

Voice Assisted Navigation System for Visually Impaired

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Abstract

Vision is one of the most vital and important senses that human beings possess. Millions of people across the globe face issues related to eyesight and use spectacles to tackle this issue but the subcategory including those hundreds or thousands who can't see at all, lead a difficult life. What they actually need are technologies and gadgets that can help them traverse with greater speed, comfort, and most importantly confidence. This project, "Voice Assisted Navigation System for Visually Impaired" aims to make life less problematic and easier for them. The project includes multiple modules which mainly help in obstacle detection, object identification using Machine Learning, GPS location gathering and sending trigger mail of coordinates and most importantly voice assistance.

Keywords: *Object detection, Machine Learning, GPS, Voice Assistance, Visually Impaired*

1. Introduction

Navigation is the art and science of determining the position of a person, plane or another vehicle and guiding it to a specific destination. A navigation system is a computing system that aids in navigation. A voice assistant is a digital assistant that uses voice recognition, language processing algorithms, and voice synthesis to listen to specific voice commands and return relevant information or perform specific functions as requested by the user.

According to WHO there are more than 39 million blind people in world who face a lot of challenge in their day-to-day life to traverse for their needs. It is expected to surge up to 115million by 2050.

The proposed system is the innovation that settles the issues looked at by conventional or existing techniques for the blind people upto some extent using sensors that are small, lightweight and is more efficient.

- This project helps blind people to run their life in a normal manner. The device can detect the obstacle that come in their way. This project is more efficient than the

existing system with cheaper and accurate one. The object detection feature helps the user understand what object is present ahead of them.

- The device uses properties of sound to detect obstacles, especially uneven surfaces and liquid, with high reliability.
- This device will use google assistant for voice control and to use all the functionality that google assistant provides.
- Integrated with google maps the GPS will provide the location and will also be helpful in navigation purposes.
- The GSM module will provide internet access and will be useful in sending messages to relatives in case of emergency.
- The use of Raspberry pi will enhance the functioning of all the hardware and will provide real time information and process it with ease.

2. Literature Survey

We conducted a random local survey to gather more information around the problem statement and to understand what the society needs as a user, user's family, or as a common man. The questions included in the questionnaire/ survey form were:

- a. What is the most challenging part for a visually impaired person?
- b. As a relative, what is the biggest fear you face?
- c. As a relative, do you think voice assistance can make life of visually impaired people easy?
- d. As a common man what do you use for navigation in unknown locations?

The outcome was :

- a. We understood that travelling, incorrect guidance and understanding the current location are some of the major challenges.
- b. We understood that safety of the visually impaired and knowing their live location is the biggest fear of their family.
- c. People feel voice assistance can make the life of a visually impaired easy.
- d. Mostly, people rely on GPS/Google Maps for navigation.

3. System Architecture

A. Circuit Diagram

The figure shows the circuit diagram. We can see a raspberry pi is used to control all the sensors. The complete board is powered by a USB adapter connected to a power source which is regulated. The First Ultrasonic Sensor HCSR04 is powered by 5V and the trigger 17 and Echo 4 pin. The second Ultrasonic HCSR04 is connected to raspberry pin 27 and 18. The LDR sensor is power by the raspberry pi board in VCC and Gnd is grounded and its connected to 0.

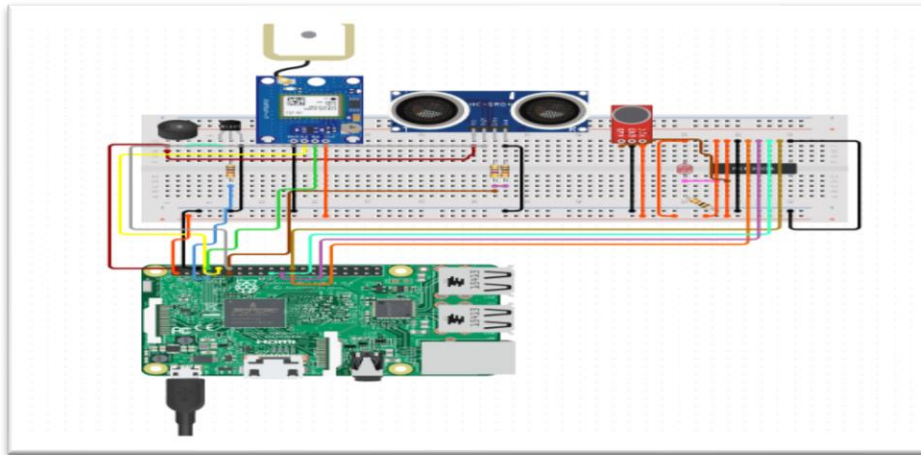


Figure 1. Circuit Diagram

The google assistant SDK is installed in the Raspbian OS which helps to communicate. The audio output is given by using python text to speech which is easy to implement since we are using raspberry pi.

