



IJIRCCCE

e-ISSN: 2320-9801 | p-ISSN: 2320-9798



INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN COMPUTER & COMMUNICATION ENGINEERING

Volume 9, Issue 6, June 2021

ISSN INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA

Impact Factor: 7.542



9940 572 462



6381 907 438



ijircce@gmail.com



www.ijircce.com

Smart Cap: Vision for the Visually Impaired

Prof. Ashwini Patil¹, Aishwarya V. Malve², Karan V Pawar³, Rushikesh B Gawane⁴,

Snehal P Salunkhe⁵

Lecturer, Department of Computer Science, Annasaheb Dange College of Engineering & Technology, Ashta, India¹

Student, Department of Computer Science, Annasaheb Dange College of Engineering & Technology, Ashta, India^{2,3,4,5}

ABSTRACT: The people that are having complete blindness or low vision face many sorts of hurdles in performing a day routine works. Our aim is to develop a navigation aid for the blind and therefore the visually impaired people. We design and build a working prototype of a system which will help for visual impaired people. The scene around the person is going to be captured by employing a Creative USB2.0 Webcam camera and therefore the objects within the scene will be detected. The headset will provides a voice output describing the detected objects. The architecture of the system consists of Raspberry Pi 3 processor, Creative USB2.0 Webcam camera, headset and an influence source. The processor collects the frame of the surrounding and converts it to voice output. The device uses TensorFlow library (v.2.0 GPU), open source machine learning library developed by the Google Brain Team for the object detection and classification. TensorFlow helps in creating machine learning models capable of identifying and classifying multiple objects in a single image. Thus, details corresponding to varied objects present within one frame are obtained using TensorFlow library (v.2.0 GPU). A Text to Speech Synthesizer (TTS) software called eSpeak is used for converting. The detail soft he detected object (in text format) to speech output. So the video captured by using the Creative USB2.0 Webcam camera is finally converted to speech signals and thus narration of the scene describing various objects is completed. Objects which come under different classes like mobiles, vase, person, vehicles, couch etc are detected.

KEYWORDS: Raspberry Pi 3 processor, TensorFlow library (v.2.0 GPU), TTS, eSpeak, Creative USB2.0 Webcam, Ultrasonic sensor.

I. INTRODUCTION

Blindness may be a condition during which individuals lose their vision perception. Mobility and self-reliability for the visually impaired and blind people has always been a drag, they're not conversant in and typically require someone to assist the navigate. They often bump in to the obstacles present in their way thus hindering their free movement. Consistent with WHO (World Health Organization), it's estimated that approximately 1.3 billion people accept some sort of vision impairment. With regards to sight, 188.5 million people have mild vision impairment, 217 million have moderate to severe vision impairment, and 36 million people are blind. the traditional methods adopted like cane helps in avoiding the obstacles in their way but they are doing not help them identify and locate the objects .Hence, assistance is required for the blind that helps him/her in locating objects in an environment.

This project targets to assist the blind in object detection with the distance of the item and to offer an audio information about the object detected.

The system allows the unaware of navigate independently the use of actual time object detection and identification. The System includes use of gadgets including Raspberry Pi-3, Pi camera, Ultrasonic sensors and energy supply. For object detection, TensorFlow is used. The Proposed System generates a audio output that's the end result of item detected and distance measured. The visually impaired guy hears the audio output through the earphones connected to the cap and hence, it allows him in navigation.

II. LITERATURE SURVEY

Visually impaired human beings face lot of problems of their day by day life. Most of the instances they depend upon others for assist. Several technology for help of visually impaired human beings were developed. Among the numerous technology being applied to help the blind, Computer Vision primarily based totally answers are rising as one of the maximum promising alternatives because of their affordability and accessibility. The most important goal of the proposed device is to create a wearable visible useful resource for visually impaired human beings wherein speech instructions are everyday from the user. Its capability addressse aspect notification of gadgets and signal boards. This

will assist the visually impaired human beings to control everyday sports and to navigate via their surroundings. Raspberry Pi is used to put in force synthetic imaginative and prescient the use of python language at the Open CVplatform.

