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VOICE BASED SMART NAVIGATION SYSTEM FOR BLIND PEOPLE

[1]Ramasuri Appalanaidu CH ,[2]Annamneedi Sai Chandana, [3]B Bhanu Priyanka, [4]U Bhargavi Tulasi, [5] P Kalyani Kusuma

[1]Professor, [2]B.Tech IV, [3]B.Tech IV , [4]B.Tech IV, [5]B.Tech IV

[1,2,3,4,5] Information Technology,

[1,2,3,4,5] Vignan's Institute of Engineering for Women, Visakhapatnam, India

Abstract: Blindness, low vision, visual impairment -, vision loss have dramatic impacts on individuals experiencing such disabilities. These carry with them physiological, psychological, social, and economic outcomes, hence impacting the quality of life and depriving such individuals of performing many of the Activities of Daily Living (ADL), the most crucial of which is navigation and mobility.

Hence this system concept is to provide a smart electronic wearable aid for blind people. This system is intended to provide an overall measureof object detection and send information related to the path. The system consists of raspberry pi zero, ultrasonic sensor, and a GPS module. This project aims at the development of an Electronic Travelling Aid (ETA) kit to help blind people to find an obstacle-free path. This ETA is fixed to the shoe. When the object is detected near to the shoe alerts them through voice commands and also in advancement with the help of Micro Phone, Here power supply is the main criteria.

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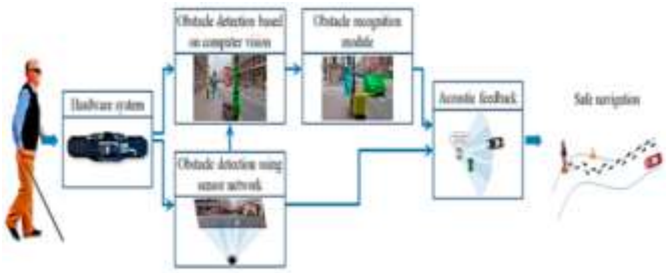
Keywords: GPS module ,Map box API, Micro Phone ,Raspberry Pi zero, Ultrasonic sensor

Introduction

Artificial Vision is the most important part of human physiology as 83% of information human being gets from the environment is via sight. The statistics by the World Health Organization (WHO) in 2019 estimates that there are 285 billion people in world with visual impairment, 39 billion of people which are blind and 246 with low vision. The oldest and traditional mobility aids for persons with visual impairments are the walking cane (also called white cane or stick) and guide dogs. The drawbacks of these aids are range of motion and very little Information conveyed. With the rapid advances of modern technology, both in hardware and software front have brought potential to provide intelligent navigation capabilities. Recently there has been a lot of Electronic Travel Aids (ETA) designed and devised to help the blind people to navigate safely and independently. Also high-end technological solutions have been introduced recently to help blind persons navigate independently.

With the rapid advances of modern technology, both in hardware and software front have brought potential to provide intelligent navigation capabilities. Recently there has been a lot of Electronic Travel Aids (ETA) designed and devised to help the blind people to navigate safely and independently. Also high-end technological solutions have been introduced recently to help blind persons navigate independently. In this project, an effort has been made to improve the quality of the system to be more helpful for the blind people. In this project, the system is has been made as a part of the blind person's shoe. and in this project we are using ultra sonic sensor and microphone which provide more accuracy of object detection and given clean information to blind people respectively.



II. Existing System

The Shoe with IR sensor and buzzer will not give accurate result to the blind people, this is the main drawback of previous project, in previous project IR sensor are the object detecting sensor, the problem associated with these reasons and less efficiency and loss the accuracy to detect object and one more problem is it does not provide any
navigational assistance.

III. Proposed System

This project presents a prototype model and a system concept to provide a smart electronic aid for blind people. This system is intended to provide overall measures object detection, human detection, and real-time Assistance system consist of raspberry pi, ultrasonic sensor and a GPS Module and USB Micro phone. This project aims at the development of an Electronic Travelling Aid (ETA) kit to help the blind people to find obstacle free path. This ETA is fixed to the shoe. When the object is detected near to the shoe and if any person coming in front it alerts them with the help of voice commands and also in advancement with help of head phones that is voice command with the help of voice recorder and replay. Here the power supply is main criteria.

