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# DEEP LEARNING BASED ASSISTIVE DEVICE FOR VISUALLY CHALLENGED

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**Abstract:** Having to deal with sight loss or low vision is merely one of the challenges that the visually impaired are facing when living life. Unsighted persons find themselves vindicated to go out individually. There are millions of blind people in this world who are always in need of helping hands. But coming to the point of Blind people, no matter what advanced technology you give them, they may not operate because they don't have the ability to see and use the devices. Not only devices, they need to depend on others completely even for small tasks. In order to fulfill the above missing parts of the blind people, we proposed a device embedded with advanced technology which will allow the person to do their own work rather than being dependent on others. In this project, we will be using Raspberry pi which will make smart sticks for blind people, embedded with pi camera modules and ultrasonic sensors. Pi Camera detects and identifies the type of object with the help of deep learning and its representative tools. An ultrasonic sensor is used to detect real-time hurdles while walking on the roads. The proposed system can provide more abundant surrounding information with the help of this Assistive device

**Keywords:** Raspberry Pi,Pi camera,Ultrasonic sensors.

## I. INTRODUCTION

Blindness or visual impairment is a condition that affects many people around the world. This case leads to the loss of the valuable sensitivity of perception. Visually impaired people suffer inconveniences in their daily and social life. Eyesight plays a major role in collecting most of the information from the real world and that information will be processed by the brain. Across the world, there are millions of people who are visually impaired, out of which many are blind. The compulsion for beneficial devices was and will be interminable. There is an immense range of navigation systems and devices existing for visually impaired individuals. India's population is currently at a whopping 133 crores, out of which, about 1.5 crore people are visually impaired, and 2.7 crore people are physically disabled. The ingenious device for blinds is a contraption that helps blind people to navigate with speed and confidence by detecting nearby objects and obstacles using the help of a pi camera, ultrasonic waves, and notify them with buzzer sound along with voice alert. The current technical knowledge is improving daily in different aspects in order to provide flexible and safe movement for the people. Currently, the most widespread and used means by the visually impaired is the white stick, however, it has limitations. With the latest technology, it is possible to extend the support given to people with visual impairment during their mobility. This project proposes an economical object detection based on the third eye for visually challenged people, so as to gain personal independence and free from external help. A portable user-friendly device is flourished that can identify the obstacles in the path using ultrasonic sensors. If the obstacle is close then raspberry pi sends a signal to sound a buzzer and also sends the voice command through the earphones

## II. LITERATURE SURVEY

Ayat A. Nada [1], proposed a Stick solution that uses different technologies like infrared, ultrasonic sensor, and laser but they still have drawbacks. In the present study, light pressure, low-cost, adaptable, fast response, and low power utilization. Smart stick-based infrared technology. A combination of infrared sensors can reveal stair-cases and other obstacle presence in the user path, within a range of two meters. The tentative results carry out good accuracy and the stick is able to identify all of the disincentives.

S. Innet, N.Ritnoom [2] proposed that blind people use a white stick as a tool for directing them when people move or walk. In spite of, the white stick is helpful, it cannot give a high assurance that it can assure blind people away from all levels of hurdles. Several researchers have been obsessed with establishing electronic devices to protect blind people away from obstacles with a higher guarantee. This study introduces a hurdles restraint alternative by using an electronic stick that serves as a tool for blind people while walking. It exploits an infrared sensor for detecting hurdles along the roadway. With all levels of hurdles, the infrared stick facilitates identifying all types of earthly material available in the course such as concrete, wood, metal, glass, and human beings. The outcome also shows that the stick detects obstacles

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in a range of 80 cm which is the same as the length of the white stick. The twig is designed to be small and light, so that blind people can carry it comfortably.

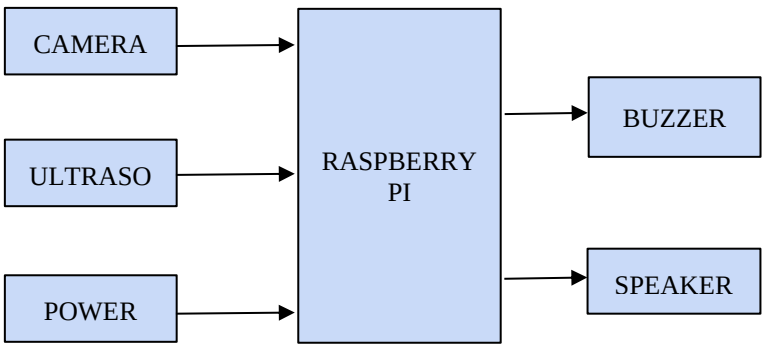
Ross Girshick [3], proposed a Fast Region-based Convolutional Network method (Fast R-CNN) for object detection. Fast R-CNN frames on previous work to accurately distribute object proposals using deep convolutional networks. Correlated to previous work, Fast R-CNN uses several innovations to improve training and testing speed while also increasing detection accuracy. Fast R-CNN tracks the very deep VGG16 network 9x faster than R-CNN, is 213x faster at test-time and achieves a higher mAP on PASCAL VOC 2012. Compared to SPP net, Fast R-CNN trains VGG16 3x faster, tests 10x faster, and is more accurate. Fast R-CNN is implemented in Python and C++.

