



# ASSTIVE DEVICE FOR PEOPLE WITH VISUAL IMPAIRMENT

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## ABSTRACT

Since time immemorial, society has struggled with the question of how best to aid persons who are blind or have some other form of visual impairment. Nevertheless, the development of a computer-aided tool is a sector that is still in the process of expanding its capabilities. All of these systems have been developed with the goal of providing the user with support in navigating without the need for the assistance of a second person. Various works make use of a variety of different computer vision methods. Nevertheless, there is no solution that can aid blind individuals with all of their core needs at this time and it is not currently accessible. Every one of the systems that are currently operational was designed specifically to do one particular task. For the purpose of this project, we suggest a novel approach to giving aid to visually impaired individuals that brings together the most important aspects of a variety of successful approaches as well as some extra functionalities. It's feasible that this brand-new approach may help blind individuals overcome some of the most major obstacles they still confront. In addition to this, we give a comparison and analysis of the many different approaches that are presently being utilised for complete navigation.

## INTRODUCTION

The current price of modern assistance devices does not meet the requirements of the market, despite the fact that engineering solutions have become an integral part of everyone's everyday lives, particularly those that are intended to assist people who have impairments. People who have visual impairments, and more specifically their experiences inside the school system, are the core population that this initiative intends to target and assist in some way. It discusses the concept of smart glasses as a tool that may be used to provide aid in a number of different occupations, each of which is depicted as a mode that the user may pick. This project involves a variety of different modes, some of which include reading via the use of text detection algorithms, recognising the item and controlling the distance of the object, and detecting the trained recognised faces. The purpose of each of these approaches is to show that the notion can successfully be implemented. As a means of keeping the expenditures associated with this project to a bare minimum, the single-board computer Raspberry Pi 3 is being used in its capacity as the central processing unit. In addition, a Raspberry Pi camera is being used to record both video and still images for the purposes of this project. The captured video is then analysed with Tensor flow, and an audio format will be used to provide the user with a description of the live scenes for use with the text recognition mode or any other modes that may be introduced in the future. These modes can be used with any other modes that may be introduced in the future as well. As a result of the completion of this project, the blueprint for the prototype of the smart glasses can now be viewed.

## PROJECT DESCRIPTION

The technology breakthroughs of today are making our day-to-day lives simpler in a number of different ways, some of which we may not even be aware of. Some of these methods are: Among the most important developments are those that are intended to provide assistance to people with disabilities in overcoming the challenges they are up against and adjusting to the altering environment in which they find themselves.

Visual impairment, which is often referred to as poor vision, is a substantial loss of vision that cannot be corrected by the use of standard glasses or contact lenses. The inability to see clearly makes it challenging for an individual to carry out some or all of the obligations that are part of their daily routine ". According to information provided by the Globe Health Organization in August of 2020, there are roughly 285 million people all over the world who are estimated to have some sort of visual impairment, 39 million of whom are blind and 246 million of whom have impaired eyesight. It would be quite difficult for you to converse with other people, as well as to expand your level of knowledge and experience, if you were to lose your sight or your eyesight.

This project introduces a novel idea for a pair of glasses that is thought to assist visually impaired people and broaden their field of vision by providing a description of the live scenes in front of them. object detection, which is meant to identify the items; and voice assistance, which is meant to advise users. All of these functions are supposed to be included in these models. The glasses are built with a low-cost single-board computer called Raspberry Pi 3, and image processing techniques are done with the help of TensorFlow models.



## LITERATURE SURVEY

It is vital to be able to find the item of interest, as well as track it well, while concurrently handling occlusions and any other associated challenges. This is true in a number of scenarios. Numerous researchers, including Almeida and Guting (2004), Hsiao-Ping Tsi (2011), Nicolas Papadakis and Aure lie Bugeau (2010), and others have experimented with different approaches to the task of object tracking. The features of the techniques are significantly influenced by the application domain in a substantial way. Before the creation of the proposed work, the following is a portrayal of some of the research activities that were carried out in the field of object tracking. These efforts were carried out prior to the development of the proposed work.