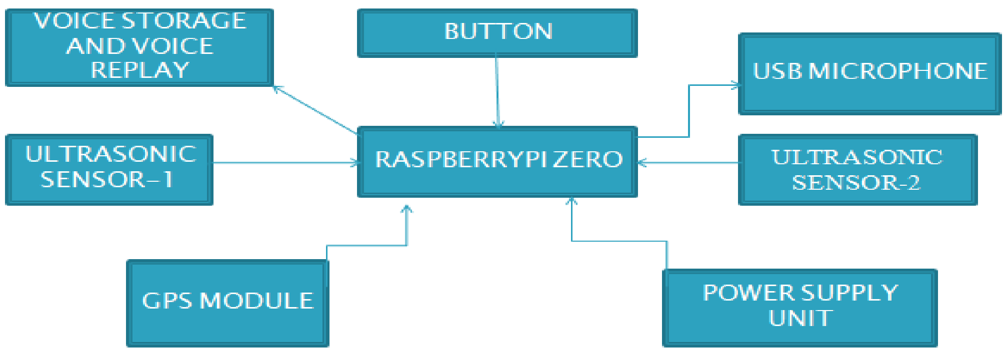


Fig.1.block diagram

Fig.2. Flow Chart

Requirements

Ultra Sonic Sensor

Ultrasonic distance sensors are designed to measure distance between the source and target using ultrasonic waves. We use ultrasonic waves because they are relatively accurate across short distances and don't cause disturbances as they are inaudible to human ear.

Fig.3.ultrasonic sensor

HC-SR04 is a commonly used module for non contact distance measurement for distances from 2cm to 400cm. It uses sonar (like bats and dolphins) to measure distance with high accuracy and stable readings. It consist of an ultrasonic transmitter, receiver and control circuit. The transmitter transmits short bursts which gets reflected by target and are picked up by the receiver. The time difference between transmission and reception of ultrasonic signals is calculated. Using the speed of sound and **Speed = Distance/Time** equation, the distance between the source and target can be easily calculated.
HC-SR04 ultrasonic distance sensor module has four pins :

- **VCC** – 5V, input power
- **TRIG** – Trigger Input
- **ECHO** – Echo Output
- **GND** – Ground

Fig .4. HC-SR04

Working of HC-SR04

1. Provide trigger signal to TRIG input, it requires a HIGH signal of atleast 10µS duration.
2. This enables the module to transmit eight 40KHz ultrasonic burst.
3. If there is an obstacle in-front of the module, it will reflect those ultrasonic waves
4. If the signal comes back, the ECHO output of the module will be HIGH for a duration of time taken for sending and receiving ultrasonic signals. The pulse width ranges from 150µS to 25mS depending upon the distance of the obstacle from the sensor and it will be about 38ms if there is no obstacle.

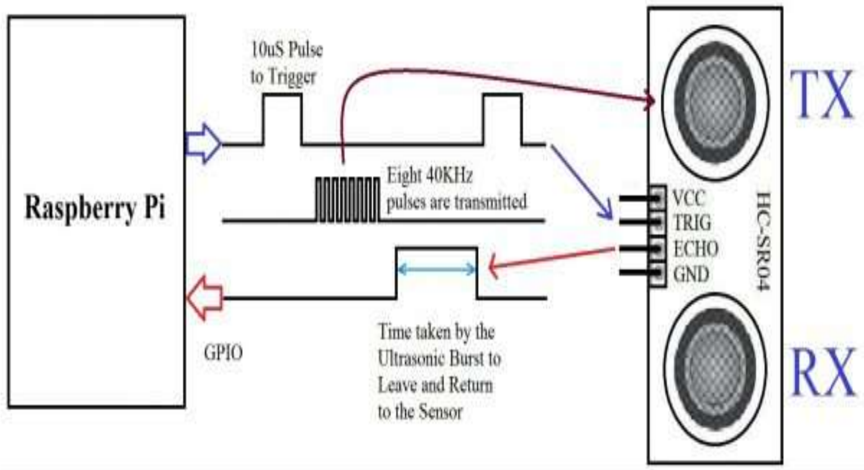


Fig.5.working of hc-sr04

Distance Calculation

Time taken by pulse is actually for **to and fro** travel of ultrasonic signals, while we need only half of this. Therefore Time is taken as Time/2.

