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Design of Smart Blind Stick using IOT

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Abstract

This is an IOT based smart stick helps blind people by alerting them about obstacles in their way. Whenever an obstacle is identified, a speech signal is triggered in ear piece of the blind person. Usually, blind people need a second person's help whiletravelling from one place to another place, while crossing the roads and even while moving within their premises. Since the availability of another person is not possible during all the times, this stick acts as a replacement. This is a device consisting of Arduino UNO, Ultrasonic sensor and voice module that informs and notifies the blind person about the hazards.

Keywords: *Arduino uno, ultrasonic sensors, RF remote.*

1. Introduction

Blind people find it difficult to manage their daily activities due to lack of vision. Also, India is termed as the blind capital of the world with a whopping blind population of around 12 million. All the blind people usually require a helping assistant to complete their day to activities including their basic needs such as buying things from the market or even walking to a nearby store. It will help a blind person to walk comfortably and keep themselves safe from danger. 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 regardedas 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. As described by WHO, 10% of the visually impaired have no functional eyesight at all to help them move around without assistance and safely. It proposes a new technique for designing a 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. Our approach modified this cane with some electronics components and sensors, the electronic aiding devices are designed to solve such issues. The ultrasonic sensors, water sensor, buzzer etc….are used to recordinformation about the presence of obstacles on the road.

2. Literature Survey

Two authors proposed an innovative blind stick technique called an intelligent walking stick for the visually impaired. The group built upa stick for outwardly hindered people that helped the individual by providing an alert. But it could not send notifications like navigation or voice message alerts. The features were limited and could not fulfill user's demand. Another bright stick of tiny size proposed an effective wearable device for tracking the route. Moreover, the cane could tell the user in advance about the path. If an obstacle was detected in walking the road, then it could suggest a safe shortcut route. Undoubtedly, it was a time-saving feature. And the authors planned to attach a camera to see the way. This paper introduced a plan that paved the way to monitor blind people in real-time. But the implementation was expensive, and it could not draw the attention ofusers.

Another research work mentioned a smart walking cane that provided advance notifications using infrared sensors. If obstacles were detected in front of the stick, it could warn the blind man through the vibration signal. However, the cane could only detect the front obstacles but produced no warning at the time of danger. Moreover, there contained a limitation for IR sensors. For example, it could not detect distant objects efficiently.

3. Proposed System

The proposed system consists of an ultrasonic sensor, a water level sensor along with GPS and GSM module. These are connected to an Arduino and are coordinated to achieve the required result.

4. Block diagram description

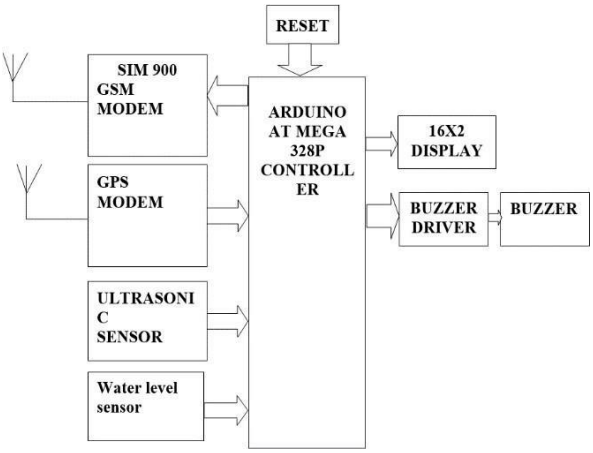


Fig 1: block diagram

Arduino Micro-controller

Arduino Uno is an open-source microcontroller board based on the Microchip ATmega328P microcontroller and developed by Arduino.cc. The board is equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards (shields) and other circuits. The board has 14 digital I/O pins (six capable of PWM output), 6 analog I/O pins, and is programmable with the Arduino IDE (Integrated Development Environment), via a type B USB cable. It can be powered by the USB cable or by an external 9-volt battery, though it accepts voltages between 7 and 20 volts.

Ultra Sonic Sensor

This is the HC-SR04 ultrasonic distance sensor. This economical sensor provides 2cm to 400cm of non-contact measurement functionality with a ranging accuracy that can reach up to 3mm. Each HC-SR04 module includes an ultrasonic transmitter, a receiver and a control circuit.