2. This paper presents a new design of assistive smart glasses for visually impaired students. The objective is to assist in multiple daily tasks using the advantage of wearable design format. As a proof of concept, this paper only presents one example application, i.e. text recognition technology that can help reading from hardcopy materials. The building cost is kept low by using single board computer raspberry pi 2 as the heart of processing and the raspberry pi 2 camera for image capturing. Experiment results demonstrate that the prototype is working as intended.

3. Suitably adapted computers hold considerable potential for integrating people who are blind or visually impaired into the mainstream. The principal problems that preclude the achievement of this potential are human factors issues. These issues are discussed, and the problems presented by icon-based interfaces are reviewed. An argument is offered that these issues, which ostensibly pertain to the blind or visually impaired user, are fundamental issues confronting all users. There is reason to hope that the benefits of research into the human factors issues of people with vision impairments will also extend to the sighted user.

4. The smart stick comes as a proposed solution to enable them to identify the world around. In this paper we propose a solution, represented in a smart stick with infrared sensor to detect stair-cases and pair of ultrasonic sensors to detect any other obstacles in front of the user, within a range of four meters. Moreover, another sensor is placed at the bottom of the stick for the sake of avoiding puddles. Speech warning messages and the vibration motor are activated when any obstacle is detected.

5. In this paper, author introduced Challenges faced by students with blindness. Blind students experience challenges that impact on their academic success when studying through ODL. Educational institutions and families had been found wanting in terms of support both financially and morally. Blind students without adequate support are unlikely to succeed in their studies. This research sought to find out the challenges faced by a student with acquired blindness enrolled at Mashonaland Central Regional Campus.

6. Science and era continually try and make human lifestyles easier. The folks that are having whole blindness or low imaginative and prescient faces many problems all through their navigation. In this paper, we layout and put in force a clever cap which enables the blind and the visually impaired humans to navigate freely through experiencing their environment. The scene around the person will be captured by using a NoIR camera and the objects in the scene will be detected. The earphones will provide a voice output describing the detected items. The structure of the gadget consists of the processor Raspberry Pi 3, NoIR camera, earphones and a energy supply. The processor collects the frames of the environment and converts it to voice output. The tool makes use of TensorFlow API, open-supply system mastering library advanced through the Google Brain Team for the item detection and classification. TensorFlow enables in developing system mastering fashions able to figuring out and classifying a couple of items in a unmarried picture Thus, info similar to diverse items gift inside a unmarried body are acquired the usage of TensorFlow API. A Text to Speech Synthesizer (TTS) software program known as eSpeak is used for changing the element gentle he detected item (intext format)to speech output. So the video captured through the usage of the NoIR digital digicam is sooner or later transformed to speech indicators and as a result narration of the scene describing diverse items Is done. Objects which come beneathneath ninety distinct lessons like cellphone, vase, person, sofa etc. are detected.

7. Human imaginative and prescient performs a critical function in consciousness approximately surrounding environment. The time period visible impairment covers huge variety and form of imaginative and prescient, from blindness and absence of usable sight; to low imaginative and prescient, which cannot be corrected to ordinary imaginative and prescient with widespread eyeglasses or touch lenses. Visually impaired tools can help them to enhance their lifestyle. To offer help to visually impaired people, this paper affords multi-sensor primarily based totally machine for item detection in indoor environment. Object detection is executed on a captured picture the usage of statistical parameters, that's similarly verified the usage of guide vector system algorithm. To growth the accuracy of the item detection, multi- sensor idea is hired via way of means of interfacing ultrasonic sensor. Moreover, small item close to feet is detected the usage of in fared sensor. Experimental effects display efficacy of the proposed method.

8. This paper presents an powerful approach of offering day to-day mobility useful resource to visually impaired humans. An android software named X-EYE the usage of LOOXCIE wearable digital digicam is designed for blind humans to navigate safely. Existing navigation useful resource structures use diverse hardware additives which include sensors which might be high priced and reason fitness hazards. The proposed device offers a cost-effective answer the usage of a wear able digital digicam and a telephone to offer secure navigation facility to the visually impaired user. X-EYE affords the functions of impediment detection, individual recognition, area monitoring and sharing, SMS reader, and language translation. Audio messages are specially generated to offer higher usability to the blind/visually impaired user. The proposed device is powerful to selfish video obstacles i.e. partial look of objects, unexpected historical past change, jitter effects, and illumination conditions. Performance of the proposed approach is evaluated on ten real-time ego centric videos. Experimental effects imply the effectiveness of our approach in phrases of offering secure mobility carrier to the visually impaired humans.

