



Smart Vision Provider

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ABSTRACT--Our eyes are organ of vision it plays a very important role in our life as well as human body. Eye which gives us the sense of sights, allowing us to learn, see and interpret the shapes, colors, greenery, entertainment and dimensions of objects, nature in the world. Some type's blindness can be cured by medical but some of them not cured by medical. For that type of peoples, we want to help by means of the smartphones & android apps. The main problem faced by the blind peoples are road crossing at the traffic signal and the obstacle in the path way. There are many hurt for blind peoples due to the above situations. In this paper we narrated that by using our ideas they can easily know about direction, street name, traffic signal status, distance and height of the obstacle. Nowadays all are having their Smartphone; so the requirement for this idea is simply a smartphone&app. from the user side. So while considering the cost it will be very less so many of blind peoples use it effectively so that many accidents can be reduced and we will give them a vision technically.

1) Introduction

Blindness is the main disability than compared to other disabilities. Eyes are the gift of god. Without vision we can't see the beauty of nature, color, entertainments etc. This can't be fully resolved but their

difficulties can be reduced by technologies. Our idea also helps them from road crossing and obstacle detection by a smartphone and android app.

1.1) Statistics

According to the facts published by the World health Organization (WHO) in 2012, there are 285 million people are to be estimated as visually impaired in worldwide. In this 39 million peoples are blind and 246 million have low vision. The sad detail about the fact is that in 39 million of peoples nearly 16 million of peoples lived in India and this status moves India to No.1 position in large blind people holders is shown in fig 1. About 90% of the worlds visually impaired peoples lived in developing countries.



Fig.1 Statistics by WHO for India

1.2) Current technologies

Many ideas can be used by the pedestrians for road crossing like guide dogs; pushbuttons etc.the guide dogs which are trained by the private companies sell it to help blind people. A collar which is surrounds the neck of dog will helps used the pedestrians to cross roads is shown in fig. 1.1(a).Another method is using push buttons in the near of traffic signal post. Normally there are two type of push button. First one is that when pushbutton is pressed it gives sound alert to blind peoples when walk signal is on second type is that it contains rotating knob. When the walk signal ON the knob will starts to rotate .by sensing the rotation by means of hand they can easily identify the walk signal is shown in fig 1.1(b).

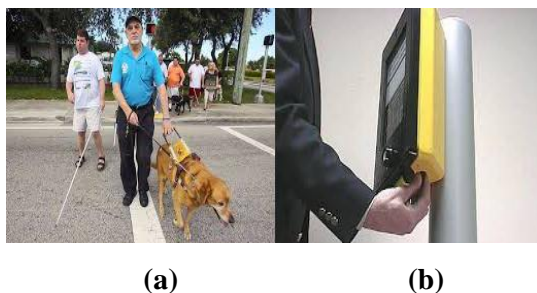


Fig.2.a& 2.b Guide dog & Push Button

1.3) Problems

The problems of using guide dogs are they can be easily distracted and they do not have any self thought to act at any situation.They get confused when the traffic rules get changed so that it leads to accidents.In using pushbuttons if there is any fault in rotating knob it starts to rotate this will also leads to accidents.

2) Our Idea

The problem in current technology can be eliminated using our idea that already told that the difficulties for blind people are road crossing and obstacle detection. For road crossing the app. tells the street name, direction and time left to cross etc. for that we simply use a Smartphone and android app. For obstacle detection it tells the height and distance of the object from the user for



that we use a circuit with ultrasonic sound sensor that can be interface with Smartphone by Bluetooth.

3) Components for Road Crossing

For road crossing we use Traffic Controller Cabinet, Data Collection Unit. Data Base Server, USB IO, TTS etc. are shown in fig 3.