There are only four pins that you need to worry about on the HC-SR04: VCC (Power), Trig (Trigger), Echo (Receive), and GND (Ground). You will find this sensor very easy to set up and use for your next range-finding project! Operating Voltage: 5V DC Operating Current: 15mA Measure Angle: 15° Ranging Distance: 2cm - 4m The basic principle of work:

Using IO trigger for at least 10us high level signal, The Module automatically sends eight 40 kHz and detect whether there is a pulse signal back. If the signal back, through high level, time of high output IO duration is the time from sending ultrasonic to returning.

Water Level Sensor

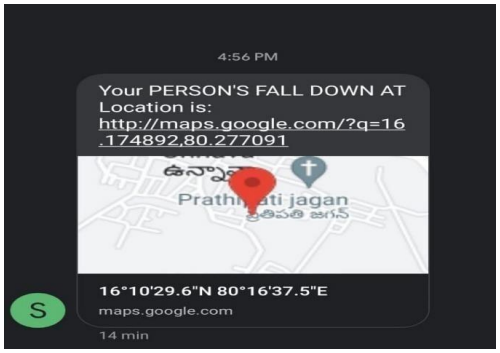
The sensor has a series of ten exposed copper traces, five of which are power traces and five are sense traces. These traces are interlaced so that there is one sense trace between every two power traces. Usually, these traces are not connected but are bridged by water when submerged. The resistance is inversely proportional to the height of the water, The more water the sensor is immersed in, results in better conductivity and will result in a lower resistance. The less water the sensor is immersed in, results in poor conductivity and will result in a higher resistance. The sensor produces an output voltage according to the resistance, which by measuring we can determine the water level.

Mercury switch

A mercury switch is an electrical switch that opens and closes a circuit when a small amount of the liquid mercury connects metal electrodes to close the circuit. There are several different basic designs (tilt, displacement, radial, etc.) but they all share the common design strength of non-eroding switch contacts.

The most common is the mercury tilt switch. It is in one state (open or closed) when tilted one direction with respect to horizontal, and the other state when tilted the other direction. This is what older style thermostats used to turn a heater or air conditioner on or off.

The mercury displacement switch uses a 'plunger' that dips into a pool of mercury, raising the level in the container to contact at least one electrode. This design is used in relays in industrial applications that need to switch high current loads frequently. These relays use electromagnetic coils to pull steel sleeves inside hermetically sealed containers.



GSM

A GSM modem or GSM module is a device that uses GSM mobile telephone technology to provide a wireless data link to a network. GSM modems are used in mobile telephones and other equipment that communicates with mobile telephone networks. They use SIMs to identify their device to the network.

GPS

The Global Positioning System (GPS) is a U.S. space-based radio navigation system that provides reliable positioning, navigation, and timing services to civilian users on a continuous worldwide basis -- freely available to all. For anyone with a GPS receiver, the system will provide location and time. GPS provides accurate location and time information for an unlimited number of people in all weather, day and night, anywhere in the world.

The GPS is made up of three parts:

1. Satellites orbiting the Earth
2. Control and monitoring stations on Earth

3.The GPS receivers owned by users.

GPS satellites broadcast signals from space that are picked up and identified by GPS receivers. Each GPS receiver then provides three-dimensional location (latitude, longitude, and altitude) plus the time. Space segment24+ satellites 20,200 km altitude degrees' inclination 12-hour orbital period ground control stations Each satellite passes over a ground monitoring station every 12 hours.

5. Result

Fig: Person's Fall Down Location

6. Conclusion

Using this blind stick, a person can walk more confidently. It detects the object in front of the person and give response to the user by the sound of buzzer. The project proposed the design and architecture of smart blind stick for blind people. The advantage of the system lies in the fact that it can prove to be very low cost for millions of blind people worldwide. It provides combination of solution working units makes a real time system that monitors position of the user and provides feedback making navigation more safe and secure.

7. Future scope

This can be taken forward in future by using different types of sensors, Raspberrypi concept. The point-to-point location of the person can be known by their family members using latest technologies like AI & Machine learning, different types of algorithms. All about our research we take care about one problem that is visual disability. To make a solution we did this with good flexibility &security. We feel it will help the blind person by givinga hope of disable to able. This is our hope.

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