## III. PROPOSED SYSTEM

The proposed system uses Raspberry pi, which is a small processing device that works as a computer at a relatively low cost. Blind and visually impaired people find difficulties in detecting obstacles while walking in the street. The system is intended to provide artificial vision and object detection, real-time assistance via making use of Raspberry Pi. The system consists of a pi camera module, ultrasonic sensors, and headsets to receive the instruction through audio, voice output works through TTS (text-to-speech). The proposed system is equipped with a pi camera module, two ultrasonic sensors. This system detects an object around them and identifies the type of the object and sends feedback in the form of speech that is warning messages via earphone. The aim of the overall system is to provide a low-cost, efficient navigation and obstacle detection aid for the visually impaired which gives a sense of artificial vision by providing information about the natural scenario of static and dynamic objects around them so that they can walk independently. The functionalities of sticks for blind people increases as compared to existing systems as it has added opportunities that will help the blind. Our added proposal system will help blind people in various domains and it becomes a multi-dimensional device that will yield a better factor and increase the performance of the stick for the visually challenged.

### *A.* Block Diagram

The block diagram of the Assistive device for blind people represents the components that are used and the connections that are made accordingly. The block diagram depicted in the figure below consists of the components like Pi Camera module, ultrasonic sensor, buzzer. The power supply is used to supply the necessary power to make the board function.



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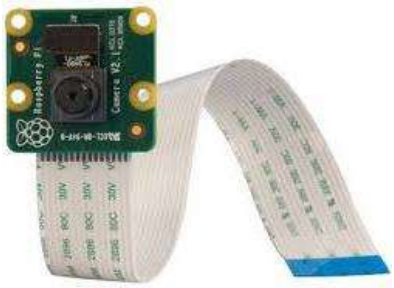
B. Pi Camera Module

Pi Camera component is a camera that could be used to take pictures and high definition video. Raspberry Pi Board has CSI (Camera Serial Interface) interface to which we can attach the Pi Camera module directly. This Pi Camera component can unite to the Raspberry Pi's CSI port using a 15-pin ribbon cable. The Raspberry Pi camera component could be used to take high-definition video, as well as stills photographs



C. Ultrasonic Sensor

Ultrasonic sensors expend short, high-frequency sound pulses at proper intervals. These propagate in the air at the velocity of sound. If they force an object, then they are caught back as echo signals to the sensor, which itself computes the distance to the target based on the time span between emitting the signal and receiving the echo


D. Buzzer

A buzzer or beeper is an audio signal device, which may be mechanical, electromechanical, or piezoelectric (piezo for

short). Natural uses of buzzers and beepers comprise alarm devices, timers, and confirmation of user input such as a mouse click or keystroke.

E. Raspberry Pi

The Raspberry Pi obtain a Broadcom BCM2836 system on a chip (SOC), which encompasses an ARM1176JZF-S 700 MHz processor (The firmware includes a number of "Turbo" modes so that the user can attempt overclocking, up to 1 GHz, without affecting the warranty), Video Core IV GPU and it originally shipped with 256 megabytes of RAM, later upgraded to 512 MB. It appends a built-in hard disk or solid-state drive but uses an SD card for booting and long-term storage.

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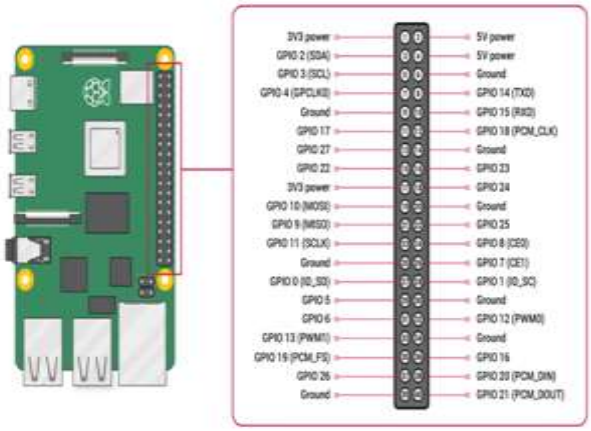

F. Deep Learning

Deep learning entities have a considerable credit assignment path (CAP) depth. The CAP is the group of conversions from input to output. CAPs depict probably causal connections among input and output. Deep-learning entities have a considerable credit assignment path (CAP) depth. The CAP is the group of conversions from input to output. CAPs depict probably causal connections among input and output.

