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An Innovative IOT Devices using Assistive Programming for Visually Impaired Person.

Authors

[1]Dr. R. KALAIMAGAL &[2]Dr M. RAMESH KUMAR

[1,2]Associate Professors, PG and Research Department of Computer Science

[1 , 2]Government Arts College for Men(Autonomous) , Nandanam, Chennai-35

Abstract:

The Proposed device uses for the visually impaired People to walk without other's help, can travel in any mode of Transportation, also escape from kidnap parties. Especially this device gives protection to ladies. Blind people can detect the objects in a five-dimensional view around them and can easily travel anywhere. When the ultrasonic sensor detects obstacle the device will notify the user through vibrations, Audio message in Bilingual languages as Tamil and English.

Keywords: Visually impairment; electronic assistive system; obstacle detection; wearable device

Introduction

According to WHO 39 million peoples are estimated as blind worldwide. They are suffering a lot of hardship in their daily life. The affected ones have been using the traditional white cane for many years which although being effective, still has a lot of disadvantages. Another way is, having a pet animal such as a dog, but it is really expensive. So the aim of the project is to develop a Wearable device with more efficient way to help visually impaired to navigate with greater comfort, speed and confidence. The Proposed device will use for the visually impaired People to walk without other's help, can travel in any mode Transportation, also escape from kidnap parties. Especially this device gives protection to ladies. Blind people can detect the objects in a five-dimensional view around them and can easily travel anywhere. When the ultrasonic sensor detects obstacle the device will notify the user through vibrations, Audio message in Bilingual languages as Tamil and English.

Methodology

In the world-wide many people are visually impaired by birth or in their grow of life. Many of the them are getting Higher Education and working in many organizations as well as in Administration. The number of people in the categories of visually impaired increasing worldwide. The proposed methodology provides the constant support for the visually challenged people for the survival of their life and their jobs. The objective of this research project is to design a smart assistive walker device like belt for frail & visually impaired people to reduce the risk of falling and the costly emergency interventions and hospitalizations and security for visually impaired women. The proposed device is based on the concept of the Internet of Things (IoT) to determine and communicate the location and the path of the person for possible action through IoT enabled device with the support of GPS, Ultrasonic Sensor, GSM Mobile Application and sound altering devices.

The device contains sensor, Aurdino, hardware device and software programs. The former, covering the electrical part of the walker with three components: Sensor, controller, output, and the later contain two components; “Map” and “Find Me” Mobile applications. The IoT treats the information received from the sensors (position, objects, and people around) and sends commands to the controller to guide the visually impaired persons to fulfill the elderly needs safely. It contains two stages of Implementation as given in the project architecture.

Making attachments and covers for the safety and the stability

For the safety and the stability of the prototype, covers for the ultrasonic sensors- to protect the sensors and attach them to the belt- and a cover box for Aurdino board and 1Sheeld have been made. The designs have been made using Coral Draw program, and then they have been cut using the LASER Cutter machine.

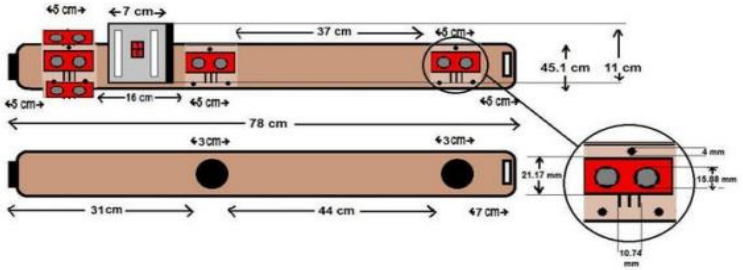
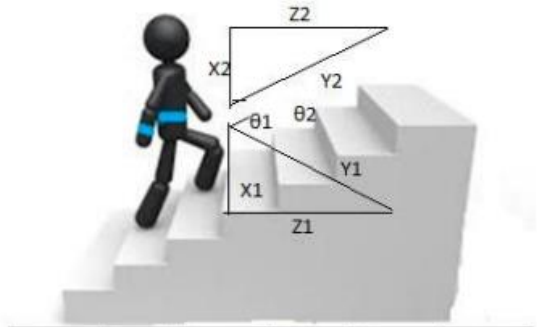
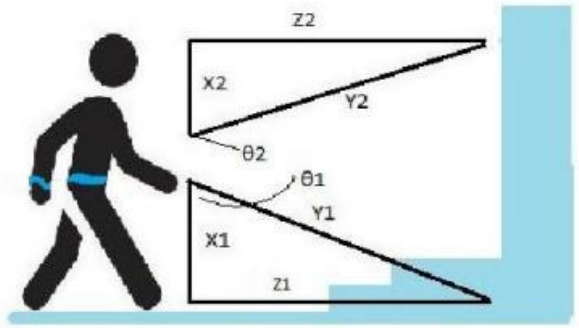