In order to send and trigger mails and messages, the APIs are used, thus, avoiding the usage of the GSM sensor. A speaker is added to the circuit which enables loud and clear output hearing. An addition made here is Buzzer which is used when the distance with an obstacle is reduced to below 20cm.

B. Framework Diagram

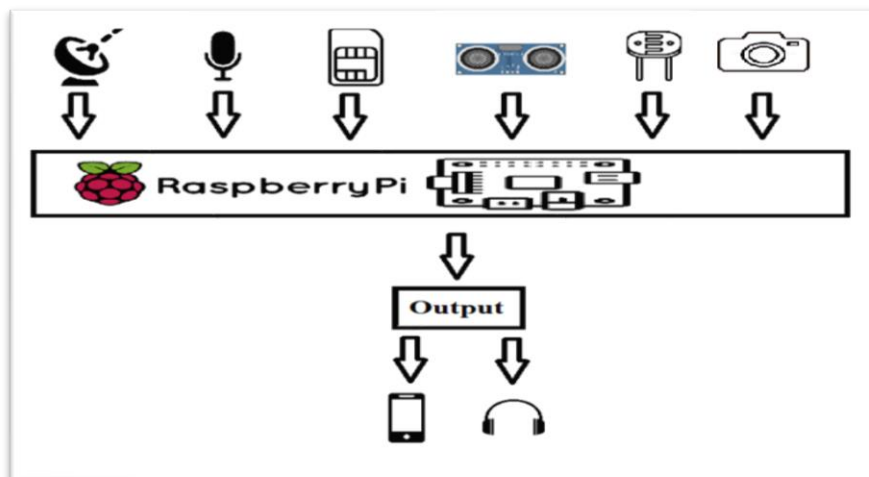


Figure 2. Framework Diagram

4. Implementation

Implementation was first done module wise and then integrated together.

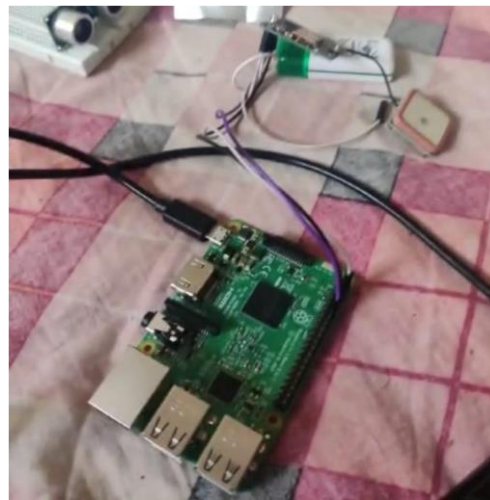
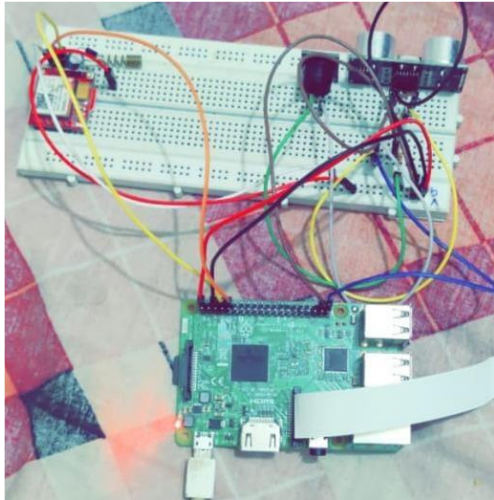


