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Smart Stick for Visually Challenged People

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ABSTRACT

Visually challenged persons face constraints in independent mobility and navigation. Mobility means the possibility of liberally moving, without support of any supplementary person, at home and unfamiliar scenarios. People with visual impairment tackle enormous limitations in terms of mobility. Our project focuses on obstacle detection, and finding location in order to enhance navigation facilities for visually impaired people. A system which guide or assist people with vision loss, ranging from partially sight to totally blind, by means of sound commands is referred as Navigation Assistance for Visually Impaired (NAVI). Many researches are being conducted to build navigation system for blind people. But most of them have limitations with respect to accuracy, usability, coverage which is not easy to overcome with current technology for both indoor, outdoor navigation.

Keywords : Microcontroller, Bluetooth, GPS(Global Positioning System), Voice Module App

I. INTRODUCTION

The objective of this project is to design a product which is very much useful to those people who are visually impaired and are often has to rely on others. It allows the user to walk freely by detecting obstacles. Our paper focuses on obstacle detection, and finding location in order to enhance navigation facilities for visually impaired people. Moving through an unknown environment becomes a real challenge when we can't rely on our own eyes. Here we are using ultrasonic sensor, GPS, Microcontroller. Ultrasonic technology is used in the same principle as laser technique; it used different tones to indicate the distance of the object. Each tone signifies a particular distance from the obstruction. Ultrasonic sensor is to detect any obstacles. It allows the user to walk freely by detecting obstacles. It sends out a high-frequency sound pulse and then times how long for the echo of the sound reflect back,by recording the elapsed time between the sound wave generated and the sound wave bounced back, it sends an voice alarm through the voice module app which is installed in smartphone. For outdoor navigation GPS(Global Positioning System) is used, and for Indoor navigiation an app is developed which in which places are predefined and when the place is mentioned it will give the shortest route for that place. Microcontroller ATMEGA328p is used for programming where the distanced calculated by the sensor and GPS location is stored for future purpose. Bluetooth is a wireless device used for short communication where information can be sent at maximum distance of 10m. This device is light in weight, portable and low cost.

II. METHODS AND MATERIAL

A. Experimental Work

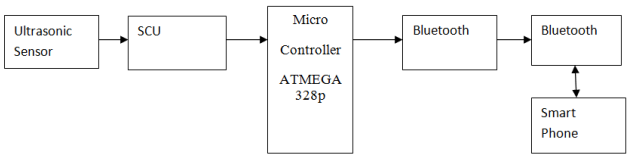

Figure 1. Block diagram

B. Hardware Materials

Our proposed consists of Four major units which are discussed below as

1. Atmega 328p

The high-performance Microchip picoPower 8-bit AVR RISC-based microcontroller combines 32KB ISP flash memory with read-while-write capabilities, 1024B EEPROM, 2KB SRAM, 23 general purpose I/O lines, 32 general purpose working registers, three flexible timer/counters with compare modes, internal and external interrupts, serial programmable USART, a byte-oriented 2-wire serial interface, SPI serial port, a 6-channel 10-bit A/D converter (8-channels in TQFP and QFN/MLF packages), programmable watchdog timer with internal oscillator, and five software selectable power saving modes. The device operates between 1.8-5.5 volts. By executing powerful instructions in a single clock cycle, the device achieves throughputs.

