



# Object Detection Guidance for Blind People using CNN Model

Nithya K S<sup>1</sup>, Bhavyashree T N<sup>2</sup>, Afsha Firdose<sup>3</sup>

B E Scholar, Dept. of CS&E, BGS Institute of Technology, Nagamangala Taluk, Mandya District, Karnataka, India<sup>1</sup>

B E Scholar, Dept. of CS&E, BGS Institute of Technology, Nagamangala Taluk, Mandya District, Karnataka, India<sup>2</sup>

Assistant Professor, Dept. of CS&E, BGS Institute of Technology, Nagamangala Taluk, Mandya District, Karnataka, India<sup>3</sup>

**ABSTRACT:** Today human life is easy due to technologies we are using. We all know blind people can't able to see therefore they face many problems. Blindness causes due to many reasons like diseases, injuries etc. The main aim of this project is to give guidance for the blind one to navigate. In this we design and implement the smart cap which help for navigation by experiencing surrounding objects. The scenes around use will be captured using NOIR camera along with it detect the object. Output will be out from the earphone which will give a voice note about object detected. In architecture we consist of raspberry pi3, NOIR camera, earphone and a power source. The device uses TensorFlow API, open-source machine learning library developed by the Google for object detection and classification. Detecting and classification of many objects in a single image using TensorFlow. eSpeak is synthesis software which converts txt to speech. Here we detect objects which comes under 90 different classes.

**KEYWORDS:** Raspberry Pi 3, TensorFlow API, TTS, eSpeak, NoIR camera

## I. INTRODUCTION

Vision is one of essential senses of human being. Blind people's faces many problems in their daily life. These blindness problem is due to heredity, accidents, etc. blind people cannot able to find out product which are around them. here main aim is to be given information to blind one about surrounding objects by detection process. Real time object detection can help blind people to navigate freely from one place to another. Raspberry Pi-3 processor which is loaded with a pre-trained Convolutional Neural Network model (CNN) developed using TensorFlow will be included in propose system. NOIR camera is connected by processor and this processor is coded by python language. The real time image is captured by NOIR camera is then processed by Raspberry pi-3 processor. Object can be detected and classified using COCO model in python. Detection of object is done by drawing a boundary box around and also shows category index of the object. Every object detected is to be stored in the form of text. Category index consist of class name, class id of an object. Each txt file is converted in voice by using software text to speech synthesizer called eSpeak.

## II. RELATED WORK

- [1] In 2015, Hanen J abnoun I, F aouzi Benzarti I, Hamid Amiri I are published a paper Object Detection and Identification for Blind People in Video Scene.. Vision is one of the very essential human senses and it plays the most important role in human perception about surrounding environment. Hence, over thousands of papers have been published on these subjects that propose a variety of computer vision products and services by developing new electronic aids for the blind.
- [2] In 2016, Kaban Chaccour, Georges Badr publishrd a paper Computer vision guidance system for indoor navigation of visually impaired people.. Visually Impaired and blind people suffer from reduced mobility, as they cannot detect the terrain and their environment. They always need assistance and walking support systems in their daily life. Solutions have been proposed many decades ago and are rapidly improving nowadays due to the technology evolution and integration. A large number of assistance aids have been deployed in real life situations whereas other concepts remained as research ideas. This paper describes a new approach of an ambient navigation system that would help the visually impaired or blind person to move freely indoor (house, office, etc.) without the assistance of anyone.
- [3] In 2016, Huang J, Rathod V, Sun C, Zhu M, Korattikara A, Fathi A, Fischer I, Wojna Z, Song Y & Guadarrama S are published a paper Speed/accuracy trade-offs for modern convolutional object detectors.. The goal of this paper is to serve as a guide for selecting a detection architecture that achieves the right



