

Smart Cane for Blind People Using IoT

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Abstract - Blind people are liable to get in contact with whatever obstacle which pass before them during walking, subjecting them to risk of injury caused from fall and it could also cause great damage to them. The aim of this project is to develop a smart cane with distance measurement system. The system is made up of an ultrasonic sensor as input and earphone as the output. Ultrasonic sensor is used to measure distance from the obstacle. Data is then sent to National Instrument Arduino UNO microcontroller for processing which later produce voice for alerting the blind person as the output. Also the system includes the GPS live locacking system and guide the path for blind person. In general, the device will alert blind people of the obstacles through the audio output through which they can walk safely without any problem.

Key Words: Survey and overviews, Sensors, Actuator, Harware and Software code design, Microcontroller and System level test, Sensor network,

1. INTRODUCTION

We being normal people can see and judge all the aspects of the environment it could be hurdle, obstacles, hole or pit. This is not possible in case of physically disabled people but they are given god gifted some great sensing ability. So for this we are creating a new IoT based Smart Stick / Cane which will help the blind people to get known about the hurdles, obstacles and holes or any moving objects beside them. It will be very beneficial for them as it will alert them for each and every aspect which they are going to face in their day to day life with the help of buzzer or voice Assistant. Our system will also track the live location of blind person and Guide the person through it for walking. Our main motivation are they blind who need to suffer a lot while travelling from place to place. We noticed that normal blind canes used by blinds have certain limitations like detecting pot-holes, stairs, distant objects, above knee obstacles, etc. We feel very bad about the blind and disabled people so we came up with the idea of developing a economical sensor equipped cane capable of assisting blind to navigate easily.

2. Literature Survey

2.1 Smart Cane with Range Notification for Blind People. [1]

Published year : 2016 Author : M.F. Saaid. In this paper Blind people are prone to sweep or knock whatever obstacle

which pass before them during walking, subjecting them to risk of injury caused from fall. The aim of this project is to develop a smart cane with distance measurement system. The system comprise of an ultrasonic sensor as input and earphone as the output. Ultrasonic sensor is used to measure distance from the obstacle. Data is then sent to National Instrument myRIO- 1900 controller for processing which later produce beeping sound as the output. The process was graphically programmed using LabVIEW with FPGA as the intended target. Performance of the system has been ascertained through several verification tests. In general, the device will alert blind people of the obstacles through the audio output

2.2 lot based route assistance for visually challenged [2]

Published year : 2018 Author : P.Bhavishya In this paper, The intelligent devices have taken us to a convenient and fash- ionable era, however while we use a pedometer to calculate the number of steps, the blind even do not have the ability to walk independently. There is no doubt that they are eager for convenience and freedom based on this, we propose an intelligent system that assists the blind in walking. The system consists of three ultrasonic sensors (attached to a cane) which are not used to just detect the obstacles but the visually challenged will be directed in the direction (front/right/left) which has no obstacles, when other two directions are blocked by an obstacle. Or when there is an obstacle in only one direction then the distance of other two directions will be calculated and he/she will be directed to go in a direction at which the distance is longer. The Mq2 gas sensor is also appended to the system to warn the user in case he/she is too drunk and make them wary.

3. PROPOSED SYSTEM

So as per the above introduction, after doing Literature survey of reference papers. Solution comes out as building a Smart Can for Blind People that will help them walking on the streets without any help. So basically our proposed system include the network of sensors, actuators, and microcontroller. This sensor network will basically detects every obstacle and alert the blind person using voice or audio output. Also our system will guide the blind person for walking. As in suppose the obstacle detected at the right side of the stick system will detects the obstacle and alerts the person using the audio output as "There is an obstacle at your right side turn left or go straight" similarly for Left side. If there is an obstacle at all the sides of the person it will alert

the person by voice output “wait till the obstacle gets clear”. Our system also provides the android supportive application for the person for GPS navigation and Live location tracking This System works using Sensor Network, network includes the sensors : Ultrasonic Sensors with SONAR, microcontroller : Arduino Uno microcontroller, actuator : Audio speaker The following are the components involved in the proposed visually challenged route assistance.

1. Arduino-Uno : The Arduino Uno is a microcontroller board based on the ATmega328. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button. Arduino can send and receive the data to most devices, and can also command electronic devices through internet. The software program used to program the Arduino UNO board is simplified C++.

2. Ultrasonic Sensor: Ultrasonic sensor is a sensor that works on principle that is akin to sonar or radar. It generates high frequency sound and calculates the time interval between the sending of signal and the receiving of echo. For this reason, ultrasonic sensors can be employed for measuring the distance. Ultrasonic sensors have been used due to their high precision within a shorter distance and resistance to external

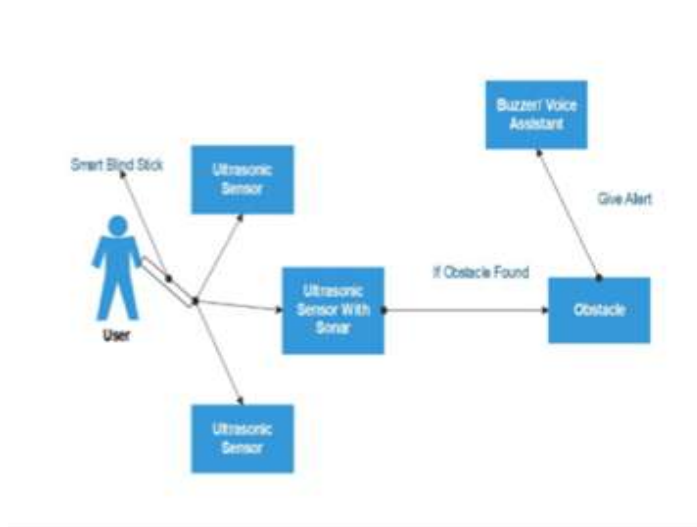


Fig -1: System Architecture.