Distance = Speed * Time/2

Speed of sound at sea level = 343 m/s or 34300 cm/s

Thus, Distance = 17150 * Time (unit cm)

USE OF MAPBOX API

Map box API python client

The Map box Python SDK is a low-level client API, not a Resource API such as the ones in boto3. Its methods return objects containing HTTP responses from the Mapbox API.

Services

Installation

$ pip install mapbox

Testing

$ pip install -e .[test]
$ python -m pytest

To run the examples as integration tests on your own Mapbox account

$ MAPBOX_ACCESS_TOKEN="MY_ACCESS_TOKEN" python -m pytest --doctest-glob='*.md' docs/*.md

Direction

The Directions class from the mapbox.services.directions module provides access to the Mapbox Directions API. You can also import it directly from the mapbox module.

The methods of the Directions class that provide access to the Directions API return an instance of **requests.Response**. In addition to the json() method that returns Python data parsed from the API, the Directions responses provide a geojson() method that converts that data to a GeoJSON like form.

Usage

To get travel directions between waypoints, you can use the Directions API to route up to 25 points. Each of your input waypoints will be visited in order and should be represented by a GeoJSON point feature.

>>.service = Directions(access_token="pk.YOUR_ACCESS_TOKEN")

The input waypoints to the directions method are features, typically GeoJSON-like feature dictionaries.

See import mapbox; help(mapbox.Directions) for more detailed usage.

GeoCoding

The Geocoder class from the mapbox.services.geocoding module provides access to the Mapbox Geocoding API. You can also import it directly from the mapbox module.

>>> from mapbox import Geocoder

>>>geocoder = Geocoder(access_token="pk.YOUR_ACCESS_TOKEN")

Geocoder methods

The methods of the Geocoder class that provide access to the Geocoding API return an instance of **requests.Response**. In addition to the json() method that returns Python data parsed from the API, the Geocoder responses provide a geojson() method that converts that data to a GeoJSON like form.

Fig.6. Neo 6m GPS

NEO-6M GPS Module that can track up to 22 satellites and identifies locations anywhere in the world. It may serve as a great launch pad for anyone looking to get into the world of GPS.

How does GPS work?

GPS receivers actually work by figuring out how far they are from a number of satellites. They are pre- programmed to know where the GPS satellites are at any given time.

