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Ultrasonic Blind Stick with GPS Tracking System

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Abstract:
The paper describes ultrasonic blind stick with GPS tracking system. Traditionally visually impaired people used a stick to find out if any obstacles are present in front of them. But this stick is inefficient in various aspects and the person using it has to face several problems. The objective of this project is to provide the visually impaired a better navigational tool. The ultrasonic blind walking stick is way more advanced than the traditional walking stick as the use of sensors makes object detection easier.GPS system provides the information regarding to his current location. The system has one more advanced feature integrated to help the blind find their stick if they forget where they kept it. A wireless RF based remote is used for finding the lost stick by pressing the remote button and buzzer sounds on stick. Thus this system allows for obstacle detection as well as finding stick if misplaced by visually disabled person. The another feature of this stick is to detect water on the ground. This stick also indicate day or night vision for blind person. This paper discuss about how this stick is built and how it will help blind people. There are various methods to do it and we are using helpful concepts from each paper.

Keywords: Ultrasonic sensor, GPS modem, ArduinoAtmega328 microcontroller, ESP8266, Light sensor, Moisture sensor, Buzzer.

I.INTRODUCTION

The study of previously developed systems and analysis of it, let us to define a newly equipped system which could overcome the disadvantages of the previous systems. So therefore using the existing technologies we provide a better solution to the stated problem. There are so many blind people in the society, who are suffering from exercising the basic things of daily life and that could put lives at risk while travelling. There is a necessity these days to provide security and safety to blind people. There have been few devices developed so far to help the blind people. The blind stick is integrated with ultrasonic sensor along with light and water sensing devices. Our proposed project first uses ultrasonic sensor to detect obstacles without touching it using ultrasonic waves. On sensing obstacles the sensor passes this data/8 to the microcontroller. The microcontroller then processes this data and calculates if the obstacle is close enough. If the obstacle is far the circuit does nothing but If the obstacle is close the microcontroller sends a signal to sound a buzzer. It also detects and buzzer will sounds a different if it detects water and alerts the blind person. One more feature is that it allows the blind person to detect if there is light or darkness in the room. The system has one more advanced feature integrated to help the blind person to find their stick if they forget where they kept it. A wireless RF based remote is used for finding the lost stick by Pressing the remote button sounds a buzzer on the stick which helps the blind person to find their stick. Thus this system allows for obstacle detection as well as finding stick if misplaced by visually disabled person. Ultrasonic sensor is used to detect any obstacle in front of blind person. It has Detection Distance of 2cm-450cm so whenever there is some obstacle in this range it will alert the blind person. Water sensor is used to detect if there is water in path. So person can be aware of it & buzzer will ring and person can get idea where the stick is placed. One more feature is that the GPS system which can use for tracking the blind person location.

II. OBJECTIVE

The main objective is to help visually challenged people to navigate with ease using advance technology. In this technology controlled world, where people strive to live independently, this project proposes an ultrasonic stick for blind people to help them gain personal independence. Since this is economical and not bulky, one can make use of it easily.

III. LITERATURE SURVEY

S.Chew (2012) [1] proposed the smart white stick, called Blind spot that combines GPS technology, social networking to help visually impaired people to navigate public spaces. The ultrasonic sensor detects the obstacle and alerts the blind person to avoid them hitting the obstacle. But GPS did not show the efficiency in tracing the location of the obstacles since ultra-sonic tells the distance of the obstacle. Osama Bader AL-Barrm, JeenVinouth [2] proposed that detects the obstacles in the path of the blind person using ultrasonic sensors. It consists of these sensors to scan three different directions, a microcontroller, buzzer and DC vibration motor. The buzzer and vibration motor is activated when any obstacle is detected. In addition, the stick is equipped with GPS and SMS message system .Another study done by (Jayant, Pratik and Mita, 2012) [3] proposed a smart stick assisted mobility for the visually impaired person. The system is based on normal ultrasonic sensors and ATMEL microcontroller. It operates with two rechargeable battery it can be recharged using USB cable or AC adaptor. The control unit is programmed using ATMEL AVR microcontroller ATME GA328P microcontroller. Once any obstacles are detected vibration and buzzer will start in order to warn the user. This