disturbances such as vibration and electromagnetic interference. HC- SR04 ultrasonic sensor consists of a control module, transmitter and a receiver. The primary reasons to use Ultrasonic sensors are that they are light weight and compact, give high amount of sensitivity and accuracy in detecting objects compared to other sensors popular like the IR sensors which fail in certain cases like surfaces, light changes etc. as stated in. 3. Gas Sensor: The Grove - Gas Sensor (MQ2) module is useful for gas leakage detection (home and industry). It is suitable for detecting H2, LPG, CH4, CO, Alcohol, Smoke or Propane. Due to its high sensitivity and fast response time, measurement can be

taken as soon as possible. The sensitivity of the sensor can be adjusted by potentiometer.

4. Audio Speaker: The Audio Speaker is used to give alerts to the user by producing voices that differ.

4. BLOCK DIAGRAM

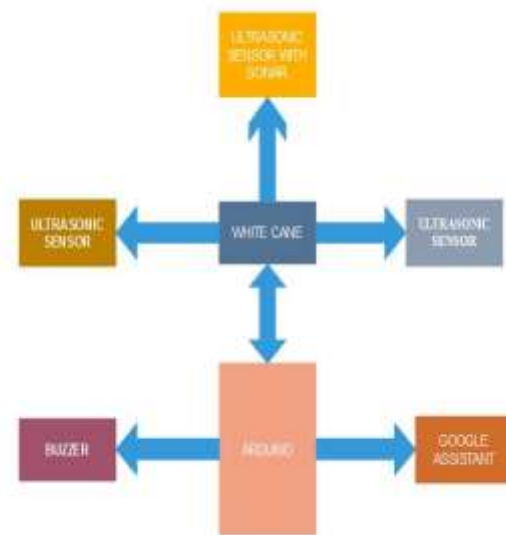


Fig -2: Block Diagram.

4.1 Discription

As shown in the above figure the system include the set of sensors and microcontrollers. It is the sensor network mounted on stick or a cane. Mainly simple white cane or stick is used for the presentation. Arduino UNO microcontroller is mounted on the white cane. Then the corresponding ultrasonic sensors are mounted and connected to the microcontroller. Then the corresponding actuator is mounted and connected to the sensor network.

5. MATHEMATICAL MODEL

System Description:

Input: Obstacle comes in front of the sensor.

Output: Buzzer will beeps after sensor detection. Voice Assistant will direct the person for movement. Android app will track the blind person using GPS.

Mathematical Model :

$$S = (I,O,F)$$

Where,

(a) S: System.

I = f I1 g are set of Inputs

Where,

(a) I1 : Distance.

F = f F1, F2, F3, F4 g are set of Function

Where,

(a) F1 : Obstacle Detection

O = f O1, O2, g are set of Output

Where,

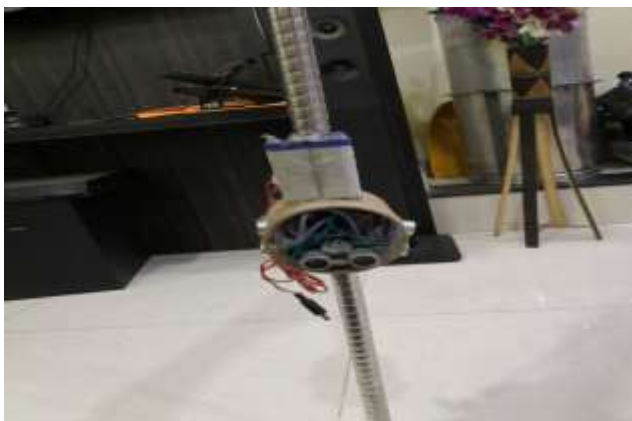
(a) O1 : Giving Alerts About Obstacle

Success Conditions: To do proper Obstacle detection and make the user aware about it.

Failure Conditions: Headphone not connected, sensor damaged.

5. Results

1. The hardware :

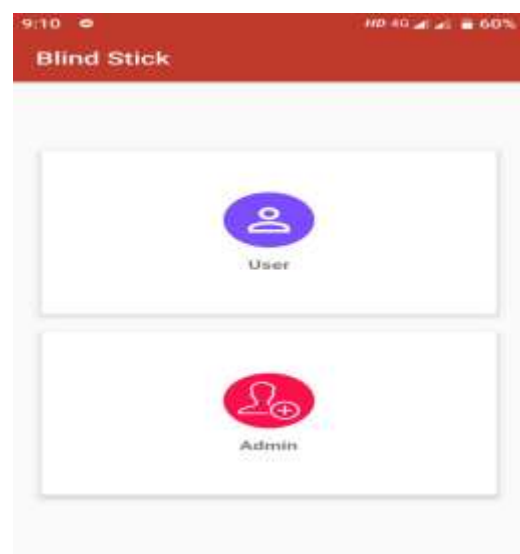


Screen Shots of The Android Applications:

2. ObstacleDetection:



3. Admin Panel :





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5. CONCLUSION

To sum up, this smart cane can act as a complete guide for blind people to walk with the help of a single stick without any complex hardware or software incorporated into it. This simple cane, is not used to just detect obstacles present in any direction. and alert the person , but uses the distance calculation to give the optimum direction(by detecting obstacles) in which the person can proceed. There is only use of one buzzer for every direction that makes different sounds for left, right, front instead of using three different buzzers. A battery powers the cane. This cane not only shows the direction, but can also indicates the person if he/she is blocked on three sides.In this system it includes GPS module trough which live location of the person can be traced

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