iJRASET
International Journal For Research in Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 8 **Issue:** VIII **Month of publication:** August 2020

DOI: https://doi.org/10.22214/ijraset.2020.31126

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International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.429
Volume 8 Issue VIII Aug 2020- Available at www.ijraset.com

AI Based Vision for Blind People

Dipika Gophane[1], Meetali Mhatre[2], Pratidnya Khedekar[3], Ashwini Shingan[4], Asst. Prof. Arathi Kamble[5]
[1, 2, 3, 4]*Student,* [5]*Asst. Prof. , Department of Computer Engineering, New Horizon Institute of Technology and Management, Thane 400615*

Abstract: ***Science and technology always attempt to make human life easier. The people who are having complete blindness or low vision face many difficulties. Blindness can occur because of many reasons including disease, injury or other conditions that limit vision. The purpose of this project is to develop an aid for the blind or the visually impaired people. In this project, we design and implement a smart device which helps the blind. The scene around the person will be captured by using a camera and the objects in the scene will be identified. The earphones will give a voice output describing the identified objects. Not every text content is present in a Braille language so, an effort has also made to convert a text content into an audio format for the visually impaired person. The architecture of the system includes the processor Raspberry Pi, Pi camera, headset and a power supply. The processor collects the frames of the surroundings and convert it to voice output. Softwares like Putty, Python 3.5 and Tensorflow will be used to develop the project. Manual testing will be performed for testing the hardware components used in the system. Whereas, for software testing automated testing will be performed to check the working of the overall software contents.***
Keywords: Raspberry Pi, Pi camera, headset, power supply, Putty, Python 3.5, Tensorflow.

I. INTRODUCTION

Vision is one among the very essential human senses and it plays the foremost important role in human perception about surrounding environment. The blind people face tons of problem in their daily life. For blind persons it'll be really difficult to acknowledge a product of their daily use. This AI based device aims to assist the blind in object detection and to supply an audio information about the thing detected. This project has been built with the help of Raspberry Pi processor board. it's controlling the peripherals like Pi Camera, headset, power bank which act as an interface between the system and therefore the user. Optical Character Recognition or OCR is implemented during this project to acknowledge characters which are then read out by the system through a speaker [1]. Also we've added another feature called as visual perception using tensorflow [2]. The camera are going to be mounted on a stand in such an edge that if a paper is placed in between the world marked by angular braces, it captures a full view of the paper into the system. When of these conditions are met the system takes the photo, processes it and if it recognizes the content written on the paper it'll announce on the speaker that the content on the paper has been successfully processed. After this it speaks out the content that was converted into text format within the system from processing the image of the paper [3].In this way Raspberry Pi Based Reader for Blind helps a blind man to read a paper without the assistance of any human reader or without the assistance of tactile writing system [4].

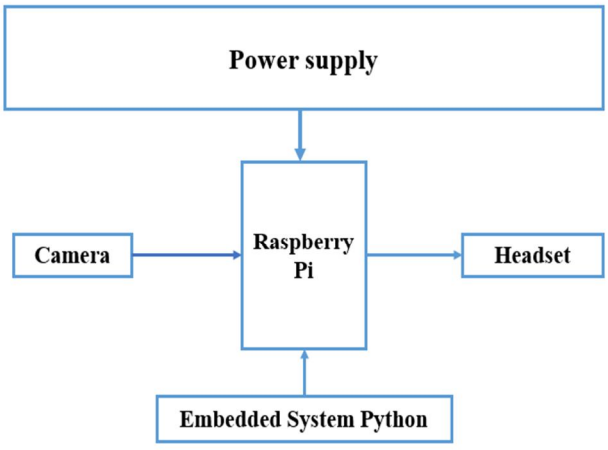

Fig. 1.1 Block Diagram

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II. PROPOSED DESIGN

When capture button is clicked this technique captures the merchandise image placed in front of the web camera which is connected to ARM microcontroller through USB. After selecting the process button the captured label image undergoes OCR.

OCR technology allows the conversion of scanned images of printed text or symbols into text or information which will be understood or edited employing a computer virus . In our system for the OCR technology we are using TESSERACT library.