system is a non-complex system to use. It has the ability to cover a distance up to 3 meters and has the rechargeable feature of the battery. Also, this system can be folded in small piece so that the user can carry it easily. However, this system has only one direction detection coverage and it is inaccurate in detecting the obstacles. The paper [4] ultrasonic blind walking stick describes an innovative stick which is designed for the visually disabled people for their easy navigation. Ultrasonic blind walking stick with GPS tracking is an advanced blind stick that allows visually challenged people to navigate by using new technology. The blind stick is able to detect the light and water by integrated with ultrasonic sensor. In this system the ultrasonic sensors are used to detect obstacles by using ultrasonic waves. By sensing the obstacles the sensor passes the received data to the microcontroller and the microcontroller processes this data and calculates if the obstacle is close enough to the person. If the obstacle is not close to the microcontroller the circuit does not do anything. If the obstacle is close enough to the microcontroller it sends a signal for sound a buzzer. It also detects water and provides different sounds and alerts the blind person. The other feature is that it allows the blind person to detect if there is light or darkness in the room. Benjamin etal (2011)[5] had developed a smart stick using laser sensors to detect the obstacles and down curbs . Obstacle detection was signalized by a high pitch ―BEEP‖ using a microphone. The design of the laser cane is very simple and intuitive. The stick can only detects obstacle, but cannot provide cognitive and psychological support. There exists only beep sound that triggers any obstacle and there is no any assistance to direct them. Central Michigan University (2009)[6] developed an electronic cane for blind people that would provide contextual information on the environment around the user. They used RFID chips which are implanted into street signs, store fronts, similar locations, and the cane reads those and feeds the information back to the user . The device also features an ultrasound sensor to help to detect objects ahead of the stick tip.

IV. METHODOLOGY

A. Block Diagram:

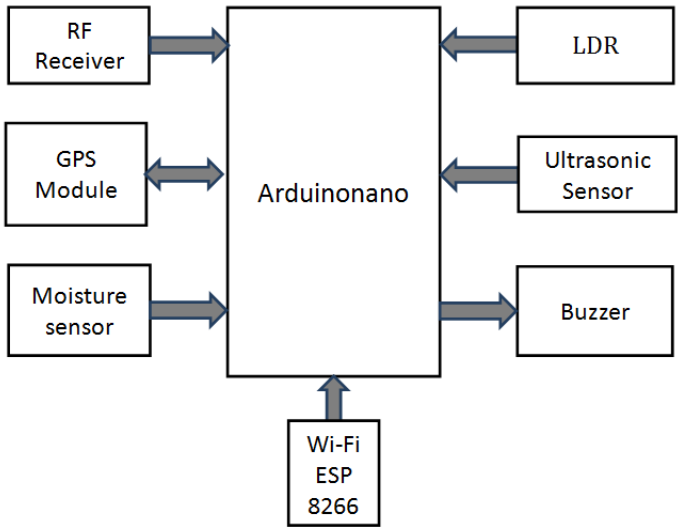

Figure.1. Block Diagram of System

B.Microcontroller:

Arduinonano 3.0 Microcontroller Arduino can control the environment by receiving input signals (Digital/Analog) and can effects its surroundings by controlling lights, relays and other devices. The microcontroller on the board is programmed using Arduino software.

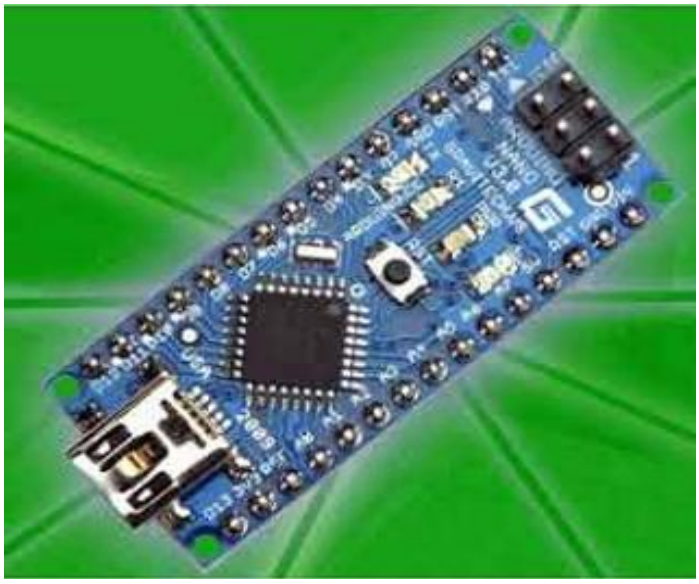

Figure.2. Arduinonano3.0 microcontroller

C. Obstacles and Dangers detection unit:

It consists of five sensors:

(1) Ultrasonic transducers: Generating, detecting & processing ultrasonic signals Ultrasonic sensor is produce the sound waves above the frequency of human hearing and can be used in a different variety of applications such as, sonic rulers, proximity detectors, movement detectors, liquid level measurement. Ultrasonic Sensor Ranging Module HC - SR04 in Figure 3.

