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Voice based navigation system for blind people Using Raspberry Pi

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Abstract: Blind people are often excluded from society because they feel that people and society are racist and may not be accepted for a long time. In order to improve the quality of life of the visually impaired or blind, in this work we focus on the development of other public facilities. The project therefore aims to play a special role in the field of providing as much information as possible to the visually impaired or blind, allowing them to travel comfortably. In order to create an example focused on users and their interests, this project aims to build a program to help people with disabilities. The program aims to assist them in providing information. In this program we will see the barrier using an ultrasonic sensor.

Keywords: Machine Learning, Object Detection, Raspberry pi, IR and Sonar Senor, Tenserflow Api.

I. INTRODUCTION

What is blind navigation system (NAVI) refers to programs that can help or guide people with visual impairments, from partially sighted to completely blind, through audio commands. The main idea of the proposed awareness system and the roadblock. ”(Raspberry Pi) for blind pedestrians and to deal with problems with existing systems successfully. The system designed will detect an object or obstacle using ultrasonic sensors and an IR sensor and provide audio instructions for orientation. It also provides information about people who look at them or raise their hands using face recognition. People who are blind and partially sighted are often dependent on others for help. The eyes are an important part of visual perception; Walking in such an outdoor setting is challenging because a blind person cannot rely on his own eyes. Traditional walking aids include white crutches and guide dogs, white crutches are the most widely used, cheap, versatile guide tools used by blind people but, they can only see nearby obstacles and cannot detect head height barriers [2]. Guided dogs had the ability to inform head height barriers, and could detect pedestrians, potential dangers, choosing the right paths and much more, a guide dog. they are expensive, require a lot of training and cannot be used for more than 5 years [3]. A few of the most important methods used were laser, GPS, computer vision infrared and SONAR. In this project we are trying to overcome all obstacles using the latest technology such as tenser flow api, sonar and IR sensor with raspberry pi.

Motivation -

In order to improve the quality of life for visual impaired or blind people, in this work we focused on developing new technologies to help these persons to access the outdoor environment in particular such as Banks, hospitals, post office, and other public utility. Therefore this work intends to play a special role in this field providing as much information as possible for visually impaired or blind people, which allows them to take a comfortable navigation. To build a prototype we focused on users and their interests, this work aims to build a system to assist people with disabilities. The system intends to help them in providing the information. In this system we are going to detect an obstacle using ultrasonic sensor and IR sensor with camera. Obstacle detection sensor acts as the heart of the system.

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II. DESCRIPTION OF THE PROBLEM

Problem statement -

Outdoor mobility becomes a daunting task for blind and partially sighted people in an increasingly urbanized world. Advances in technology cause the blind to fall behind, at times even risking their lives. Available blind navigation technology is not affordable enough some devices rely heavily on infrastructure requirements.

Objective-

- A cheaper in price but will still maintain with a good functional system.
- This system able to help visually impaired individuals to avoid the obstacles such as people and animal.
- It can provides the distance of the obstacles in front of them.

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- It can reduce the dependency on walking stick to detect all the obstacles manually.
- It can also reduce their time in finding the exact direction that they want to heading to.

III. METHODOLOGY

We are using a program in the popular IoT-based hardware module known as the RASPBERRY-PI with IR Sensor and Infrared Sensor. It will then test and the output class will be determined by precise metrics.

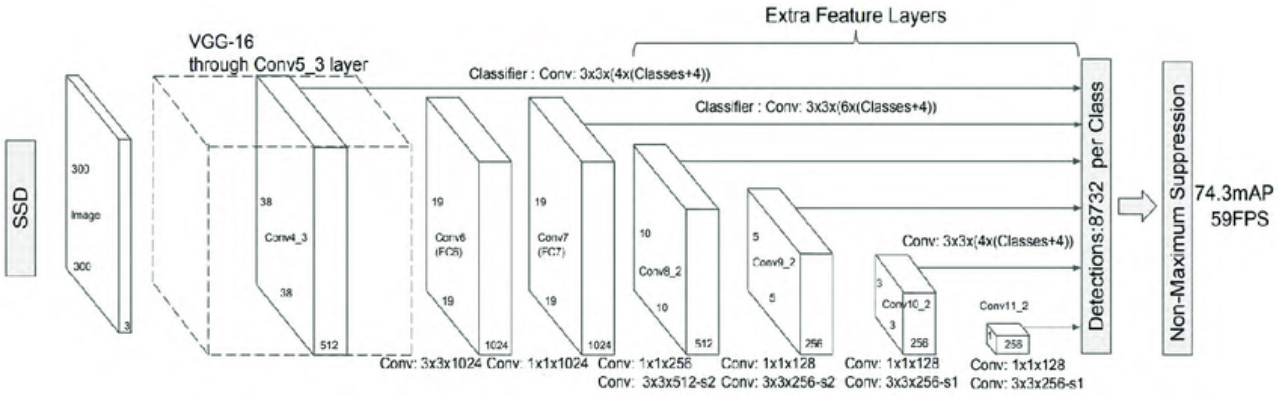
If that Blind Person is too close to the private or far from a safe place, it will produce output based on voice and distance units. TensorFlow APIs.