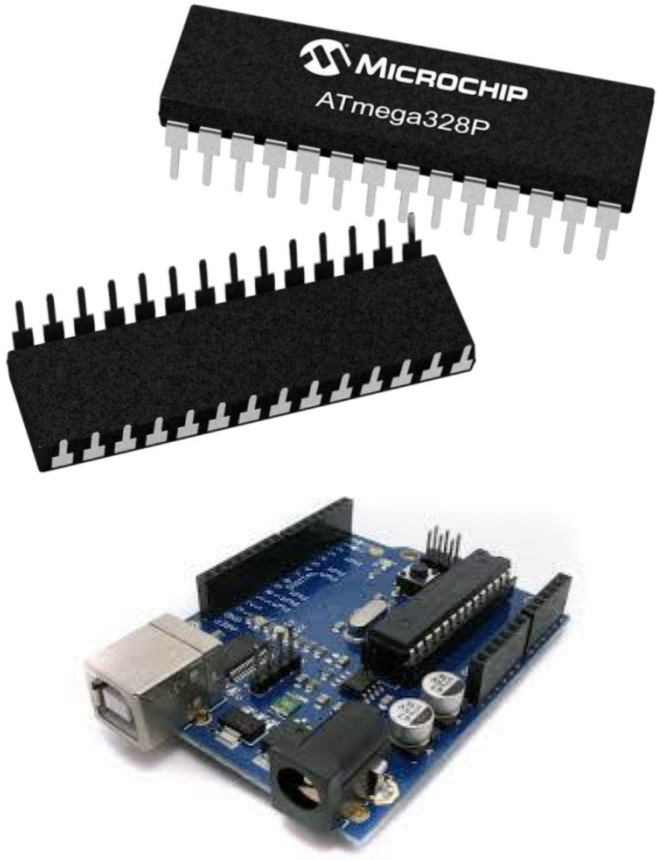

Figure 2. Atmega IC

2. Bluetooth

Bluetooth is a wireless technology standard for exchanging data over short distances (using short-wavelength UHF radio waves in the ISM band from 2.4 to 2.485 GHz]) from fixed and mobile devices, and building personal area networks (PANs). It was originally conceived as a wireless alternative to RS-232 data cables. Bluetooth operates at frequencies between 2402 and 2480 MHz, or 2400 and 2483.5 MHz including guard bands 2 MHz wide at the bottom end and 3.5 MHz wide at the top. Bluetooth Serial Adapter modules are often underestimated when it comes to serial RS232 connectivity, fact is that serial communication by a Bluetooth serial adapter actually gives you the most economical, most efficient, secure and reliable wireless serial connection within the 300 feet range. A Bluetooth serial adapter gives you a convenient and easy way to wirelessly communicate with your serial devices, regardless if they are new or old, and with the Bluetooth 2.0 and 2.1 protocols you get secure 128bit encryption communication. It can be powered by the included USB cable, a USB Mini power adapter, pin 9 at the DB9 connector or by an external battery. You can communicate with this Bluetooth serial adapter via standard built-in Bluetooth or by using an external USB Bluetooth dongle. The advantage of using one of these methods is that you will need only one Bluetooth serial adapter to setup a communication link. If you want a direct cable replacement which automatically connects your devices wirelessly without the need for a computer then you can also use this adapter in pairs.

Figure 4. Bluetooth Module

3. GPS

The Global Positioning System (GPS) is a satellite-based navigation system made up of at least 24 satellites. GPS works in any weather conditions, anywhere in the world, 24 hours a day. Each satellite transmits a unique signal and orbital parameters that allow GPS devices to decode and compute the precise location of the satellite. GPS receivers use this information and trilateration to calculate a user's exact location. Essentially, the GPS receiver measures the distance to each satellite by the amount of time it takes to receive a transmitted signal. With distance measurements from a few more satellites, the receiver can determine a user's position and display it electronically to measure your running route, map a golf course, find a way home. A GPS can give you turn-by-turn directions to the nearest coffee shop, shoe store, or burger joint, and can increase your confidence and independence when out and about.

Figure 3. GPS

4. Ultrasonic Sensor

An Ultrasonic sensor is a device that can measure the distance to an object by using sound waves. It measures distance by sending out a sound wave at a specific frequency and listening for that sound wave to bounce back. By recording the elapsed time between the sound wave being generated and the sound wave bouncing back, it is possible to calculate the distance between the sonar sensor and the object. Since it is known that sound travels through air at about 344 m/s (1129 ft/s), you can take the time for the sound wave to return and multiply it by 344 meters (or 1129 feet) to find the total round-trip distance of the sound wave. Round-trip means that the sound wave traveled 2 times the distance to the object before it was detected by the sensor.

Figure 4. Ultrasonic Sensor

III. FUTURE SCOPE

- Further improvement in the paper will be by implementing the image processing where the expression of the person can be identified.
- Another scope is to identify the object by scanning and its name is delivered as a voice message.

IV.CONCLUSION

The paper proposed the design and architecture, of a new concept of Smart Stick for visually challenged people. The advantage of the system is it is very low in cost. The blind people can move to other places without any others help for both indoor and outdoor navigation.

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