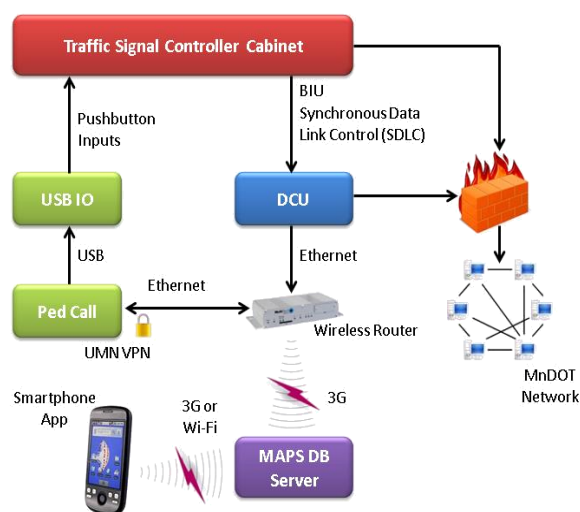


Fig .3 Components Used for Road Crossing

3.1) Traffic Controller Cabinet

A traffic signal is typically controlled by a controller inside a cabinet mounted on a concrete pole is known as traffic controller cabinet. The cabinet typically contains power panel, to distribute electrical power in the cabinet, a detector interface panel, to connect to loop detectors & other detectors, detector amplifier, monitor unit, flash transfer relays etc. A type of TS-1 standard controller was introduced in 1976 is shown in fig.4. Traffic controller use the concept of phases, which are directions of movement grouped together. for example, a simple intersection may have two phases: North/South & East/West. A 4 way intersection has eight phases. In this idea we use dynamic time control type traffic controller. The system adjusts signal phasing and timing to minimize the delay of people going through intersection. The controller uses input from detectors, which are sensors that the controller processor receives request from whether vehicles or other road users are present. Here main purpose of traffic controller cabinet is providing timing and phasing information.

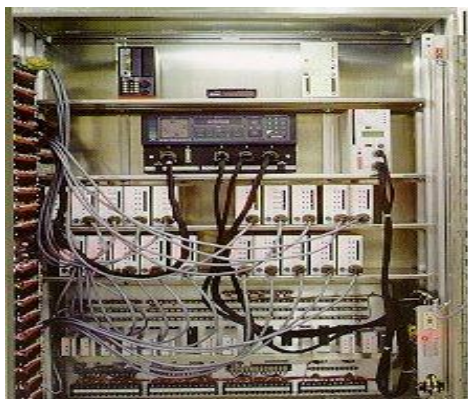


Fig.4 Traffic Controller Cabinet

3.2) Data Collection Unit

Data Collection unit is the important part in the hardware side. It is mainly used to provide current status of the signal. In order to provide real-time signal and timing data, the DCU continuously monitors the states of signal phases, pedestrian walk sign, and loop detectors. When there is a signal phase or a detector state change, the DCU will transmit a text string to a server as well as to the user. The DCU unit has been triggered by inductive loop detector, pedestrian calls and phasing changes. For example, a signal state change will generate the following string output string.

String Ex: S01010143120302031545NW40.

From above code user and intersection details can be easily identified.

Intersection ID: S0101

User ID: 0143

Date: 01-02-14(DD-MM-YY)

Time: 03:15:45

Direction: N-North

Status: W-Walk

Duration: 40 sec

.end of string

In this string W shows that walk sign is on and 40 sec remaining to cross road. If a signal changes then DCU produce string like,

S01010143010214031545NDW55.

Here DW states that don't walk for 55 sec.

3.3) Data Base Server



A database server contains the details & they store intersection spatial information, signal timing and pushbutton requests, user details. It stores two types of data's. First one is, at starting if a user wants to use this application he/she should register his mobile number, IMEI number and should provide his details in the register center the details will be stored in the data base server. Once the detail has been received he will be allocated with separate ID for his mobile number with that only user can able to access traffic signal. Second type is that, status changing details in DCU also stored in the data base server. The database server allows data communications between the Smartphone user application and a traffic signal controller.

3.4) Ped Call and USB-IO

An USB-IO module is connected before the controller which is a relay operated device. When request is send by the user it can be detected by the Ped call and the relay get closed to make contact to the USB to traffic controller cabinet. So the data was sent to the DCU.

3.5) Security and Wireless Comm.

For Security, already told that each user can be allocated with separate ID that will prevent unauthorized remote access. Also a Private Network is provided to stop data stolen from Data Base Server.

The Communication between controller and mobile phone can be achieved by using Wi-Fi or bluetooth. Nowadays all people have Wi-Fi enabled Smartphone this makes idea more simple.



