ADRISHTI-A STEP TOWARDS ALTERNATE VISION

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Abstract - *Visually disabled people come across many challenges on daily basis, some challenges are new and some routine. Since blind people cannot detect the obstacles or move to any destinations without being independent. Most of the times the blind typically use traditional canes that cannot detect the objects higher than the waist.*

The prototype consists of two modules namely the phone module and shoe module. The shoe module is incorporated with a lightweight controller device and sensors whereas the phone-module includes GPS system. The controller in the shoe module is attached with Bluetooth transceiver which syncs to a smart phone app that uses Google maps to direct the person and facilitates the user by providing the information about the path. Once the user selects the destination then the route is laid, the direction is constantly updated to allow the user to go according to the pattern from being dynamically adaptive and avoid any diversion from a planned directional path. The signal sent from the phone module will be determined by the Bluetooth and a corresponding message is sent to the controller in the shoe module. The major objective in this paper is to keep the device smart and cost efficient. The software used is reliable and stable.

Key Words: Blind, GPS, Bluetooth module(HC-05), LCD display, Renesas microcontroller, Ultrasonic sensor.

1. INTRODUCTION

Generally, visually disabled persons are reliant on cane sticks and other people either for asking directions or completely depend on them for moving from one place to other. Currently, technologies like Google Maps and other navigational apps on mobile devices are the primary sources of finding a better route. On comparison mobile based map application offers wide range of information over the normal paper maps. However, the use of mobile based map application requires visual attention of the user. Special tactile maps are designed for the blind people to navigate easily in new places. Understanding tactile maps requires more effort and they fail to provide accurate information whether the user is on the right path or not. On the contrary, the audio feedback along with the mobile based map application can serve visually impaired people to navigate with ease. This also minimizes the effort which in turn helps them in better understanding of their path.

Considering all these resources we intend to apply this in our technology helping the blind to reach their destination with ease. Once the user (blind/guardian) insert destination and choose a route, he can amicably move with help of audio output guiding through the path. Destination can be set through Google speech-to-text converter which is an inbuilt feature in device application and makes more user-friendly for visually challenged person to navigate. Ultrasonic sensors are integrated with the shoe that detect obstacles in the path and provides audio feedback so that collision can be avoided and helps the visually challenged person to navigate easily and reach the destination.

2. OBJECTIVE

The main objective is to assist blind people to navigate with audio output by detecting the obstacles ahead. To develop a prototype with high accuracy and better comprehensibility. The prototype aims at providing low weight product with immediate sensory feedback.

To develop a user friendly application software which will help the user to operate the prototype easily. A feature that enables the user to know the exact location through audio output with the help of GPS. The product must be economically feasible and should be open for future upgrades.

3. METHODOLOGY

The shoe module in prototype consists of microcontroller, ultrasonic sensor, moisture sensor, Bluetooth module and an LCD display panel. The microcontroller in the shoe module is attached with Bluetooth transceiver which syncs to a smart phone app that uses Google maps to notify the user turn-by-turn information. Moisture sensor detects the humidity.

Bluetooth module(HC-05) acts as two-way communication, commands and information is exchanged between controller and mobile. Alternate technologies like ZigBee, Wi-Fi can be used for faster rate of communication between the shoe module and the phone module. Once we set the destination, the direction is constantly updated to allow the user to go according to the pattern from being dynamically adapted to any wrong deviations from a planned directional path. Once the obstacle is determined by ultrasonic sensor a speech output is given by the device. The ultrasonic sensor will continuously emit ultrasonic waves so when any obstacle is encountered the receiver receives the reflected signal and notifies the user.

The phone module must be a smartphone with GPS and should install an app which controls and communicates with the shoe module. The exact location can be determined by switching the power button five times consecutively.

4. LITERATURE SURVEY

This chapter explains about a device that helps visually impaired people. It acts as an assistive device that is smart as it uses artificial navigating system together with ultrasonic proximity sensor that has adjustable sensitivity and a GPS module which helps the user to move easily and independently in any environment. Physically disabled people face many problems on a daily basis, so that motivated to help the people with the use of existing technology and make their life easier and trouble free.

One often encounter a number of challenges while navigating in indoor and outdoor environments. In such situations the blind people face difficulty in locating, finding the path and to avoid the obstacles. Therefore, a navigation system enabled shoe has been developed and tested on number of individuals. The navigation system and sensors used in it are all low cost, small volume and easily integrated. It uses speech to text voice recognition technology which enables him to command and communicate with the device with ease.

Not always any blind person can afford all the time to reach a certain place. The time constraint plays an acute role in everyone's life. So the navigational device is not only smart but helps the blind people to save time of asking directions. It helps to overcome the reliance on other people and become independent. The navigational system eliminates the possibility of complex user interface and provides an easy user friendly software with only small time practice enables the user to control the system easily.