9. The most effective and the maximum inexpensive navigations equipment to be had to them are educated puppies and the white canes. Although those equipment are very popular, they can't offer the blind with all data and capabilities for secure mobility, that are to be had to regular people. The method to that is to make any boundaries on the street smooth to pick out in order that even the smallest unevenness at the direction like a protrusion or a despair may be identified. In this paper, we gift a value powerful and strong answer through the method of wearable and transportable assistive gadgets for visually-impaired people. We have used essential components, particularly ultrasonic sensor Arduino Nano micro controller. They are utilized in unit tune yore scope which paperwork as essential detail of the machine together with different modules to create a prototype of an impediment detection machine. The benefits and downsides of this type of machine in addition to the functionalities which can be advanced with the addition of more recent modules are all defined here.

10. The objective of this paper is to manual unsighted human beings with clever tool the use of an Android Phone. This tool is an revolutionary and motive powerful manual machine for Visually Impaired People(VIP). Blind human beings fundamental trouble is to navigate the outside region. Voice is the primary of scope, lets in you to govern your phone the use of your voice. This machine primarily based totally on Android era and designed for seeking to resolve the not possible state of affairs that afflicts the blind human beings. The software allows the person to open any app in addition to to name any touch thru voice instructions. Users can command a cell tool to do some thing through speech. These instructions are then at once interpreted through the Speech Recognition Engine (SRE) that converts speech into textual content for direct actions. This approach additionally allows, whilst the VIP feels on my own in a lacking surroundings with the aid of using permitting him to make a voice call to a regarded person. Apart from this, the machine is introduced with a Selendroid app interface which permits the VIP to fetch the cutting-edge data from numerous net servers. The cutting-edge data retrieved with the aid of using the Selendroid structure consists of stay climate report, transport associated data and information update.

11. Eyes are organs of our visible system. In this paper, we're offering a completely unique sensible digital eye that gives avenue steering to blind humans at the same time as they're walking. Surrounding visible facts is amassed with the aid of using photo and obstacle sensors hooked up on a helmet which the person has to position in. The facts is sent to a processor which goes in a line much like our mind function. The processor analyses the facts and offers essential voice data to the person which allows them in movement. The electric powered electricity for this unit is availed via sun image voltaic module, piezoelectric supply and additionally from power generated from frame temperature. The tool will assist in excellent volume to the visually impaired those who are unfortunate see this beautiful world.

12. This paper convey the selection approximately the hassle facing by the visible impaired individual. Here, we designed the device to device for the visually impaired individual to deal with problem with inside the environment. They face problems in independent gaining access to public shipping on account that they can't study the course variety and uncertain approximately the bodily area of the bus, figuring out the individual and that they also can discover trouble in crossing the road. We consciousness on imparting the primary benefits and obstacles of every approach in attempt to tell the clinical network approximately the development in the location of device and additionally provide customers a evaluate approximately the competencies of every device.

13. The need for developing a low-price assistive device for the visually impaired and blind human beings has multiplied with constant growth of their populace worldwide. The stick device supplied with in side the paper makes use of synthetic intelligence along with diverse sensors in actual time to assist the visually disabled human beings to

navigate their surroundings independently. Image popularity, collision detection and impediment detection are the 3 responsibilities carried out via way of means of the device. The image popularity challenge changed into carried out the use of a phone utility powered via way of means of synthetic intelligence. The responsibilities of collision detection and impediment detection applied ultrasonic sensors to alert the consumer of the boundaries acting in his route. The stick device additionally controlled to illustrate the essential traits of affordability, excessive efficiency, mobility and ease.

III. PROPOSED SYSTEM

A. Architecture Diagram

The below figure is that the architecture diagram of the planned System. The system helps the blind to navigate severally using real time object detection and identification. The proposed system consists of a Raspberry Pi-3 processor that is loaded with a pre-trained Convolutional Neural Network model (CNN) developed using TensorFlow.