IV.Results

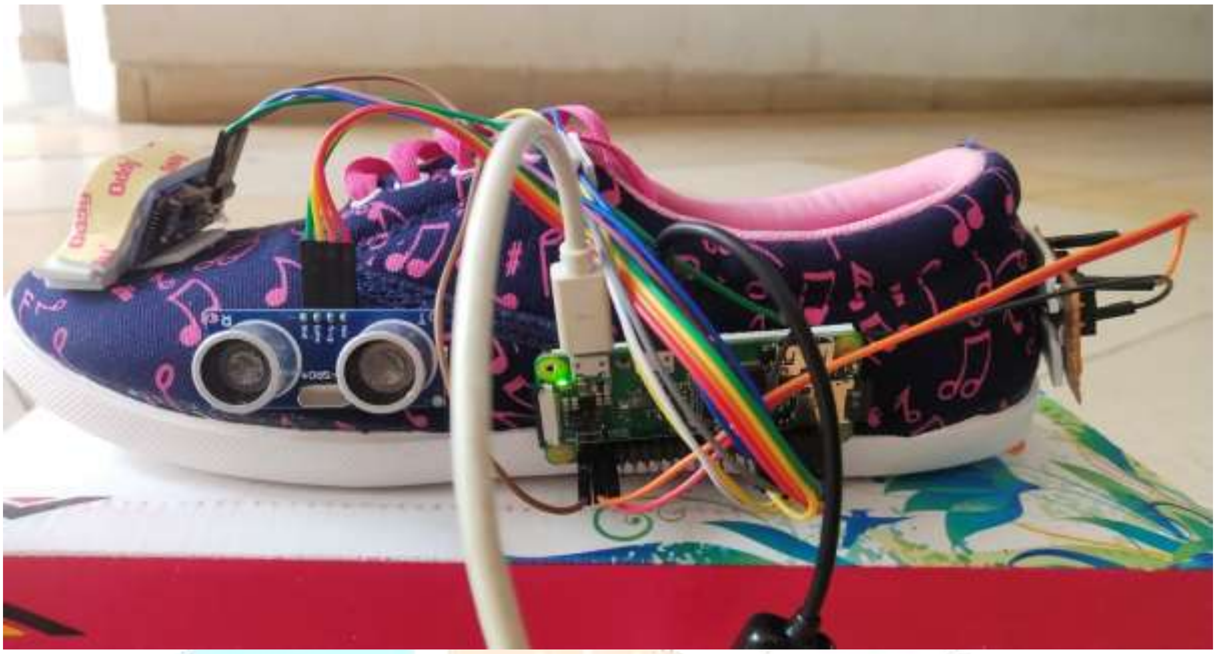


Fig.7. prototype

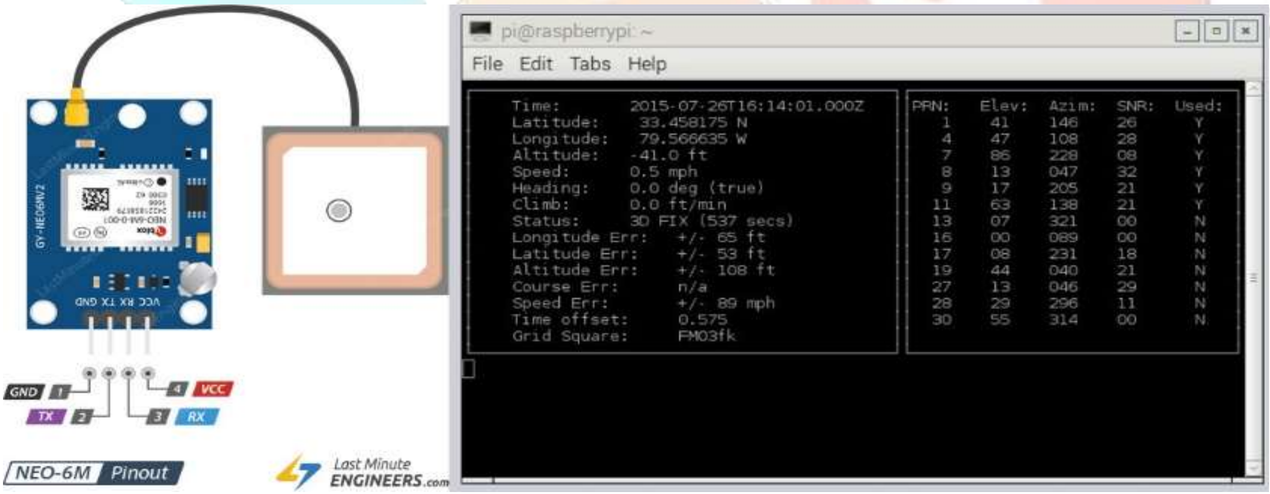


Fig.8.Output for microphone

Table.1. For Ultrasonic Sensor

Action	**Result**
Moving in different directions for sensing the obstacles	**Obstacle at front Obstacle at side**