APIs give us ease so they can save time. TensorFlow Object Acquisition API is actually a structure for building an in-depth learning network that solves acquisition object issues. There are trained models in their framework and they call it the Model Zoo. This includes a COCO database collection, a KITTI data set, and an open image data set. Here, we are focusing on COCO DATASETS.

What is SSD model for object detection?

Image result for ssd model for object detection SSD is a single-shot detector. It has no delegated region proposal network and predicts the boundary boxes and the classes directly from feature maps in one single pass. To improve accuracy, SSD

Introduces: small convolutional filters to predict object classes and offsets to default boundary boxes. SSD has two components: SSD head and a backbone model. Backbone model basically is a trained image classification network as a feature extractor. Like ResNet this is typically a network trained on ImageNet from which the final fully connected classification layer has been removed. The SSD head is just one or more convolutional layers added to this backbone and the outputs are interpreted as the bounding boxes and classes of objects in the spatial location of the final layers activations. We are hence left with a deep neural network which is able to extract semantic meaning from the input image while preserving the spatial structure of the image albeit at a lower resolution.



IV. LITERATURE REVIEW

SR.NO	Name Of Paper	Author	Publication	Year of Publication	Description
1	Low Cost Smart Navigation System for the Blind	BarathiKanna S, Ganesh Kumar T R, Niranjan C, Prashanth S, Rolant Gini J, M.E.Harikumar	IEEE	03 June 2021	The proposed solution works on the Internet of Things realm wherein the blind can "communicate" with the environment. This prototype is equipped with an ESP8266, a power source for the development board and coin motors along with a smartphone application, thereby making it accessible for even the working class visually impaired.

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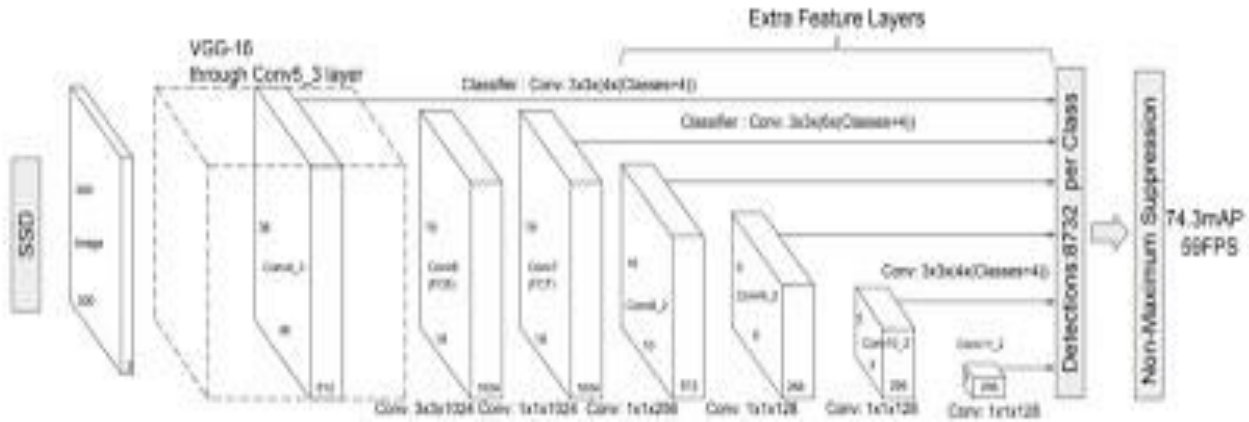
2	IoT Based Navigation System for Visually Impaired People	Shabnam Chodhary,VaishaliBhatia,K.R Ramkumar	IEEE	15 September 2020	This paper presents an RFID based electronic model, which will help a blind person to use public transport very quickly and safely in his daily life without any external help
3	V-Eye: A VisionBased Navigation System for the Visually Impaired	Ping-jungduh,YuCheng Sung, Liang-Yu Fan Chiang	IEEE	10 June 2020	This paper proposes V-Eye, which fulfills these needs by utilizing a novel global localization method (VB-GPS) and image-segmentation techniques to achieve better scene understanding with a single camera
4	An AIBased Visual Aid With Integrated Reading Assistant for the Completely Blind	Muiz Ahmed Khan ,Pias Paul , Mahmudur Rashid	IEEE	20 October 2020	In this work, we propose a novel visual aid system for the completely blind. Because of its low cost, compact size, and easeof-integration, Raspberry Pi 3 Model B+ has been used to demonstrate the functionality of the proposed prototype

