of this application note. In this type of amplifier, the switches are either fully on or fully off, significantly reducing the power losses in the output devices. Efficiencies of 90-95% are possible. The audio signal is used to modulate a PWM carrier signal which drives the output devices, with the last stage being a low pass filter to remove the high frequency PWM carrier frequency.

User Keys

There are two types of user keys in this project. We considered push buttons as user keys.
User key 1: This key is used to sent an e-mail alert to destination in case panic situations
User key 2: This key is used to activate either image mode or video mode. By default video mode is enabled in the system in order to provide live video to the owner.

Database

A database is a systematic collection of information that is organized so that it can be easily accessed, managed and updated. Databases support storage and manipulation of data. Databases make data management easy. In this project we are using a memory card as database.

IV. SOFTWARE IMPLEMENTATION

IOT Platform

The term “Internet of Things” (IOT), coined by Kevin Ashtonin1999, has been in use for several years and continues to be of interest, specifically when it comes to technological progress. IOT refers to giving objects representation in the digital realm through giving them a unique ID and connecting them in a network. In other words, these things are connected to the internet and are able to automatically transfer data without relying on human interaction. Hence being “Machine to Machine” (M2M) interaction. Essentially, M2M interaction enables networked devices to exchange data and perform actions without the input or assistance of humans, for instance in remote monitoring. But this is not necessarily the case. For instance, one can envision the IOT to become an important feature of the ‘home of the future’, where one can begin pre-heating the oven just before they get home from work via a (mobile) application. Hence, the IOT has many interesting applications that can be applied to both individuals and corporations.

Operating Principles

For the purpose of connecting an object to the IOT, we focus on the Thing speak API. The interface provides simple communication capabilities to objects within the IOT environment. Moreover, Thing speak allows you to build applications around data collected by sensors. It offers near real-time data collection, data processing, and also simple visualizations for its users. Data is stored in so-called channels, which provides the user with a list of features. Each channel allows you to store up to 8 fields of data, using maximum of 255 alphanumeric characters each. There are also 4 dedicated fields for positional data, consisting of: Description, Latitude, Longitude, and Elevation. All incoming data is time and date stamped and receives a sequential ID. Once a channel has been created, data can be published by accessing the Thingspeak API with a 'write key', a randomly created unique alphanumeric string used for authentication. Consequently, a 'read key' is used to access channel data in case it is set to keep its data private (the default setting). Channels can also be made public in which case no read key is required.

V. RESULTS

Our project "Smart Assistive Stick for Visually Impaired People with Email Alert in Panic Situation" provides so many applications which are very useful to blind people. Our blind stick can help the blind people to overcome their obstacles like moving from one place to other place. This blind stick guides the blind people to move by providing voice assistance and it can also be useful when the blind people are in panic situation by accessing the location and send it to the registered Email IDs.