Fig 1.1 Making attachments and covers for the safety and the stability



X1	X2	Y1	Y2	Z1	Z2
80	90.1	100.2	110.3	120.4	130.5

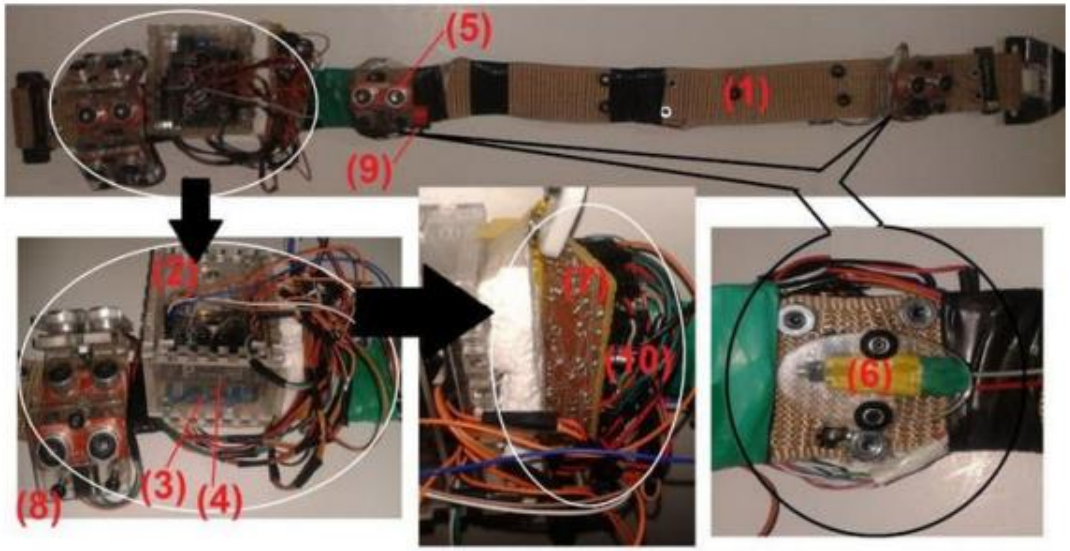
Fig 1.2 (a) Setting the ultrasonic sensors for the safe distance slope area



X1	X2	Y1	Y2	Z1	Z2
0.1	0.1	0.1	50.6	90.1	150.2

Fig 1.2 (b) Setting the ultrasonic sensors for the safe distance in normal for sudden obstacle area

X1 is the distance from the belt to the ground. X2 is the distance from the belt to 15 cm above the head of the blind. They differ according to the blind's body. Consequently, Y1 and Y2 change which are the distances that the sensor detect any object less than them. That makes a safe distance Z1 and Z2 in front of them. The angel's θ1 and θ2 are 30°and 10° respectively. The numbers used in this prototype are as shown in the table. The components of the circuit are connected as follows: 11 • 1 Shield component is connected and put on the Arduino board. • The ultrasonic sonic sensor has 4 pins for each of the five sensors: Power, Ground, Trigger and Echo. All of the Power pins are connected to each other to the Vcc output, and the same goes with the ground pins to the GND output. The Trigger and Echo pins are connected each one to one pin in Arduino board (Pins: 13:7 and 4:2). • The vibration motor has 2 terminals for each of the two motors. One terminal at each motor is connected to the GND. The other terminal at each motor is connected to the emitter pin of an NPN transistor. The collector pin of each transistor is connected to GND. The base of each transistor is connected to 1K Ohm resistor and the other terminal of the resistor is connected to pins (5:6) in Arduino board. • All the Vcc pins are connected with one wire to the output Vcc of the Arduino board and all the GND pins are connected with one wire to the output GND of Arduino board



1-belt, 2-plastic box, 3-microcontroller, 4-1Sheeld, 5-ultrasonic sensor, 6-vibration motor, 7-PCB, 8-cover for attachment, 9-on/off switch, 10-wires and jumpers

Analysis of the results Making attachments and covers for the safety and the stability and Setting the ultrasonic sensors for the safe distance were calculated.