V. SYSTEM DESIGN AND FLOW



Raspberry Pi

It is a small device capable of enabling people of all ages to scan a computer, and learn to edit in languages like Scratch and Python. The Raspberry Pi 3 equipment has been developed using a few forms that highlight the memory limit types and limited gadget support. Raspberry pi square capacity v01.This square frame shows Model B and B +; Models An, A +, and Pi Zero are comparable, yet they do not have Ethernet and USB center point components. The Ethernet connector is connected to an additional USB port.

Ultrasonic sensor

An ultrasonic **sensor is an instrument that measures the distance to an object using ultrasonic sound waves. An ultrasonic sensor uses** a transducer to send and receive ultrasonic pulses that relay back information about an object's proximity

Moisture Sensor

A resistive soil moisture sensor works by using the relationship between electrical resistance and water content to gauge the moisture levels of the soil. You'll observe these sensors to possess two exposed probes that are inserted directly into the soil sample.

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Vibration coin

Contain the motor inside in it and attached to ultrasonic sensor to generate the vibration after detecting the object.

OpenCV

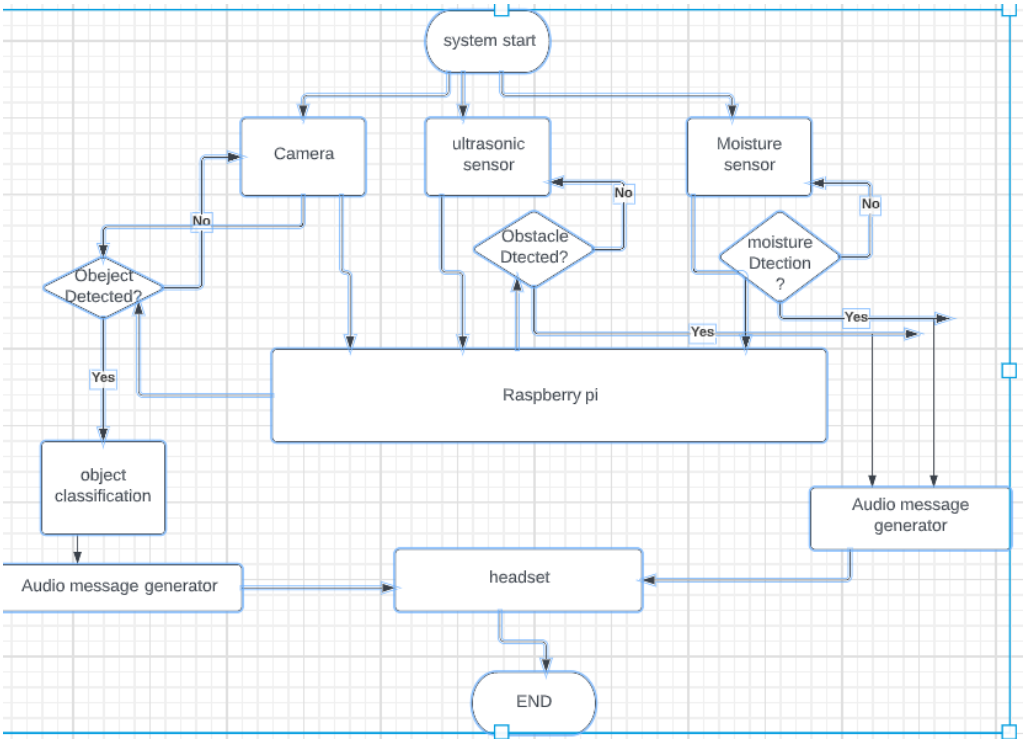
OpenCV is the huge open-source library for the computer vision, machine learning, and image processing and now it plays a major role in real-time operation which is very important in today's systems.

Image-Processing

Image processing is a method to perform some operations on an image, in order to get an enhanced image and or to extract some useful information from it.
If we talk about the basic definition of image processing then "Image processing is the analysis and manipulation of a digitized image, especially in order to improve its quality".