5. BLOCK DIAGRAM

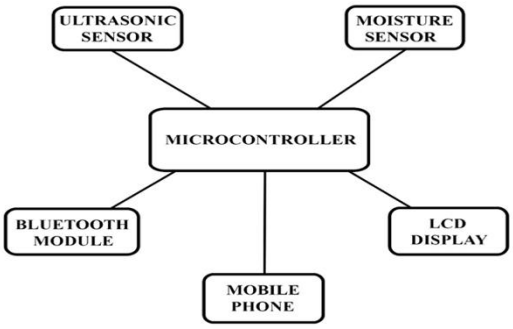

Fig1 - Functional Block diagram

6. HARDWARE AND SOFTWARE REQUIREMENTS

6.1 HARWARE COMPONENTS

6.1.1 RENESAS MICROCONTROLLER

Reansas microcontrollers are widely known for their low level power consumption with supply voltage varying from 1.6 - 5.5 volts. The RL78/G13 microcontroller provides high performance with accurate output and the execution time can be varied from 32Mhz - 32kHz. It consists of 64 pins which include code flash memory, DMA

Fig2 - Renesas microcontroller

controller, high-speed on-chip oscillator, serial interface, data flash memory and more. Renesas microcontrollers are used in many applications such as home appliance, security, office automation and healthcare.

6.1.2 ULTRASONIC SENSOR

Ultrasonic sensor emits the ultrasonic waves from the transmitter and receiver receives the emitted signal bounced back from the obstacle. VCC, trigger, echo and ground are the four pins available in the sensor. It works on the formula Distance = Speed x Time. The ultrasonic sensor measures the distance between 2cm-80cm.

Fig3 - Ultrasonic sensor

6.1.3 MOISTURE SENSORS

Moisture sensor measures the water content in the soil. The water content in the soil is measured in terms of percentage with help of dielectric constant, electric resistance and interaction with neutrons. The working temperature of moisture sensor is between 10 degrees to 30 degrees Celsius.

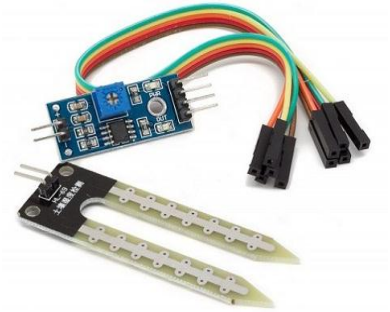

Fig4 - Moisture sensor

6.1.4 BLUETOOTH MODULE

Bluetooth is a technology for wireless communication. It is short range and the communication between bluetooth and microcontroller takes place via seril port. The operating frequency of HC-05 Bluetooth module is 2.4 GHz. It is used in electronic devices like television, mobile phones etc.

Fig5 - Bluetooth module

6.1.5 LCD DISPLAY

Liquid crystal display works on two modes 4-bit and 8-bit. It consists of two rows each rows can diplay upto 16 charecters. Charecters can alphanumeric that is both alphabets and numbers can be diplayed. Operating voltage is between 4.7-5.3 volts. LCD displays are much thinner compared to cathode ray tube.

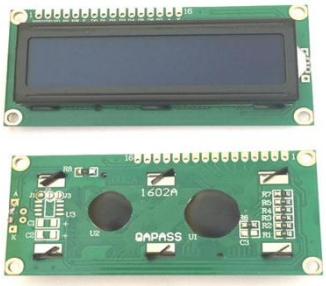

Fig6 - LCD display

6.1.6 Li-ion BATTERY

Li-ion is a portable rechargeable battery. It is widely used in electronic devices,elcetric vehicles and also in military and aerospace application. The voltage capacity is 12 volts with sleep mode conception less than 2mA.

Fig7 - Li-ion battery

6.1.7 MOBILE PHONE

The smartphone should be GPS enabled with proper internet. An app called adrishti must be installed, with the help of this app the location of the user can be traced and its signals the user on reaching the destination point. The app uses the bluetooth module to interact with the shoe module.

Fig8 - A smartphone device

6.2 SOFTWARE REQUIREMENTS

- IDE: Renesas Microcontroller
- Operation system: Renesas flash programmer
- App name: Adristhi

7. FLOW CHART

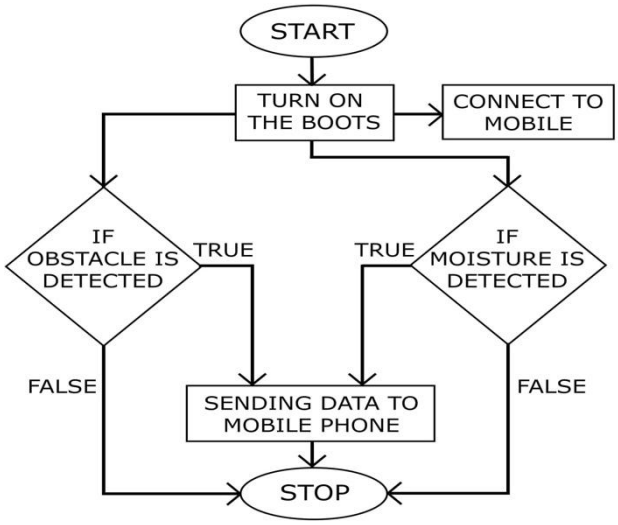

Fig9 - The work flow of Shoe module

First step in the shoe module is to start. Start will turn on the boots, once the boots is turned on then the next step is to connect it to mobile phone (smartphone) with the help of Bluetooth module in the shoe. The basic setup of the module is done and is ready to use. We have two case scenarios one is to detect the obstacle and the other scenario is to detect the moisture. If the obstacle is detected, then the condition proves to be true and this data will be sent back to the mobile device. Similarly, if the moisture is detected the condition proves to be true and the data will be communicated back to the mobile device. If both of the scenarios cease to be false, then no data will be sent back to the mobile device. If both the cases appear to be true simultaneously then that data will be sent back to the mobile in a successive order (first come first serve).