Fig. 5 Security from Data Stolen

4) Obstacle Detection

Ultrasonic sensor that are used for distance measurement using sound waves. In this idea we also use this sensor to calculate height and distance measurement of the object from the user.

4.1) Ultrasonic Sound Sensor

Ultrasonic sensors it is also known as transceivers because they can send and receive waves both operation. A typical model of sensor is shown fig 6. Basically work on a principle similar to radar or sonar which evaluates attributes of a target by interpreting the echoes from radio or sound waves respectively. Ultrasonic sensors generate high frequency sound waves and evaluate the echo which is received back by the sensor. Sensors calculate the time interval between sending the signal and receiving the echo to determine the distance to an object. Here for object height and distance detection we use three sensors called ground, lower and upper



sensors. The ground & lower sensors are used for detection of distance of object from the user. als lower & upper sensors are used for detecting height of objects.



Fig. 6 Ultrasonic Sound Sensor

4.2) IOIO Board

Another main component of obstacle detection is IOIO board is shown in fig 7. This board is used to connect the sensors input to the external devices using either by USB or wireless Bluetooth connections. This app uses the IOIO Lib. software library to send the sensor data over Bluetooth from the IOIO to the phone.

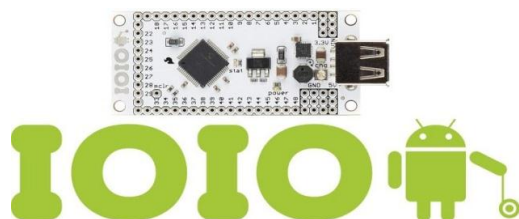


Fig. 7. IOIO Board for Android

4.3) Sensor Arrangement

In order for the setup to work reliably, the IOIO board, sensor array, and 9V battery had to fit in such a way that the electronics would be secure, steady, and removable. All these requirements had to be met without disturbing or interfering with the natural movements of the user. This necessary to design and construction an enclosure for the electronics. The system uses three Maxbotix LV series ultrasonic sensors for obstacle detection. The enclosure has been placed on the cane. This placement was designed to detect objects in front of the user and to provide details of height and distance of the object from the user.

4.4) Measurements

The distance of object from user can be calculated before that the distance travelled by individual sensors are calculated first by,

$$\text{Distance} = \frac{1}{2} (\text{speed of sound}) \times (\text{round trip delay}).$$

5) Text To Speech (TTS)



The most important application in Smartphone is Text to Speech. The above told components that provide details in the form of text only. But the blind peoples can't able to see. You have questioned how the user can get the detail? The answer is by means of Text To Speech Application. This app. converts the text into audible sound that can be heard by the user. For example, the Voice Over screen reader feature on iPhones allows the device to speak the content in the screen. It also allows people with vision impairments to interact with the device. Many mobile companies like Apple, HTC etc. have this type of application which is developed by Android.



Fig. 8 Speak By Android Phone

6) Android the Legend

Android is an operating system based on the Linux kernel, and designed primarily for touch screen mobile devices such as Smartphone's and tablet computers. Initially developed by Android, Inc., which Google backed financially and later bought in 2005. The first publicly available Smartphone running Android, the HTC Dream, was released on October 22, 2008. In other Operating system we select to use Android because by using Android we can create any type of applications is shown in fig 9. Nowadays it reaches 11, 00,000 applications.



Fig.9 Apps. By Android

7) Working of App.

From the fig we can easily understand the operation of this system that when the user wants to access the traffic signal details first he/she should register his mobile number & IMEI number



for security purposes. Every traffic controller has been provided with a particular limit of Bluetooth and separate ID. When a user comes near the traffic signal the mobile alerts the traffic signal ID (EX: Raja street 04).By using that registered mobile he can send request signal to server via either 3G or Bluetooth connections. Once a signal receives and it turns the Ped call to on through router. USB-IO is normally a switch when a request send, it get closed and make connection between the traffic controller cabinet and USB input. Traffic controller cabinet which provides timing and phasing sequences which is collected by Data Collection Unit by above explained string format it provides current details about changes in traffic signal. The user can get the traffic signal details using the same router. The wireless router/modem will not be necessary when the signal data can be accessed through the MnDOT's firewall in the future. Normally the input from the blind peoples is two types; single tap command and double tap command.