Figure.3. ultra-sonic HC-SR04

Ultrasonic sensor module HC - SR04 provides 2cm - 400cm non-contact measurement facility, the ranging accuracy can reach to 3mm.

The modules contain ultrasonic transmitters, receiver and control circuit. The basic principle of work:

(1) Using IO trigger for at least 10us high level signal,

(2) The Module automatically sends eight 40 kHz and detect whether there is a pulse signal back.

(3) IF the signal back, through high level , time of high output IO duration is the time from sending ultrasonic to returning.

Test distance = (high level time×velocity of sound (340M/S) / 2

IR sensor: To detect small size of obstacles: pit, staircase, or stone, as it located at the lower side of the stick. After detecting

the small size of obstacles on ground, IR sensor will send the signal to the Arduino, as result it will send a voice instruction for small obstacle available. And at the same time it will enable the buzzer for informing the blind person about presence of obstacles on ground.

Water sensor: A water sensor is located at the base or bottom of the stick to have precaution against the wet surface which it can causing slipping on the floor and thus can hurt. When the water sensor comes in contact of the wet surface, it produces an electrical signal which triggers the Arduino controller. A voice instruction for wet surface is produced and also a buzzer is enabled for alarming against a wet floor.

LDR sensor: Light Dependent Resistor, changes its resistances due to change of the light intensity. During night, LDR will have high resistance and no current pass through it but through a LED connected parallel to it which illuminates and acts as a Flashlight, which can be easily noticed by others. It alerts people about the presence of blind person to let him to pass the way.

Buzzer: A transducer (converts electrical energy into mechanical energy) that typically operates A buzzer is in the lower portion of the audible frequency range of 20 Hz to 20 kHz. This is accomplished by converting an electric, oscillating signal in the audible range, into mechanical energy, in the form of audible waves. Buzzer is used in this research to warn the blind person against obstacle by generating sound proportional to distance from obstacle.

GPS and GSM System:- When GSM modem receives a message the microcontroller will process the message with the keyword saved in it. Then, it will get the location of the stick from the GPS modem and transmit the location to the GSM modem in order to respond to the sender. In case of an emergency, the user of the stick can press the emergency button the microcontroller access the location from the GPS modem and transmit the location to the GSM modem which will send a SMS messages to the all saved numbers in the microcontroller The GPS will update the location of the stick and automatically save the location in microcontroller EEPROM memory. If the microcontroller receives the word "codeword"(it is set) from the GSMmodem, the microcontroller will track the last location from the EPROM and transmit it to the GSM modem which will send an SMS message that states the location for the person to the required number. Addition to that, if the emergency button is pressed the directly the microcontroller will transmit the last location saved in the EEPROM to the GSM modem to send it to all saved number in the microcontroller.

ESP8266:ESP8266 is high integration wireless SOCs, designed for space and power constrained mobile platform designers. It provides unsurpassed ability to embed Wi-Fi capabilities within other systems, or to function as a standalone application, with the lowest cost, and minimal space requirement. ESP8266EX offers a complete and self-contained Wi-Fi networking solution; it can be used to host the application or to offload Wi-Fi networking functions from another application processor. When ESP8266EX hosts the application, it boots up directly from an external flash. In has integrated cache to increase the performance of the system in such applications.

V. CONCLUSION

All the studies which had been reviewed show that, there are a number of techniques for making a ultrasonic blind stick for blind people. The aim of this paper is to get familiar with the work done in making walking stick smarter and more helpful. The literatures related to this topic were reviewed and analysed. As technology improves these smart sticks need to be modified. The simulation results are expected for the ultrasonic sensors, water sensor and ESP8266 in one microcontroller. So in this paper wide survey of the work related to this project is done and we have shortlisted some useful aspects from each project. This will also help to decide designing approach.

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