1. The necessities required by blind people are as follows:
2. The sake of making a better design, it is important to collect information on their requirements and expectations. In a number of papers, including ones written by blind people, certain needs have been outlined in order to provide researchers with assistance in developing a deeper comprehension of the issues at hand. The paper has identified certain types of information needs for a defined task, such as the function of the task, the form in which we start, and so on. Categorizing the information needs of the visually impaired may appear to be a difficult task, but the paper has identified these information needs. People who have had normal eyesight for a longer period of time may be more interested in learning more details than people who were born without them since the quantity of information that is required truly relies on the personality of the individual as well as his past.
3. A Processing System for Stereographic Images Designed for Individuals Who Are Visually Impaired
4. The accompanying piece of research presents a recommendation for a system that would assist those who are blind or visually impaired in navigating by utilising stereo vision, systematic methods to image processing, and operational procedures for signification. This would be a useful tool. A computer that is worn on the body, stereo cameras that operate as a vision sensor, and stereo ear buds that are built into the shell are all included in the end product of the system.

## EXISTING SYSTEM

Only India will cover half of the world's 39 million blind people; the country is home to approximately 15 million people who are completely blind and have no vision at all. These individuals are wholly reliant on the help and support of other people in order to go about their daily lives, such as when they need to cross the street or complete their own work. There are currently 39 million blind people in the world. Only India will cover half of that number. Many Products are at market but not up to the requirements of blind people at the present there are only devices that can sense the object and if the object is detected the ultrasonic sensors produces a beep sound, and the sound increases as the person moves towards the object closer. As India the fastest Growing IT industry many Start-ups are working on developing a device for people

with visual impairment. As India the fastest Growing IT industry many Start-ups are working on developing a device for people with visual impairment.

The general public will need to learn how to use the new devices that are right in front of their faces, as well as adapt to the barrage of wireless data, images, and audio that will be coming from these newly sentient glasses. This will be in addition to learning how to use the new devices that are right in front of their faces. Additionally, if you picture or video someone without their consent, it may give off a creepy vibe to the subject of your attentions.

## PROPOSED SYSTEM

The suggested system has been put into place so that it may address the issues that are present in the existing system and make life easier for blind people. Raspberry Pi is used to implement Item Detection and Character Recognition for blind people. Object Detection Technology is used to identify the object by using python Models and libraries such as TensorFlow and OpenCV. Character Recognition Technology is used to read printed text.

The voice generating module is crucial to the functioning of the system that is proposed. After the location of an item has been determined, it is of the utmost importance that the individual in issue be informed of its existence. After determining the location of an object and its distance from a person, we are obligated to provide voice commands concerning the things that are in the path of blind people. This is accomplished with the help of many Python programmes, including pytorch, pyttsx3, pytesseract, and engine.

A buzzer can be found in the glasses, and it beeps more slowly when the thing ahead of you is further away or shorter, and it beeps more quickly when the object is closer or taller. An Arduino Nano serves as the "brain" of each pair of glasses. An ultrasonic sensor is attached to a hinge at the front of the glasses, and it is this sensor that provides input to the Arduino. The Arduino creates a proportional mapping between the distance readings of around 10 to 60 centimetres and the buzzer's buzzing speed, which ranges from 50 to 250 milliseconds. The buzzer that I used is just a standard passive module for a buzzer.

## Case Study

For instance, we developed an integrated machine learning system that enables visually impaired people to recognise and categorise real-time based everyday objects. The system also generates voice feedback and distance warnings based on how close or far away they are from the object, which enables visually impaired people to avoid potentially dangerous situations. In order to accomplish this, we make use of the TensorFlow API and Models, in addition to Opencv and other other Python Libraries.

## Data Collection

APIs provided by TensorFlow are being utilised in the process of implementing anything. Utilizing application programming interfaces (APIs) is advantageous since they provide a standard set of actions. Therefore, rather of beginning from scratch, we may reuse code that was



developed earlier. It is safe to claim that not only are they useful, but also that they are efficient. APIs help us save time by making our processes easier to use. TensorFlow is utilised in this framework for the purpose of constructing a deep learning network that can tackle object identification issues. The collection of trained models that are contained inside its framework has been given the moniker "Model Zoo." This collection features several different datasets, including the Open Images Dataset, the COCO dataset, and the KITTI dataset. The major focal point of this article is COCO DATASETS.