7.1) Single Tap Command:

Single Tap command is nothing but touching the screen at one time. It is used to know the street name and Direction. For ex. When a user point out some direction and perform single tap then it says (“Left Anna Nagar”) by that user can identify his required route by changing the direction.

7.2) Double Tap Command

Double Tap command is touching screen for two times. Double tap command is used for knowing details about walk signal. While pointing the phone toward a desired direction of crossing, the double-tap input will confirm the crossing direction and submit a request for pedestrian walk signal. The Smartphone application will then wirelessly request signal timing and phasing information from the traffic signal controller. For example, the Smartphone will announce **“Wait 25 Sec. for Walk Signal”** every 5 seconds after a double-tap. As soon as the walk sign is on, the Smartphone will vibrate for 1 second to alert the user and then announce, **“Walk Sign ON Walk Within 40 sec.”** When it's about 5 seconds before the ending of a walk phase, the Smartphone will vibrate again then announce **“5 Seconds left”** to alert the user finishing the crossing soon is shown in figure 10.



Fig.10. Single, Double tap in Mobile

8) Obstacle Detection

If any obstacle is present in the path of the user it can be detected by the sensors. Normally three sensors send ultrasonic sounds continuously to measure the distance of objects from the user when the sound gets reflected. For example, consider an object of small size in 2 meter distance from the user. The ground sensor always points to the ground & the distance can be measured by using the angle made by the ground & lower sensors by detection algorithm in Smartphone. The height can be measured by the angle made by the lower & upper sensors. Normally the height can be told as either low (bench, dustbin, etc) or high (tree, wall, etc). The details from the sensors are transmitted to the Smartphone by IOIO board by using Bluetooth. Then the Smartphone will calculate distance & height by detection algorithm app. in mobile and announce **“Objects in the distance of 2 meters and low size”**. Then it continuously alerts the user for 5 sec with current distance at that time. The flow chart shown in fig.11

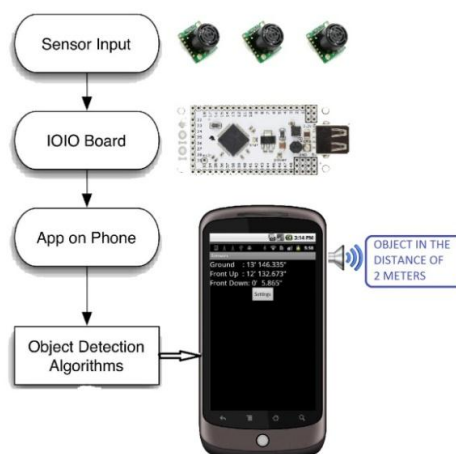


Fig.11 Functional Chart of Obstacle detection

9) Advantages

By implementing this idea in future there is no need of guide dogs, pushbutton or any type of help to them. Accidents will be reduced. It can be used by any type of peoples because by considering cost it becomes very low and operating is very simplest concepts of performing tap commands only.

10) Our Future Vision

By the growth of technology our idea can also be graded up by, The Data Collection Unit will not be needed if Traffic Controller Cabinet has also able to send the data. In this idea we use Ultrasonic sound sensor for obstacle detection it can also possible to use camera which analyze the object it can gives details about distance, height and width also. But in this we also consider the cost also so we use ultrasonic model. But in future the wireless camera of low price which is fixed in the shirt and transfer data by Bluetooth is also possible. We believe that In future the system becomes simpler now we have planned and using camera we can also find accurate height & width.

11) Conclusion

Born with Blindness is very horrible one. But we sure that our idea will helpful to forget their blindness in situations of road crossing & Obstacle in path. Our Idea will change the blinders world because they can free to walk don't worry about signals, obstacle and they need no others help. There is another chance to make them without blindness that is "EYE DONATION". So donate eyes and enlighten others Life after our die.



12) Reference

- [1] http://en.wikipedia.org/wiki/Ultrasonic_sensor.
- [2] http://en.wikipedia.org/wiki/Pedestrian_crossing
- [3] [http://en.wikipedia.org/wiki/Android_\(operating_system\)](http://en.wikipedia.org/wiki/Android_(operating_system))