Using Flite library the data will be converted to audio. Camera acts as main vision for detecting the label image of the merchandise or board then image is processed internally and separates label from image by using open CV library and finally identifies the product and identified product name is pronounced through a speech format. Now the identified received label image is converted to text by using tesseract library. Once he identified label name is converted to text and converted text is presented on display unit connected to controller. Now converted text should be converted to voice to listen to label name as voice through speaker connected to audio jack port using flite library. Tesseract is an optical character recognition engine for various operating systems. It is a free software, released under the Apache License, Version 2.0, and development has been sponsored by Google since 2006. In 2006 Tesseract was considered one among the foremost accurate open source OCR engines then available.

III. ALGORITHMS

A. Neural Networks

Neural Networks are a class of models within a general machine learning literature. Neural networks are a specific set of algorithms that have revolutionized machine learning. They are inspired by biological neural networks and therefore the current so- called deep neural networks have proven to figure quite well. Neural Networks are general function approximations, therefore they can be applied to almost any machine learning problem about learning a complex mapping from the input to the output space.

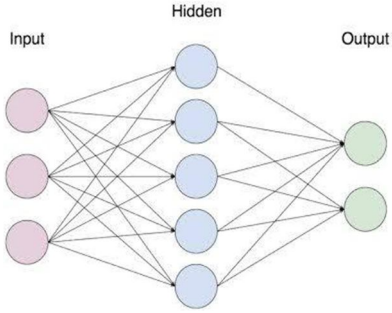

Fig. 3.1 Neural Networks

IV. RESULT

A. Object Detection

The camera captures the image of objects in front of the blind people and the description of the object will be in form of an audio signal which can be heard by the blind person via a Headset.

The pi camera gets initialized once the program starts running. It take few seconds for the picam initialization. Picam is the camera attached to the raspberry Pi which is used for capturing image of the objects present in front of it.

As soon as the picam starts, a frame is generated according to the framerate. Framerate is the rate at which the size of the frame is generated. The images which are captured in this frame are further processed and a text is generated related to the object which is detected accordingly.

Here are few objects detected as discussed above:

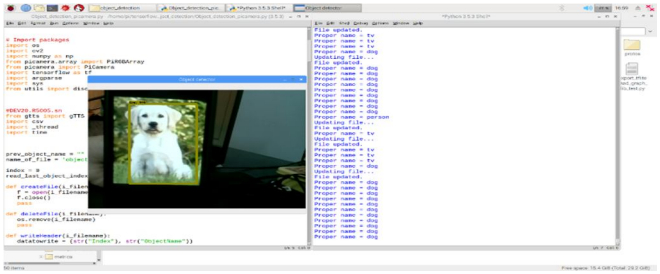

Fig. 4.1 Detecting Dog

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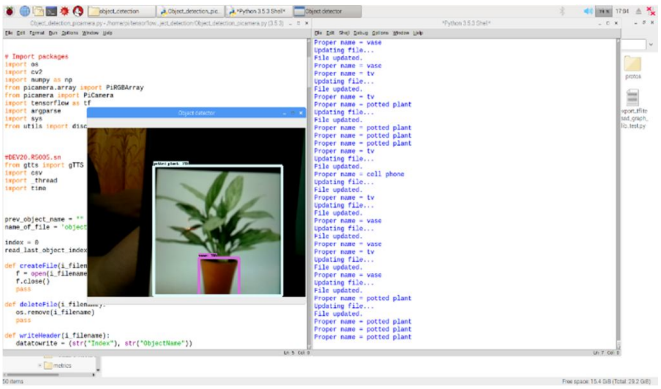

Fig. 4.2 Detecting Potted Plant

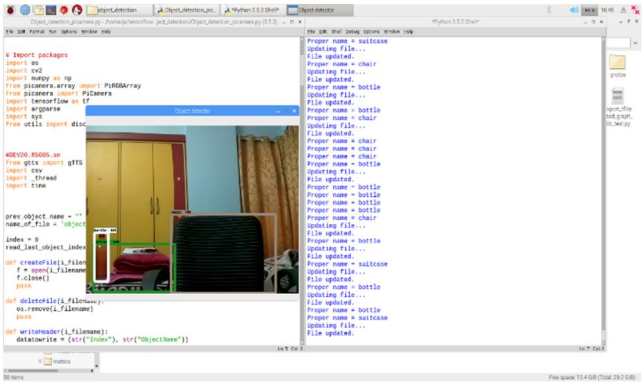

Fig. 4.3 Detecting Bottle & Chair

B. Text to Speech

All books are not available in braille language. So we using text to speech to convert the text format in speech. Then blind person can easily read the books.