### Developing a Model

Establish an independent virtual environment. The primary objective of Python virtual environments is to provide Python projects with an environment that is separate from other types of work. This indicates that each project has the ability to have its own dependencies, independent of the dependencies that each other project has. The next step is to set up your PC with the API's required dependencies. Once your virtual environment has been activated, then install the necessary dependencies and libraries to run the model.

### Training, Saving and Loading the Model

TensorFlow comes equipped with a plethora of models that have already undergone training. Which option you go with is entirely up to you. They are of acceptable quality, and you may select one of them according to the specifications of your machine. The SSD Mobile Net DETECTION has the benefit of being faster than the SSD DETECTION as well as the MASK RCNN, and it also offers a higher level of accuracy. On the other hand, SSD Mobile Net DETECTION delivers a more reliable performance overall.

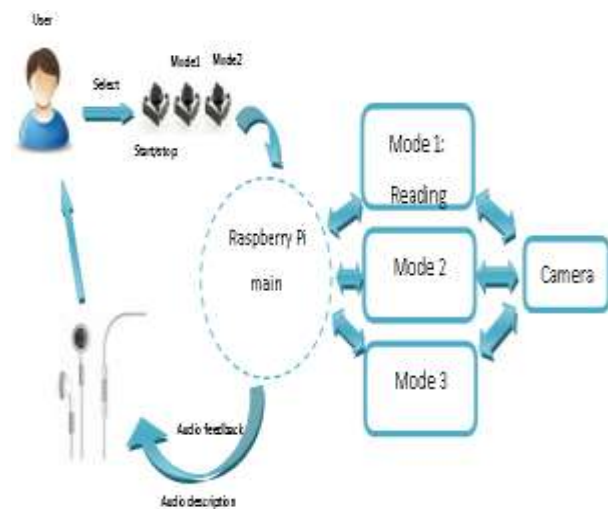
Every single input picture is given 256 feature maps that are of the size 7x7 when processed by ResNet34's backbone method. Each grid cell in SSD is assigned with the job of detecting things placed in their own section of the image once the picture is split using a grid in SSD. The grid is used to segment the picture. The most fundamental aspect of object detection is the process of determining both the kind and location of an object that may be present inside a particular region.

### Object Detection, and Reorganization

After training a model with an algorithm to perform, loading dependencies and libraries onto the Raspberry pi, and performing the last phase of our case study, we found that. Examine the setup menu of the Raspberry Pi to check if the Pi camera option is activated on the device. Execute the Python script by using the command python file as the invocation. pyThe object detection window will then be opened, which can be utilised to locate and identify objects in the same manner as demonstrated in the video.

### Context Diagram

A context diagram is used to define the limit between the framework, or frameworkpart, and its condition, demonstrating the elementsit interfaces with. Context diagram issameas the blockdiagram.



### ASSISTIVE DEVICE FOR BLIND PEOPLE

The device is equipped with a Raspberry Pi that is attached to one of the sides of the glass and has components like a Pi camera that are used to identify the object and provide assistance to the person with audio when the person approaches the object. As the person moves closer to the object, the device guides with distances and provides assistance with the closer it moves; this is accomplished by using the TensorFlow API, TensorFlow models, and Opencv Packages that are trained to Raspberry Pi by using Python. The prototype for this project consists of a pair of spectacles equipped with a camera and an earpiece, which are connected to a single board computer using the raspberry pi 3 package for raspberry pi. This package is used to implement the modelling and coding for the image processing.

- The individual is guided while chairs, seats, cots, and other items are announced.
- While you are taking a stroll on the street, it warns you of approaching two-wheelers as well as any other cars, animals, or people who are walking slowly.
- Warns pedestrians of crooked sidewalks and floors, sandy and marshy regions, open sewer canals and manholes, and so on, when they are strolling in a crowded location.