- speed/memory/accuracy balance for a given application and platform.
- [4] In 2016, Liu W, Anguelov D, Erhan D, Szegedy C, Reed S, Fu C & Berg AC are published a paper Single shot multibox detector. European conference on computer vision.... We present a method for detecting objects in images using a single deep neural network. Our approach, named SSD, discretizes the output space of bounding boxes into a set of default boxes over different aspect ratios and scales per feature map location. At prediction time, the network generates scores for the presence of each object category in each default box and produces adjustments to the box to better match the object shape.
  - [5] In 2017, KrutiGoyal, KartikeyAgarwal, Rishi Kumar are published a paper Face Detection and Tracking Using OpenCV... An application for tracking and detecting faces in videos and in cameras which can be used for multipurpose activities. The intention of the paper is deep study of face detection using open CV.
  - [6] In 2017, Nitin R. Gavai, Yashashree A. Jakhade, Seema A. Tribhuvan, RashmiBhattad published a paper on MobileNets for Flower Classification using TensorFlow.... Classification of objects into their specific classes is always been significant tasks of machine learning. As the study of flower, categorizing specific class of flower is important subject in the field of Botany but the similarity between the diverse species of flowers, texture and color of flowers, and the dissimilarities amongst the same species of flowers, there still are some challenges in the recognition of flower images.

### III. PROPOSED SYSTEM

#### A. Block diagram:

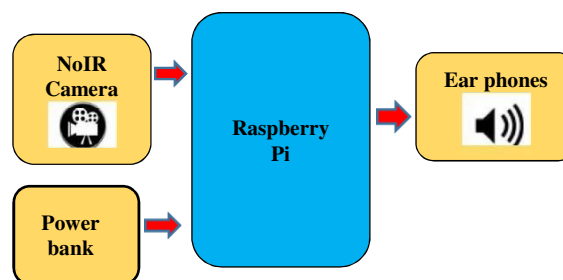


Fig.1 Block diagram of the proposed system

#### B. Description about the diagram:

Smart Cap is based on TensorFlow and text to speech synthesizer software along with a single object detection model and it is able to classify the one or more objects present in an image, also it can identify the exact position of the image with a bounding box framing the object. This project is able to detect objects which come under 90 various classes. The system work starts by suitably powering the raspberry pi processor. Thus, the web camera interfaced through one of the USB ports of raspberry pi is initialized. NoIR camera is used to capture the real time video. It is converted to set of frames using python command. We are using a simplest and fastest pre trained object detection model 'ssd\_mobilenet\_v1\_coco' offered by TensorFlow to detect various objects present within our image. Identification of various objects present in the image is done using detection graphs and weights. The output contains a box representing a part of the image where a particular object was detected, score representing level of confidence for each of the objects and class label. This can be displayed when the raspberry pi is interfaced with a display system. The text documents like class label, scores etc. are converted to voice output by using the text to speech converter software called eSpeak. The earphones connected to audio jack of raspberry pi provides voice description corresponding to the objects present in the image.



#### IV. SIMULATION RESULTS

THE PROTOTYPE OF THE PROPOSED SYSTEM IS SHOWN BELOW.



FIG.2. PROTOTYPE OF THE SYSTEM PROPOSED



FIG.3. OUTPUT SCREEN

The above figure shows the image of the output screen. It shows that in a single frame three objects like television, person and chair is detected. Anyway the disadvantage of the system is that it has left many objects in the frame undetected. Also sometimes there will be error in the object classification that the system will misinterpret one object as another.

#### V. CONCLUSION AND FUTURE WORK

The system has a simple architecture that transforms the visual information captured using a camera to voice information using Raspberry Pi. the blind one needs only to wear the cap and doesn't require any particular skills to operate it. This is cheap and configurable and they simply has to only power up the device. The system helps in clear path indication and environment recognition. The device is a real-time system that monitors the environment and provides audio information about the environment making blind people navigation more safe and secure. The smart cap will be really helpful for the blind people in their navigation. The object detection can be developed to find the distance of an object. In this paper, the COCO model is used to train the SSD mobile net which can detect only 90 classes of objects. The number of objects can be increased by training the model by ourselves.

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