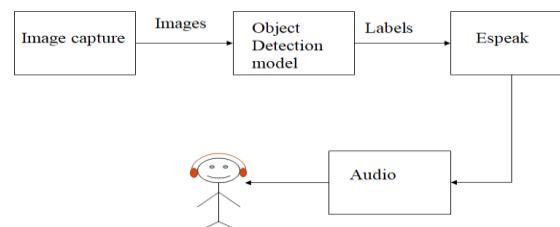


Fig.1 Architecture Diagram

The processor is connected to a Creative USB2.0 webcam camera. The processor is Python- encoded. The Creative USB2.0 webcam records the image in real time and is delivered to the Raspberry Pi-3 processor for processing. The code uses the COCO model to recognize and classify objects. It draws boxes around the detected object and also shows the category index of the object.

The category index of the recognized objects is saved in a text file. The category index consists of the class name and the class ID of the recognized object. After the object has been recognized, the ultrasonic sensors measure the distance of the recognized object. This information is saved in a text file. The content of the text file is converted to speech using the eSpeak Text to Speech Synthesizer (TTS) software. This system is portable and can be easily carried by the user.

WEB-CAM: It connects to a computer and internet and captures picture or motion video of user or another object and it allows face to face communication.

ULTRASONIC SENSOR(HC-SR04): It emits sound waves at a frequency too high for humans to hear, they wait for sound to be reflected back and calculates the distance.

RASPBERRYPI: It's a tiny credit card size computer in addition of a keyboard, mouse, display, power supply, USD card with installed LINUX distribution. It works as a low-cost server to handle light internal or web traffic.

B. Flowchart

The flowchart shows the step-by-step process going on in the proposed system.

- Start the process
- The Raspberry Pi 3 processor is in use
- The processor is loaded with a pre-trained object recognition model that is downloaded
- Pre-trained Neural Convolutional The network model (CNN) developed with TensorFlow is loaded into memory. TensorFlow is often used in the area of memory-loaded object recognition.

- The webcam, which helps in real-time video recording or image capture, which helps to identify the object present in the image using the model trained above.
- Class and punctuation markings with the bounding box, where images are recognized by drawing the bounding boxes.
- Results in detecting the object.
- The ultrasonic sensors that detect the distance are supplied with power.
- The output of object detection and measured distance is saved in text format in a file.
- The text document is converted into speech with eSpeak using the text-to-speech synthesizer.
- The output is in the form of speech via headphones or earphones.
- The process stops.