Figure 3. Implementation of Ultrasonic

Figure 4. Implementation of GPS

5. Test Cases

Table 1. Test Cases

Sr. No.	Test Case	Steps	Expected Result	Actual Result	Status
1	Ultrasonic Object Detection	Run Ultrasonic file	Calculates and prints distance. Calls Buzzer module as distance is less than 20 cm	Calculates and prints distance. Calls Buzzer module as distance is less than 20 cm	Pass
2	Predict Detected Object	Run Object Detection Algorithm	Detect the object : MUG	Detect the object : MUG	Pass
3	GPS coordinate Extraction	Run GPS file	Extract and display GPS Coordinates	Extract and display GPS Coordinates	Pass
4	Sending Trigger Mail	Click on Button	Mail sent with GPS coordinates	Mail sent with GPS coordinates	Pass
5	LDR : Light ON	Surrounding Light	Glow light due to low surrounding light	Glow light due to low surrounding light	Pass

6	Voice Assistance	Trigger with initial command	Reply answer for “What is my current location”	Reply answer for “What is my current location”	Pass
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6. Actual result images

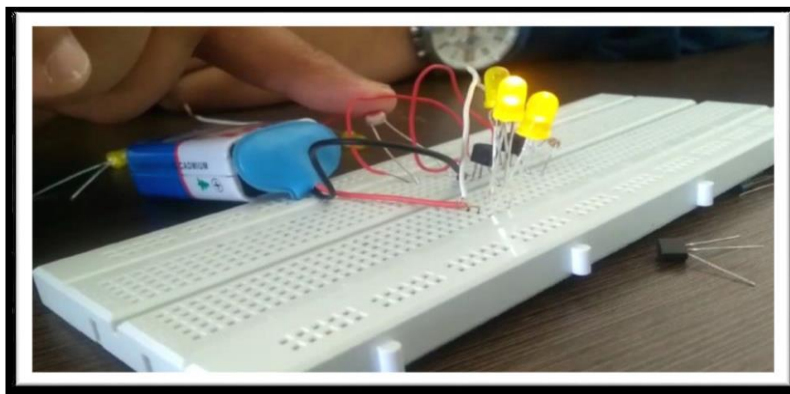


Figure 5. LDR Circuit

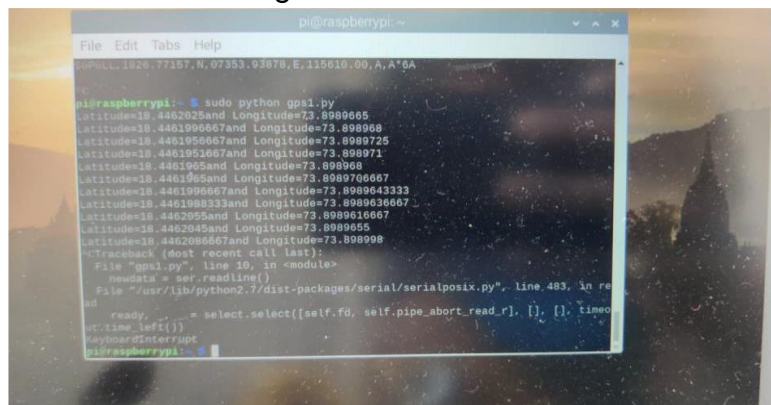


Figure 6. Output :GPS Coordinates

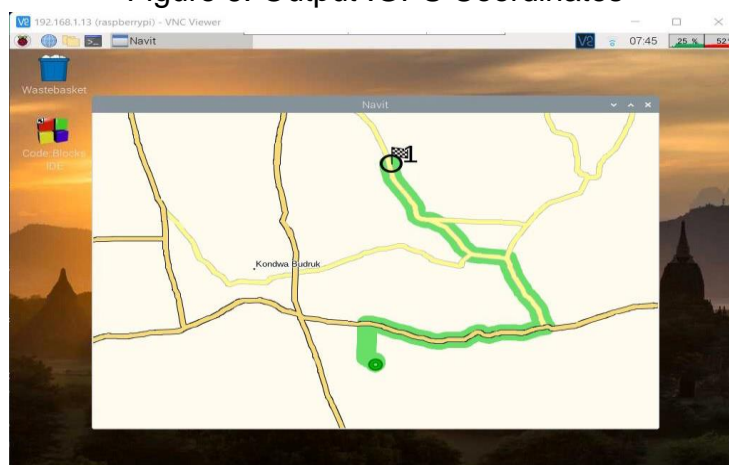


Figure 7. Output from Navit

7. References

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