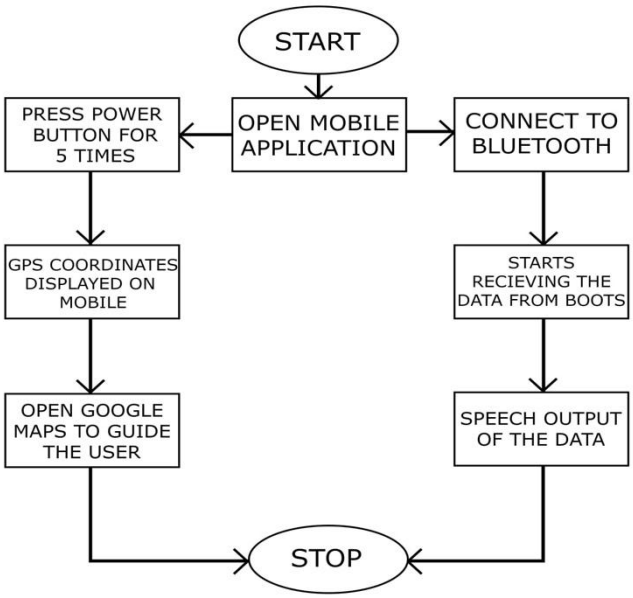

Fig10 - The work flow of Phone module

Start the phone module and open the preinstalled application on the smartphone. Here we have two cases one is to find the location of the user and other is mobile device communication with the shoe module. The first case is to connect the mobile device to the shoe module through Bluetooth connection. Once the connection is set the mobile starts to receive data from the boots and if any obstacle or moisture is detected then that information will be passed back to the mobile which will deliver an audio output. The second case is when the power button is pressed five times simultaneously then the GPS coordinates will be displayed on the mobile device by opening the google maps to assist the user, the location will also be notified through audio output. The cycle of the two cases mentioned will be active till the device is turned off.

8. RESULT

Once the obstacle is detected by the ultrasonic sensor emergency alert is being displayed on the LCD display and the user will be notified through audio feedback. Similarly, when moisture is detected by the moisture sensor it will be displayed on the LCD panel and also alerts the user through speech signal. The interface is easy and user friendly.

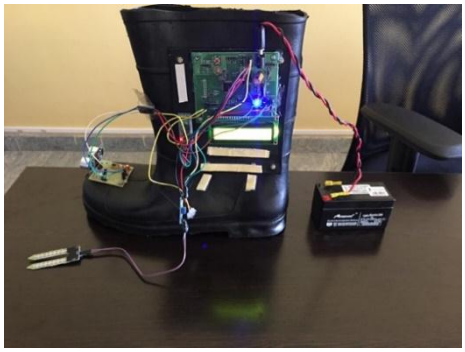

Fig11 - Prototype with all the components

9. APPLICATION AND ADVANTAGES

9.1 APPLICATION

- **ECONOMICALLY ACCESSIBLE**- The device is economically accessible for the blind people in order to enhance the quality of life.
- **WEARABLE**- From conducted study and review, it is more flexible and comfortable to the blind person to wear the device rather than carrying it.
- **SIMPLE**- Interface is simple and user friendly which requires minimum practice to get used to the device.
- **RELIABLE**- The device meets the specifications both in terms of software and hardware.
- **WIRELESS CONNECTIVITY**- The device is connected wirelessly which ensures great comfort during mobility.

9.2 ADVANTAGES

- The main application is the product assists the blind to navigate independently.
- The real time systems also help in detecting different shapes, materials and distances.
- The sensor and the entire circuit are attached to the shoe which is low in weight and portable.
- The device has capability in specifying the source and the distance of the objects that may encounter the blind in future scope.
- Alerts the user when stepping on damp roads.
- The product has scope in military application.

10. CONCLUSION AND FUTURE SCOPE

10.1 CONCLUSION

With the effective use of existing technology, a smart device has been developed to implement a user-friendly, easy to use interface that is capable of assisting the user. A real-world prototype has been developed, based on low-cost microcontroller with GSM module which will help blind to navigate easily to reach their destination.

10.2 FUTURE SCOPE

Possible future work is in review process in order to add new technologies that are available which may include edge sensitivity. Routine weather forecast on timely basis can be done that alerts the user beforehand about rainfall and storms. The product can further be enhanced for wider applications by using Artificial Intelligence and image processing which helps to detect the obstacles much more accurate and with precision. Implementation in defense sector which uses sensors to detect land mines and gives feedback to the soldiers to prevent casualties.

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