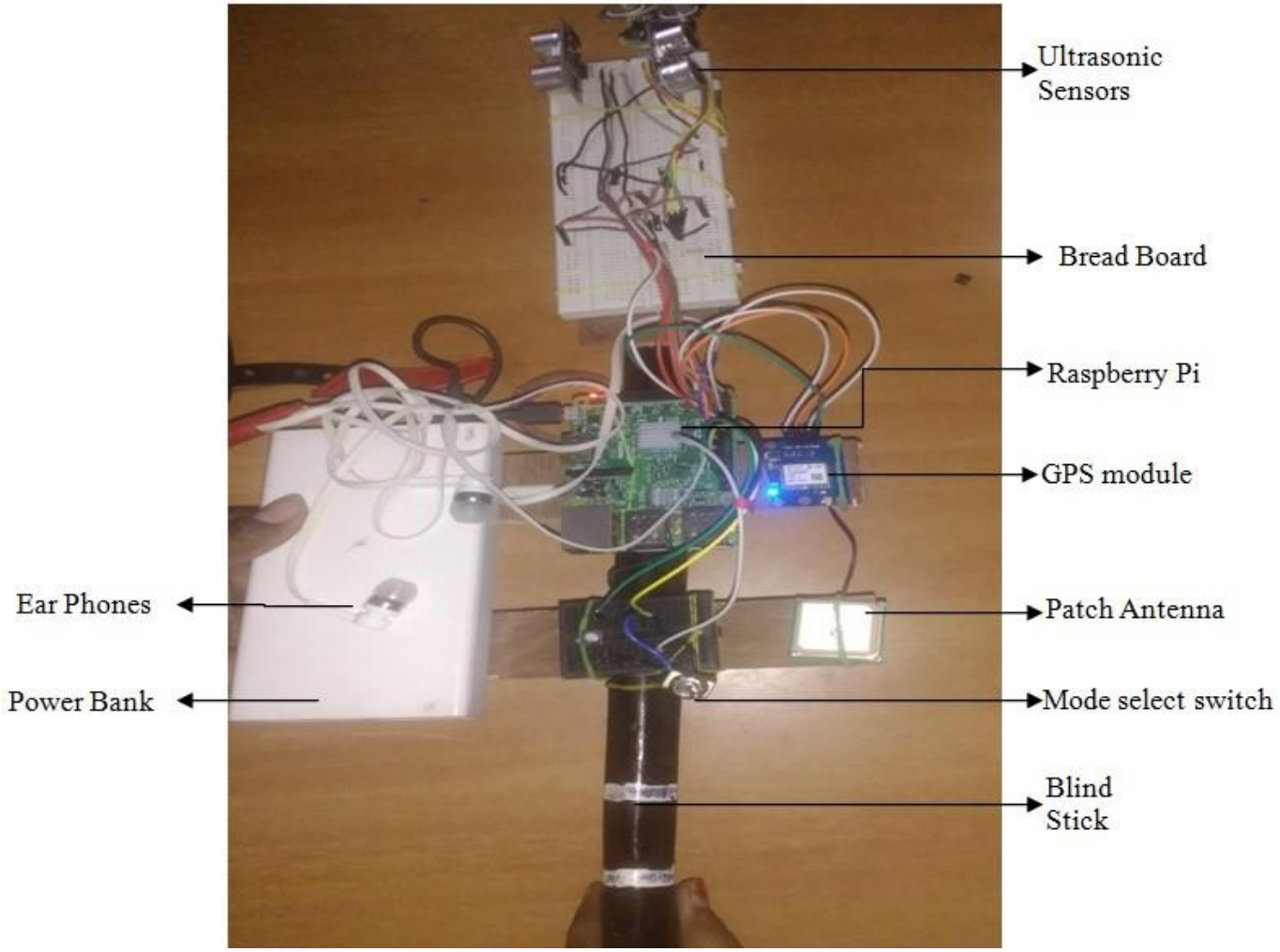

Fig 5 Blind stick

The Email Alert is very important role of the blind stick. If a blind persons unaware of the location of which he has to go or if he is misguided to the exact location of which he has to go then an Email Alert has sent to his family members tracing about his destination location.