### REQUIREMENTS

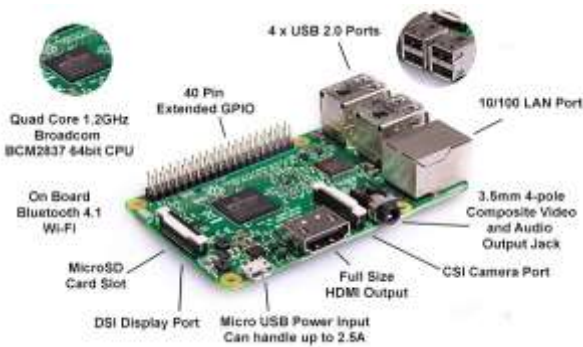
- 1- Raspberry Pi3
- 2- Raspberry pi camera
- 3- Ultrasonic Sensor
- 4- Infrared Sensor
- 5- Earpiece: to deliver the audio output to the user.

### Raspberry Pi 3:

The Raspberry Pi Foundation of the United Kingdom developed a line of low-cost single-board computers under the brand name Raspberry Pi. The mission of the Raspberry Pi Foundation was to promote the education of fundamental computer science concepts in educational institutions and in nations that are still developing.



The initial model ended up being used for applications other than those that were planned for it, such as robots, and it started to sell for purposes other than those that it was originally meant for. The Raspberry Pi does not come with any extra accoutrements of any type, including a keyboard, a mouse, or any kind of case of any description. On the other hand, USB ports make it possible to establish connections to the chip.



### Raspberry Pi Camera

The Raspberry Pi Camera v2.1 has been upgraded with a fixed focus that is more accurate and a Sony IMX219 image sensor that has 8 megapixels. It is compatible with each and every model of Raspberry Pi. It also supports video at 1080p30, 720p60, and 640x480p90 resolutions, and it is capable of producing static graphics with a resolution of 3280 by 2464 pixels.

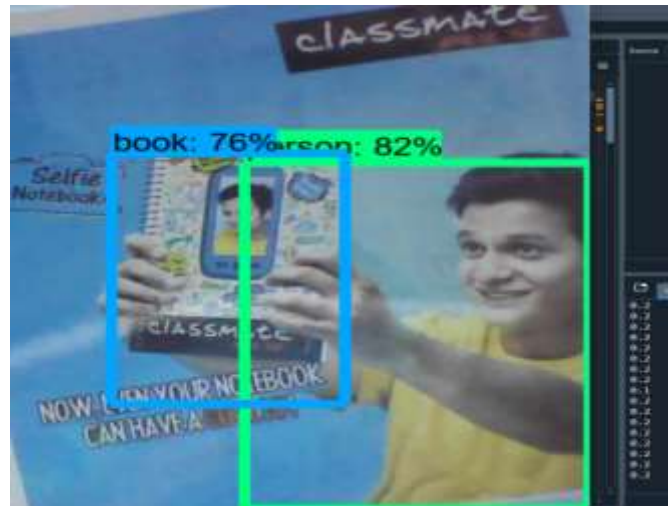


### RESULT

Obstacles that may be encountered when walking include everyday items and appliances, numerous sorts of cars, food, and more. This is advantageous to a wide range of users, including those in the banking, travel, food, and education industries, among others. The similar conclusion may be drawn from the opinions of those who work in the financial industry. For those who are blind or visually impaired, a detecting app may assist them locate items with more accuracy using the suggested approach.

Using deep learning object identification and speech recognition technologies, we devise an object detection system in this research. The speech synthesis in this technology makes life easier for those who are blind or visually

challenged. Our research focused on the most effective ways to assist the blind, one of the many possible applications for deep learning technology. As a consequence, the system was enhanced with speech recognition and voice direction technology and put to the test.



### CONCLUSION

The findings of this study might one day be put to widespread use to aid visually impaired people in their day-to-day activities. It is conceivable that the technology will be implemented in other settings, such as coal mines and sea beds, where visibility is limited in order to assist the expansion of industrial output and growth. The completion of this research should ultimately result in an improvement in the standard of living enjoyed by blind and partly sighted individuals. People who are visually impaired have the ability to stay safe in their day-to-day lives, whether they are reading a book or walking through a city, by making the most of the software and the auditory feedback that comes with it. This allows them to avoid a variety of potential hazards. As a result, it will be of assistance in avoiding any accidents. It is possible to utilise the cameras on mobile devices to recognise items in the surroundings and emit noises in an audio format.



This makes mobile devices easy to carry around with one because of their portability. enabling persons who are blind to "See Through the Ears" in this way to receive assistance.

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