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Smart Android Application for Visually Blind People

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***Abstract*: The proposed system is developed with the aim to assist visually impaired people. It equipped with a lot of predefined voice commands, many activities can be performed including making calls, sending and receiving text messages, using the "phone book" with ease, determining the user's position, obtaining information about present time and controlling the battery level. The blind stick will be equipped with sensors and will detect the obstacle in the user's path. It will calculate the distance of obstacle from user and convert it into footsteps. The user will be given a voice message that the obstacle is certain footstep ahead.**

***Keywords*: android, micro controller**

1. Introduction

Visually impaired people are the people who find it difficult to recognize the smallest detail with healthy eyes. Those who have the visual acuteness of 6/60 or the horizontal range of the visual field with both eyes open have less than or equal to 20 degrees. These people are regarded as blind. A survey by WHO (World Health Organization) carried out in 2011 estimates that in the world, about 1% of the human population is visually impaired (about 70 million people) and amongst them, about 10% are fully blind (about 7 million people) and 90% (about 63 million people) with low vision. The main problem with blind people is how to navigate their way to wherever they want to go. Such people need assistance from others with good eyesight. As described by WHO, 10% of the visually impaired have no functional eyesight at all to help them move around without assistance and safely.

The proposed system includes smart stick to help visually impaired people that will provide them navigation. The conventional and archaic navigation aids for persons with visual impairments are the walking cane (also called white cane or stick) and guide dogs which are characterized by a many imperfections. The most critical shortcomings of these aids include: essential skills and training phase, range of motion, and very insignificant information communicated been communicated.

Our approach modified this cane with some electronics components and sensors, the electronic aiding devices are designed to solve such issues. The ultrasonic sensors with Arduino board are used to detect obstacle between paths. Ultrasonic sensor has the capacity to detect any obstacle within the distance range of 2cm-450cm. Therefore, whenever there is an obstacle in this range it will alert the user.

This proposed system tries to help visually impaired and old persons to access the android mobile phone efficiently, provide security, safety to visually impaired person. Proposed system also includes smart android application which alerts the user in voice format when obstacle is detected to ultrasonic sensor. Application also includes additional features such as calling, obtaining current location, date and time with ease. Most blind guidance systems use ultrasound because of its immunity to the environmental noise. With the rapid advances of modern technology both in hardware and software it has become easier to provide intelligent navigation system to the visually impaired.

2. Methodology

System consists of four units:

A. Micro-controller Unit
B. Obstacle Detection Unit
C. Blue-tooth Module link with Android Mobile
D. Smart Phone

A. Micro-controller Unit

The main purpose of selecting this component is that it is a 4 KB flash that can be reprogrammed a thousand times. The complete board is powered by a 9V battery which is regulating to +5V. It is a 40-pin integrated circuit that provides 5V supply for pin 40, pin 20 and the oscillator. 11.0592 MHz between pins 18 and 19 and two capacitors Pico-farad 22. The power to start the program on pin 9 is determined by the 5V supply and the capacitor 10micro farad. The resistance is 10 k ohms. We have a dedicated pin number 3Rx on the ultrasonic sensor that has an approximate obstacle distance. Once the obstacle is identified, current flows into a current limiting resistor at the bottom of the two transistors that magnetizes the relay coil and then triggers the buzzer.

B. Obstacle detection unit

Ultrasonic sensors are used on the stick. The ultrasonic sensor consists of transmitter and receiver. The ultrasonic sensors emit sounds capes with frequency lying in ultrasonic spectrum (>20 kHz), which is inaudible to human ears. First the

transmitter conveys an ultrasonic wave, which actions in air and when it becomes objected with any obstruction it gets reflected back towards the sensor the reflected wave is then observed by the receiver portion and accordingly vary buzzer signals and alarm the blind person to change his/her path.

After the collection of data calculations are done according to the formula:

cm = time * 0.034 / 2

Inch = time * 0.0133 / 2

C. Bluetooth module link with android mobile

HC-05 model is linked with the application in the mobile. Android application contains one speaker which performs various activities using voice commands and application also gives signals to user when obstacle is detected.

The voice command condition is as follows:

If the distance between objects and the person is 30 inch, it will send the command as the “obstacle is one steps away”. If the object is about 60-90 inch, it will send the command as the “obstacle is two steps away”. If the Object is about 90-120 inch, it will send the command as the” object is three steps away from you”.

D. Smart phone

In second part of system is smart phone which is carried by blind person and which contain fast speed internet along with Android Application. The application is integrated with the stick of the blind people and will guide the user along its path. With predefined voice commands many activity performs including calls, using phonebook, current date and time and battery status with ease. Determine the user position, obtaining information about present time and detecting obstacle between the path and alert the user. It also includes the help command if any command is difficult to remember by user. Application uses Google API’s to find location.

3. System architecture

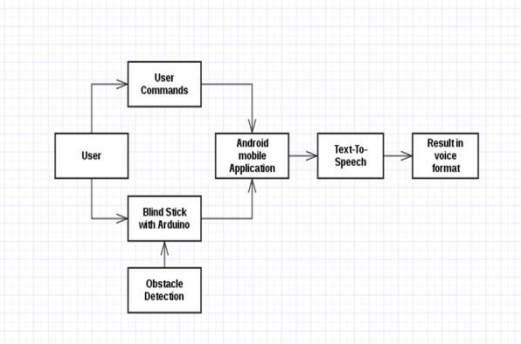

Fig. 1. System architecture

The proposed system first uses ultrasonic sensors to detect obstacles ahead using ultrasonic waves. On sensing obstacles, the sensor passes this data to the microcontroller. The microcontroller then processes this data and calculates if the obstacle is close enough. If the obstacle is not that close the circuit does nothing. If the obstacle is close the microcontroller sends a signal to sound. It also detects and sounds a different obstacle if it detects and alerts the blind. The system has one more advanced feature is that blind people can speak out many different easy commands and by using that commands blind person can easily reach their destination without any complication. It is equipped with a lot of predefined voice commands many activities can be performed including making calls, sending and receiving text messages, using the “phone book” with ease, determining the user’s position, obtaining information about present time, and controlling the battery level.

4. Conclusion

With the proposed architecture, if constructed with at most accuracy, the blind people will able to move from one place to another without others help, which leads to increase autonomy for the blind. The developed smart stick that is incorporated with multiple sensors will help in navigating the way while walking and keep alarming the person if any sign of danger or inconvenience is detected.

5. Future scope

A variety of future scope are available that can be used of with the stick such as usage of Global Positioning System can help the blind person to source to destination route information. GPS can help to find the shortest and best path as accordingly to Google (Bing map based on real time coordinates).

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