Image processing basically includes the following three steps:

1. Importing the image
2. Analysing and manipulating the image
3. Output in which result can be altered image or report that is based on image analysis



gTTS

- gTTS (Google Text-to-Speech), a Python library and CLI tool to interface with Google Translate's text-to-speech API. Write spoken mp3 data to a file, a file-like object (byte string) for further audio manipulation, or stdout. Or simply pre-generate Google Translate TTS request URLs to feed to an external program.

Feature

Customizable speech-specific sentence tokenizer that allows for unlimited lengths of text to be read, all while keeping proper intonation, abbreviations, decimals and more;
Customizable text pre-processors which can, for example, provide pronunciation corrections;

Image-Processing

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Pygame

Pygame is a cross-platform set of Python modules which is used to create video games. It consists of computer graphics and sound libraries designed to be used with the Python programming language. Pygame was officially written by Pete Shinners to replace PySDL. Pygame is suitable to create client-side applications that can be potentially wrapped in a standalone executable.

VI. PROJECT IMPLEMENTATION

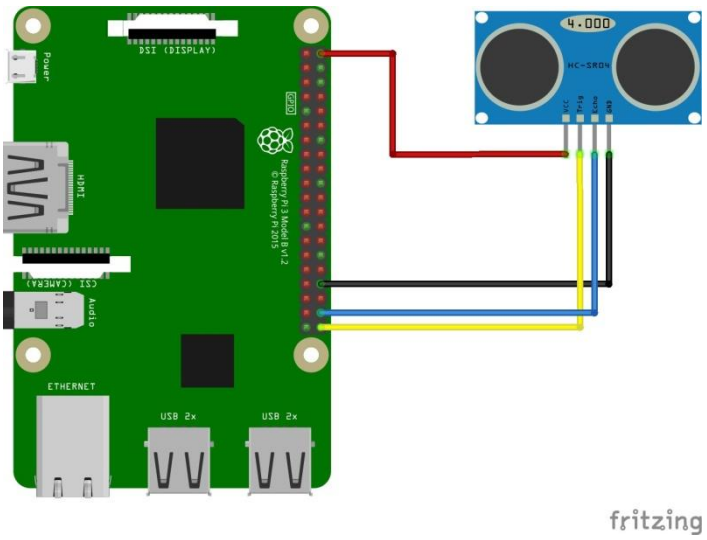

Fig. ultrasonic sensor

Both of these sensors send the data to raspberry pi which in turn processes the data and sends the desired output to the text to speech module. This again takes text as an input and converts it to an audio response which reaches the user through headset. This full process keeps going simultaneously and continuously until the user decides to switch off the device.

Fig. Result 1

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Fig. Result 2

VII. ADVANTAGES AND DISADVANTAGES

Advantages

- Low production cost .
- Low design time
- This system is applicable for both the indoor and outdoor environment .
- Setting the destination is very easy.
- This system be capable of using in public Places .
- It is a dynamic system .
- Less space .
- Low power consumption.

Disadvantages

- It is bulky to carry.
- Device being very sensitive it may send faulty message during accidental cases.
- Requirement of power source

VIII. APPLICATIONS

The World Health Organization (WHO) reported that there are 285 million visually-impaired people world wide. Among these individuals, there are 39 million who are totally blind.

- The product developed is light in weight,
- compact hence does not cause fatigue to the user.
- So this helps the blind person to be self-dependent till particular extent by giving info of surrounding objects, person, and help in keeping the track of current location.
- This system can be used in the home, hospitals and Colleges
- This system can be used in both the known and unknown environments like airports, malls and public parks etc.

IX. CONCLUSION AND FUTURE SCOPE

"Even without sight there is still vision" A navigation system for visually impaired people has been designed, implemented, and assessed in both indoor and outdoor environments This research would help future developers in giving an extended helping hand. The work presented would help blind people to easily and safely navigate using public transport. The proposed solution also provides strong justification for using hybrid technologies, because of the inability of all sensors to work under all environmental conditions (sunlight, rain, etc.)

Future scope for this project is to improve the capabilities by this system by incorporating landmark as saved destination. We would also like develop an algorithm for position and velocity so that other methods of navigation such

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as dead reckoning can be implemented accurately. To use the online route, for obtaining the route from the Google maps, so that the blind person can travel to the places which are not stored in the database.

ACKNOWLEDGMENT

The completion of our project brings with it a sense of satisfaction, but it is never complete without those people who made it possible and whose constant support has crowned our efforts with success. One cannot even imagine our completion of the project without guidance and neither can we succeed without acknowledging it. It is a great pleasure that we acknowledge the enormous assistance and excellent co-operation to us by the respected personalities.

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