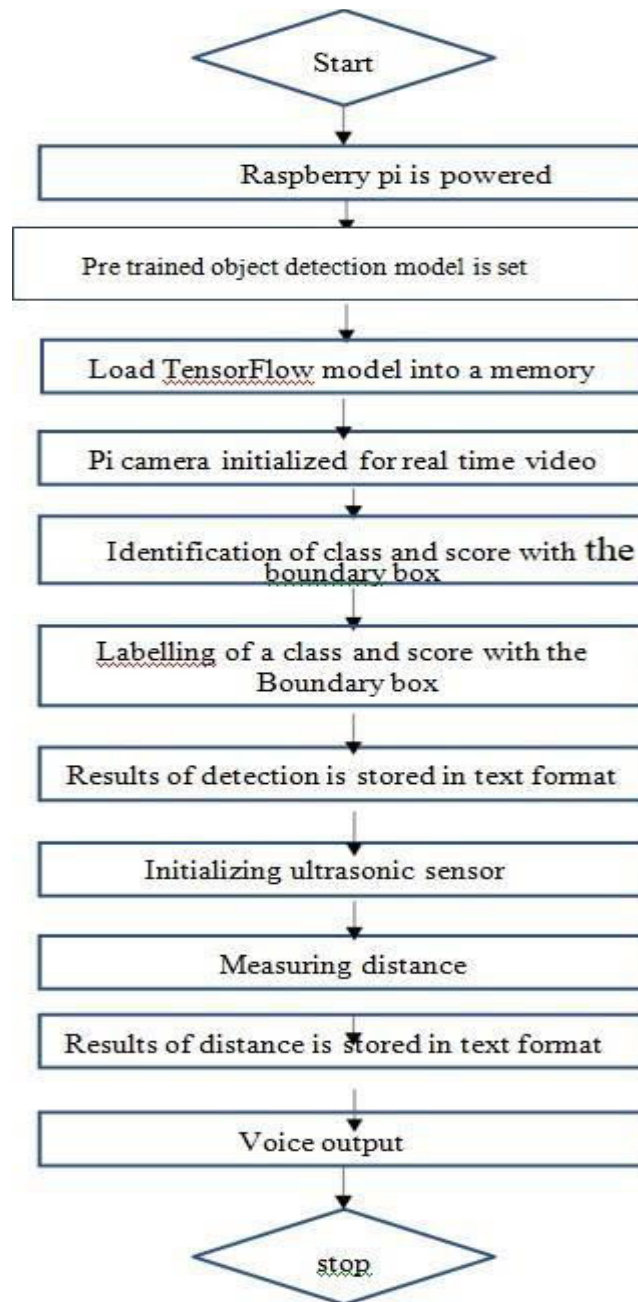


Fig2. Figure showing the workflow of the system.

C. Object detection model

Tensor flow Library:

Tensorflow is a free and open-source software library for machine learning. It can be used across a range of tasks but has a particular focus on training and inference of deep neural networks. Tensorflow is a symbolic math library based on dataflow and differentiable programming.

Algorithm

SSD Algorithm:

Single Shot MultiBox Detector

In terms of performance and precision for object detection tasks, scoring over 91% mAP (mean Average Precision) at 165 frames per second on standard datasets such as COCO.

COCOAPI- It contain various images which is used in day today life. It is used for machine learning purpose.

How to train SSD: Ground truth boxes for each image.

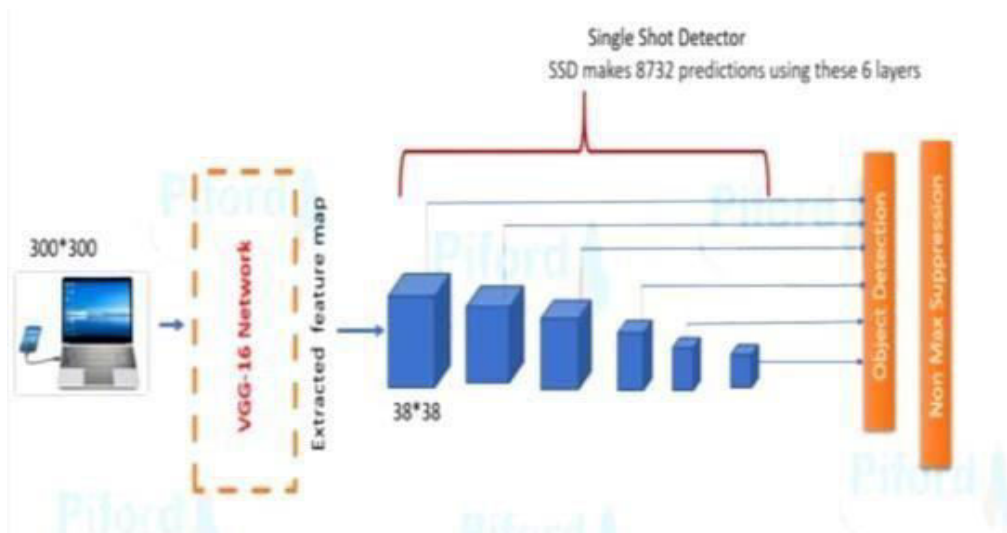


Fig3.SSD Layered Architecture

VGG-16- Proposed by Karen & Andrew from oxford in 2014.Used to extract future map. 6 Convaation lover which perform classification & object detection task.

1 object= 8732 prediction

non-max suppression:- so remove duplicate predict. SSD check confidence score per image 200predict.

Ground Truth Boxes and Matching Strategy:

Ground truth box means a set of measurements that is known to be much more accurate than measurements from the system you are testing.

Multiple default boxes of different sizes and aspect ratio across the entire image.



Fig 4. Ground Truth Boxes

Convolution layers will boxes of different aspect ratios. We want to find box which have higher overlap to ground truth box. Use IOU intersection over union.