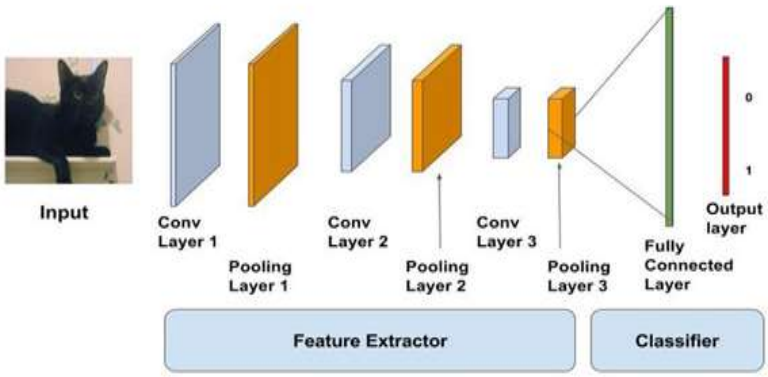


Image recognition

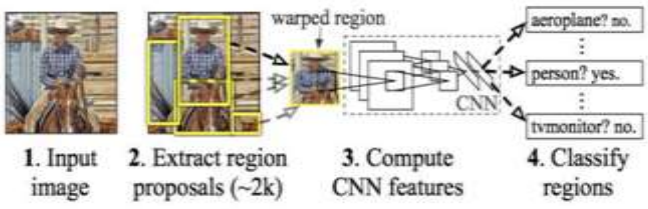


Fig. . CNN Algorithm

G. Methodology

The methodology in the proposed system is Deep learning algorithm which is considered the best one in order to predict the outcome of object detection.

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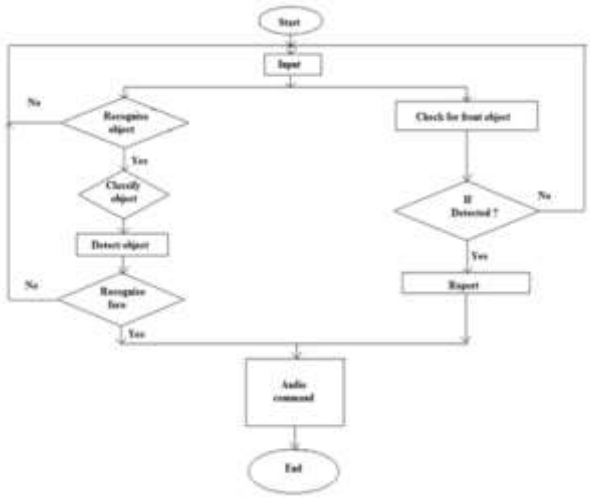
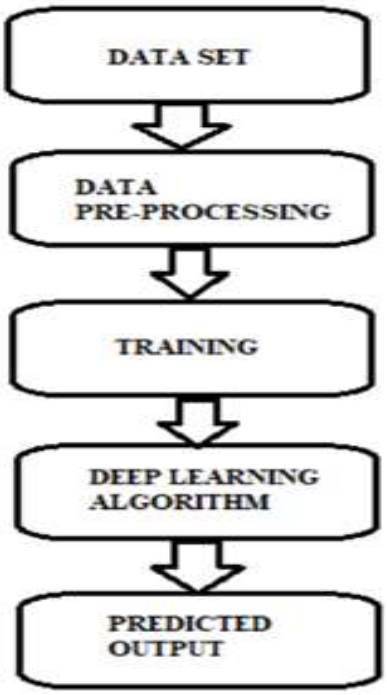



In the Object detection process, follow the tensor flow architecture, preprocessing the data, building the model, training and estimating the model. It is termed tensor flow because it will take input as a multidimensional array, also called tensors. The input starch is at one extent, and then it dribbles through this system of multiple operations and comes out the other end as output. After the training process, whenever the object comes near to the camera it captures the image and then verifies the image in the data set, then it alerts the user about the obstacle. It is a user-friendly device that helps the user in all aspects. Coming to the sensors, ultrasonic sensors used for near obstacle identification.

The accessory device can be used in two modes;

1. Object detection
2. Object distance measurement.



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## IV. CONCLUSION

The main purpose of this study is to produce a prototype that can identify the type of object and that can detect obstacles in front of users and feed it back, in the form of voice messages and buzzers, to the user. Due to its powerful learning ability and advantages in dealing with occlusion, scale transformation, and background switches, deep learning-based object detection has been a research hotspot in recent years. This provides a detailed review of deep learning-based object detection frameworks which handle different sub-problems, such as occlusion, clutter, and low resolution, with different degrees of modifications on R-CNN. The analysis starts on inclusive object detection pipelines which provide base architectures for other related tasks. Finally, we move for several promising future regulations to gain a thorough understanding of the object detection landscape. It aims to solve the problems faced by visually challenged people in their daily life. The system also takes measures to ensure their safety.

## V. FUTURE SCOPE

The global position of the user is obtained using the "Global Positioning System" (GPS), and their current position and guidance on their destination will be given to the user by voice. This not only helps the user but also gives the information about the current status of the user to their family members. Now Google is creating AI-powered glasses that can help blind and visually impaired people. The glasses, developed by Envision, can get visual details from images of the people and public transport, among other things, and speak to the user. It can also read texts from books, identify friends and describe surroundings to the person

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