ARCHITECTURE OF PROPOSED SYSTEM

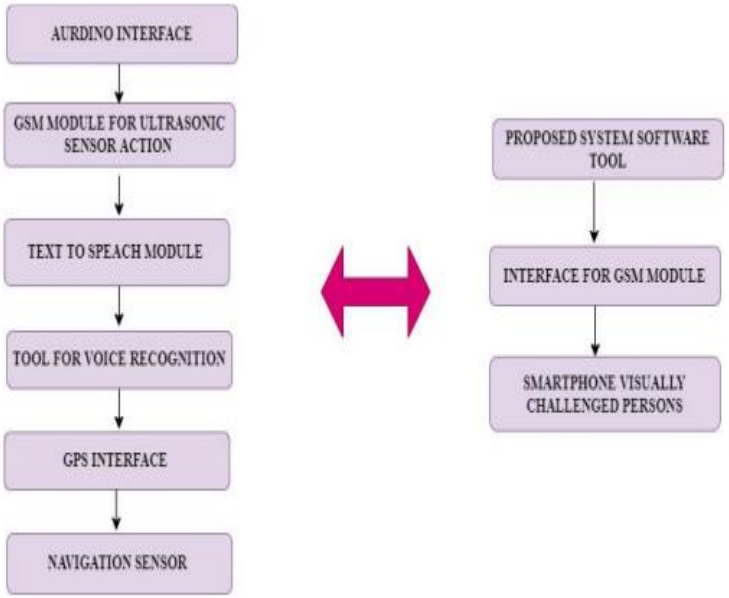


Figure 1.3 Implementation Architecture

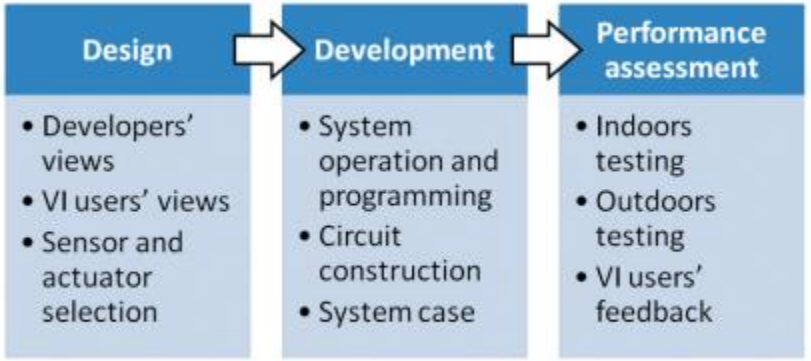


Fig 1.4 Implementation Methods

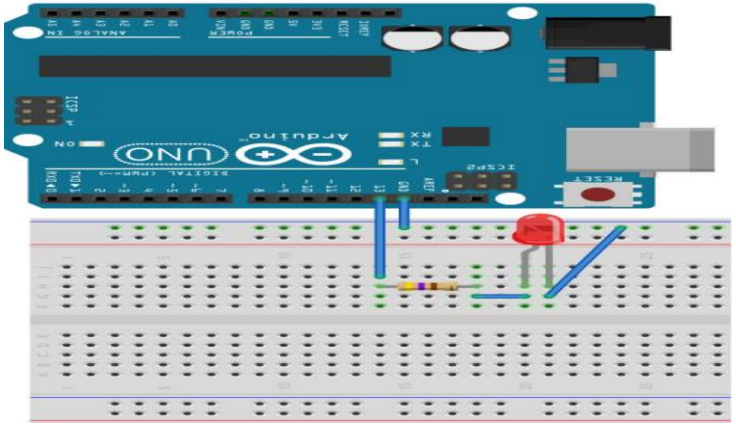


Figure 1.4 Aurdino Interface for Implementation

Sample Code :

Part of Code for Implementation

```
 (arduino) > python
>>> import serial >
>> serial.__version__'3.4
' >>> exit() (arduino)
>>conda activate arduino (arduino) > python
>>> import serial
>>>ser = serial.Serial('COM4', 9800, timeout=1)
>>>ser.write(b'H')
>>>ser.write(b'L')
>>>ser.write(b'H')
>>>ser.write(b'L')
>>>ser.close()
>>> exit() (arduino)
```

Future Work

Many languages may be implemented in the device. Also range of Direction is also to be considered

Conclusion

There is a large body of work focused on the development of mobility assistive devices for visually impaired (VI) people. However, none of them seems to satisfy the needs of VI people, which might suggest that these requirements have not been considered during the development process. In this sense, this study aimed to develop a novel assistive system based on the opinions provided by a group of VI persons who also participated in the performance assessment stage. Two ultrasonic sensors and one infrared sensor were combined to estimate the proximity and height of an obstacle in front of the user who acquired that information via audio messages and vibrating alerts. The proposed system was tested by twelve VI participants, who were asked to provide suggestions for improvement. Our prototype performed well indoors and achieved overall positive feedback when detecting obstacles at different heights, although it was unable to provide directional information. Future research endeavors in this field might be benefited from more collaborative participation between end-users, researchers, and institutes for VI people.

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