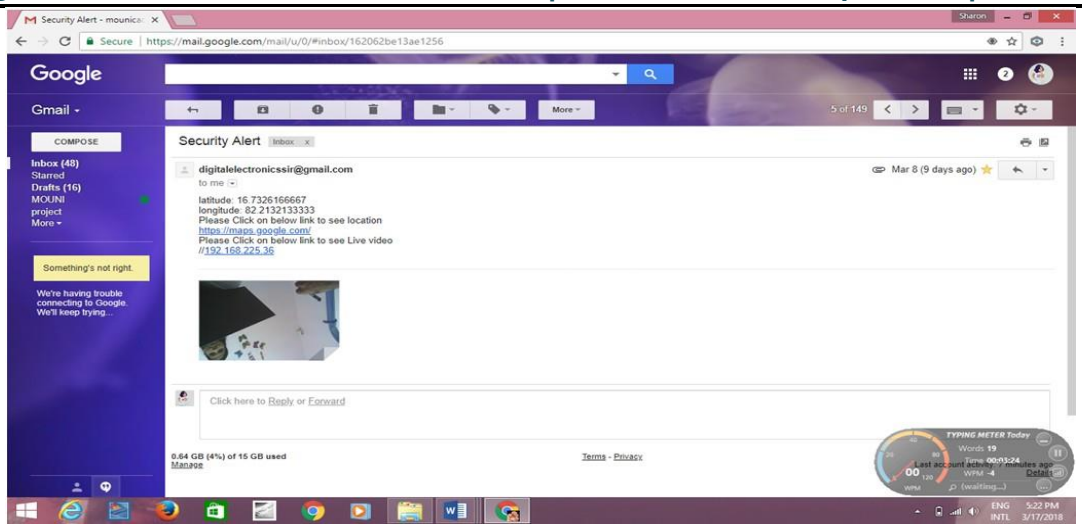

Fig 6 Email Alert

By using GPS we can track the exact location of the blind person if he is lossed his way.

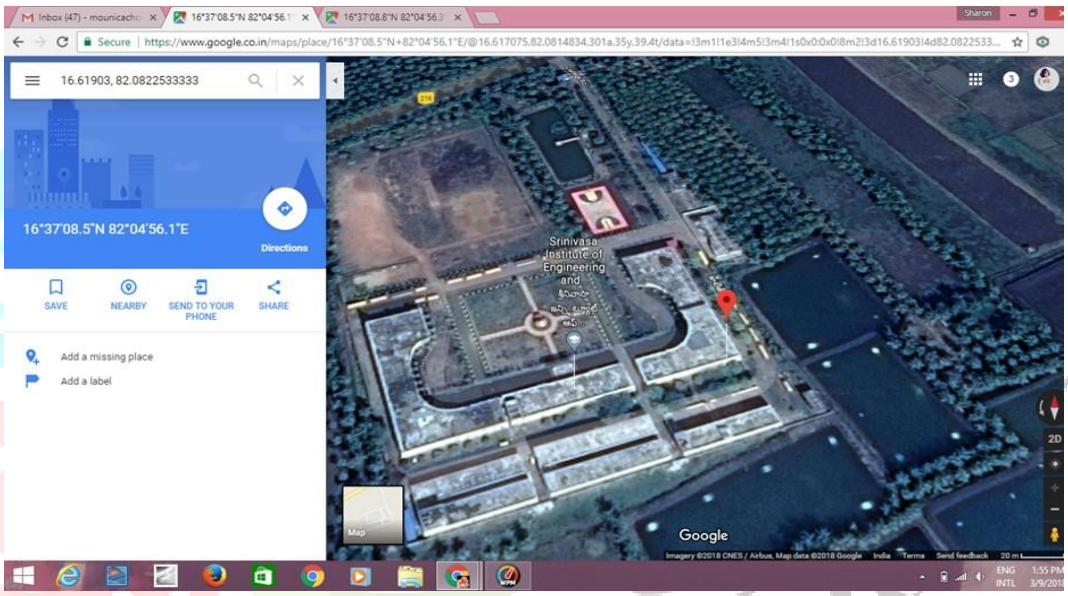

Fig 7 Location Tracking

VI. CONCLUSION

This paper presents the design and the implementation of a smart blind stick which can be very helpful to the blind people. This blind stick can help the blind people to move from one place to other place by providing voice assistance. And it also provides email alerts to the registered email IDs by accessing the location through GPS sensing. Our proposed project first uses ultrasonic sensors to detect obstacles ahead using ultrasonic waves. This project describes about implementation and deployment of system which provides voice assistance to visually challenged people so that they do not rely on others for travelling. This project uses ARMII based microprocessor for providing voice assistance based on hurdle detected by IR Sensors which are embedded on blind stick. Along with voice assistance for travelling, smart blind stick provides an email alert to the registered smart phone when user in panic situation. The objective of email alert is to provide GPS Co-ordinates and captured image of the location. For accessing GPS Co-ordinates the system uses GPS and for capturing image of location camera issued.

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