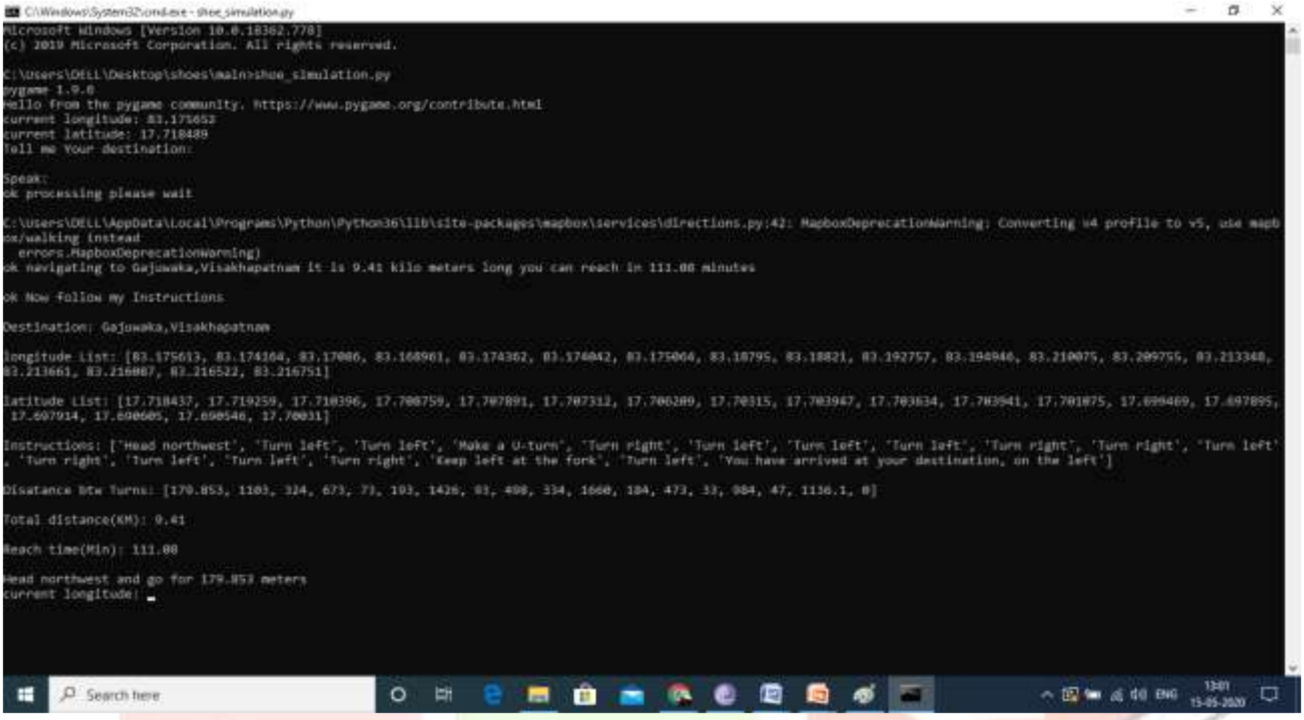


Fig.8.Output for Navigation

V.Conclusion

The future of IOT is virtually unlimited due to advances in technology and consumers desire to integrate devices such as smart phones with household machines. Wi-Fi has made it possible to connect people and machines on land, in the air and at sea. It is critical that both companies and governments keep in ethics in mind as we approach the fourth Industrial Revolution (Pye, 2014). With so much data travelling from device to device, security in technology will be required to grow just as fast as connectivity in order to keep up with demands. Governments will undoubtable face tough decisions as to how far the private the sector is allowed to go in terms of robotics and information sharing. The possibilities are exciting, productivity will increase and amazing things will come by connecting the world.

UL is committed to the continued development and widespread deployment of technologies in support of the IOT ecosystem. UL senior technical experts serve in key leadership positions in many of the current standards development efforts, including the OIC, the Thread Group, the NFC Forum, and the Air Fuel Alliance. UL is also just one of two NFC Forum-authorized testing laboratories in North America, and is the exclusive testing partner for the Thread Group's recently announced certification program. UL has extensive experience in IOT technologies, and can conduct testing at locations throughout North America, the European Union and Asia.

In order to make use of latest technology, we have proposed navigational shoes system. Wearable electronic kit is proposed. Main goal of this proposed system is to provide navigational assistance for this visually impaired

The system we have designed consists of sensor for sensing the surrounding environment and giving feedback to the blind person of the position of the nearest obstacles in range. The idea is to extend the senses of the user through this after a training period, without any sensible effort. Sensors will detect obstacles in all the directions and indicates the user saying that obstacle at front, left, right with its respective directions. Using USB microphone user gives the input to raspberry pi saying the destination place to get the directions. The directions to the destination along the time taken for the user to reach the place will be given. The user follows the instructions given to him/her and starts navigating. The person needs to wear this device all the components are connected to one shoe in convenient manner. Visually impaired persons can now travel anywhere without help of another person. By using our device visually impaired persons can be independent and learn to travel by their own. Our project involves hardware design and software knowledge. Using smart shoe, blind people need not to be depend on others for mobility. It is implemented to improve the mobility of both blind and visually impaired people in a various area.

VI. Scope For Future Work

After Detecting Obstacle the name of the object can be detected by using Image Processing. The person needs to know when there is a traffic signal and has to know the possibilities of moving from that place. We can use 360 degrees camera for detecting the vehicles, obstacles etc.

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