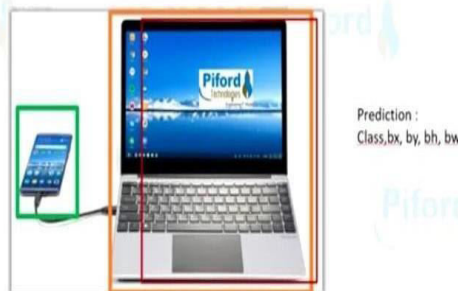


Fig5. Matching Strategy

SSD- Match default bounding box to ground truth boxes. Boxes picked with highest overlap.

IV. CONCLUSION

The system has a easy structure that transforms the visible statistics captured the use of a digital digicam to voice information the use of Raspberry Pi. The proposed machine is reasonably-priced and configurable. The tool is a real-time machine that monitors the surroundings and affords audio statistics approximately the surroundings making his/her navigation greater safe and secure.

TensorFlow is extensively used in the field of item detection. It is an open supply software program library for numerical computation the use of records flow graphs. The item detection may be evolved to be counted number the quantity of items in a scene. In this paper, the COCO version is used to train the SSD mobile net that could detection most effective instructions of items. The quantity of items may be increased with the aid of using training the version by us.

ACKNOWLEDGMENT

We would like to thank our project guide Prof. Ashwini Patil for her enormous co-operation and guidance. We have no words to express our gratitude for a person who wholeheartedly supported the project and gave freely of her valuable time while making this project. All the inputs given by her have found a place in the project. The technical guidance provided by her was more than useful and made the project successful. She has always been a source of inspiration for us. It was a memorable experience learning under such a highly innovative, enthusiastic and hard working teacher.



REFERENCES

1. Hanen J abnoun I, F aouzi Benzarti I, Hamid Amiri I, "Object Detection and Identification for Blind People in Video Scene' 2015 15th International Conference on Intelligent Systems Design and Applications(ISDA)
2. Nitin R. Gavai, Yashashree A. Jakhade, Seema A. Tribhuvan, Rashmi Bhattad "MobileNets for Flower Classification using TensorFlow", 2017InternationalConferenceonBigData, IoTandDataScience(BID),VishwakarmaInstituteofTechnology,Pune, Dec2022,2017
3. KrutiGoyal,KartikeyAgarwal,RishiKumar"FaceDetectionandTrackingUsingOpenCV"
4. ,InternationalConferenceonElectronics, Communication and Aerospace Technology ICECA 2017
5. Tsung-Yi Lin, Michael Maire, Serge, Belongie, Lubomir Bourdev, Ross Girshick, James Hays, Pietro Perona, Deva Ramanan, C. Lawrence Zitnick, Piotr Dollár, "Microsoft COCO: Common Objects in Context", arXiv:1405.0312v3 [cs.CV] 21 Feb2015
6. Liu W, Anguelov D, Erhan D, Szegedy C, Reed S, Fu C & Berg AC (2016) "Ssd: Single shot multibox detector. European conference on computer vision", Springer:21-37.
7. Huang J, Rathod V, Sun C, Zhu M, Korattikara A, Fathi A, Fischer I, Wojna Z, Song Y & Guadarrama S (2016) Speed/accuracy trade-offs for modern convolutional object detectors. arXiv preprint arXiv:1611.10012.
8. M.Maiti,P.Mallick,M.Bagchi,A.Nayek,"Intelligentelectronicseyeforvisuallyimpairedpeople",978-1-5386-2215-5/17/\$31.00©2017IEEE
9. Namita Agarwal, Anosh Iyer, Sonalakshi Naidu, Snedden Rodrigues, "Electronic Guidance System For The Visually Impaired – AFramework",2015InternationalConferenceonTechnologiesforSustainableDevelopment(ICTSD-2015),Feb.04– 06,2015,Mumbai,
10. India
11. Kabalan Chaccour, Georges Badr, "Computer vision guidance system for indoor navigation of visually impaired people", 2016 IEEE 8th International Conference on IntelligentSystems.



INNO  **SPACE**
SJIF Scientific Journal Impact Factor
Impact Factor: 7.542



ISSN INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA



INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN COMPUTER & COMMUNICATION ENGINEERING

 **9940 572 462**  **6381 907 438**  **ijircce@gmail.com**



www.ijircce.com

Scan to save the contact details