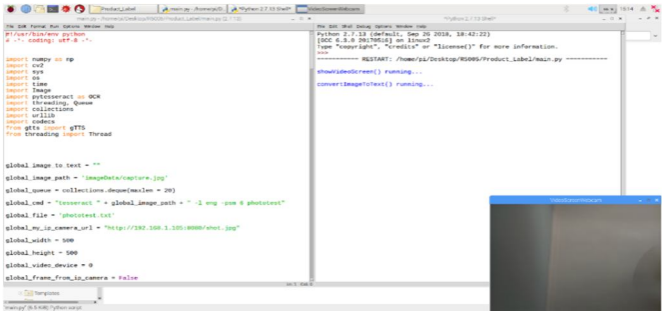

Fig. 4.4 convert Image to Text

Here in this figure, Fig Picam. 6. We can see that the picam is getting initialized to capture the text content present in front of it.

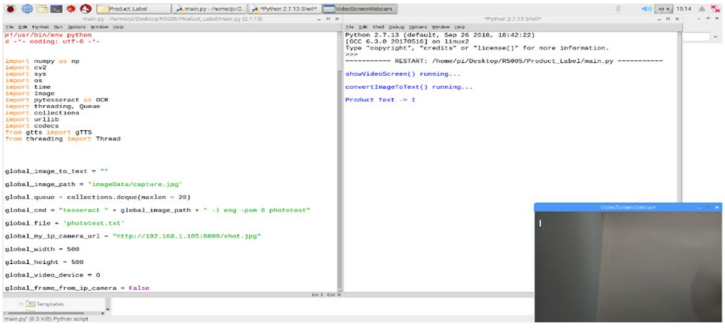

Fig. 4.5 Text Detection

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Here we can see the text generated keeps on detecting the text content as it gets the text in front of the picam, which is given as the Product text.

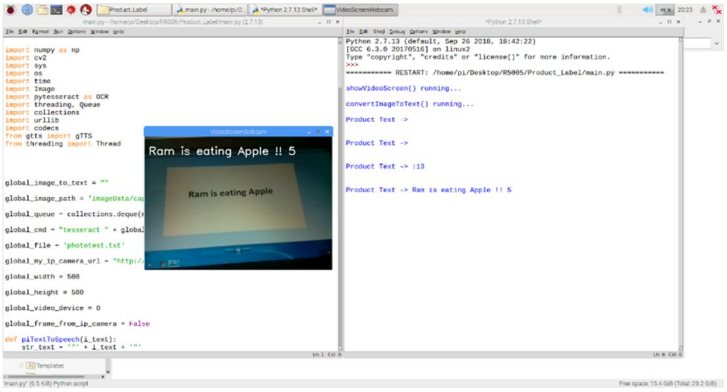

Fig. 4.6 Product text generation Output

In the above Screenshot 8.14 we can see that the sentence "Ram is eating apple" is given as an input to the device.
The device will detect the text present in the sentence and convert each and every content into a speech format. Therefore a speech content is generated as output which is in a written format as an input.

V. APPLICATIONS

A. Detection of objects in front of the visually impaired.
B. Will help him/her to go through text contents such as books, newspapers etc.

VI. CONCLUSION

[1] The system features a simple architecture that transforms the visual information captured employing a camera to voice information using Raspberry Pi. The advantage of this technique lies within the incontrovertible fact that it can convince be very effective solution to many Visually Impaired People worldwide.
[2] The system also enables the visually impaired to not feel at an obstacle when it comes to reading text not written in braille. The image pre-processing part allows for the extraction of the specified text region from the complex background and to offer an honest quality input to the OCR. The text, which is that the output of the OCR is sent to the TTS engine which generates the speech output.

VII. ACKNOWLEDGMENT

The making of B.E. project needs co-operation and guidance of a number of people. We, therefore consider it as our prime duty to thank all those who help as during this venture. It is our immense pleasure to express our gratitude to our Project Guide Ms. Arathi Kamble, who provided us with constructive and positive feedback during the preparation of this project. We express our sincere thanks to Dr. Sanjay Sharma, Head of Department (Computer Engineering), and all other staff members of Department for their kind cooperation. We would also wish to thank our Principal Dr. P. D. Deshmukh for motivating us and also for providing necessary facilities during the period of working on this report. Last but not the least, we are thankful to our friends and library staff members whose encouragement and suggestions helped us to enhance our ongoing B.E. Project. We are also thankful to our parents for their constant support and best wishes. Thank you

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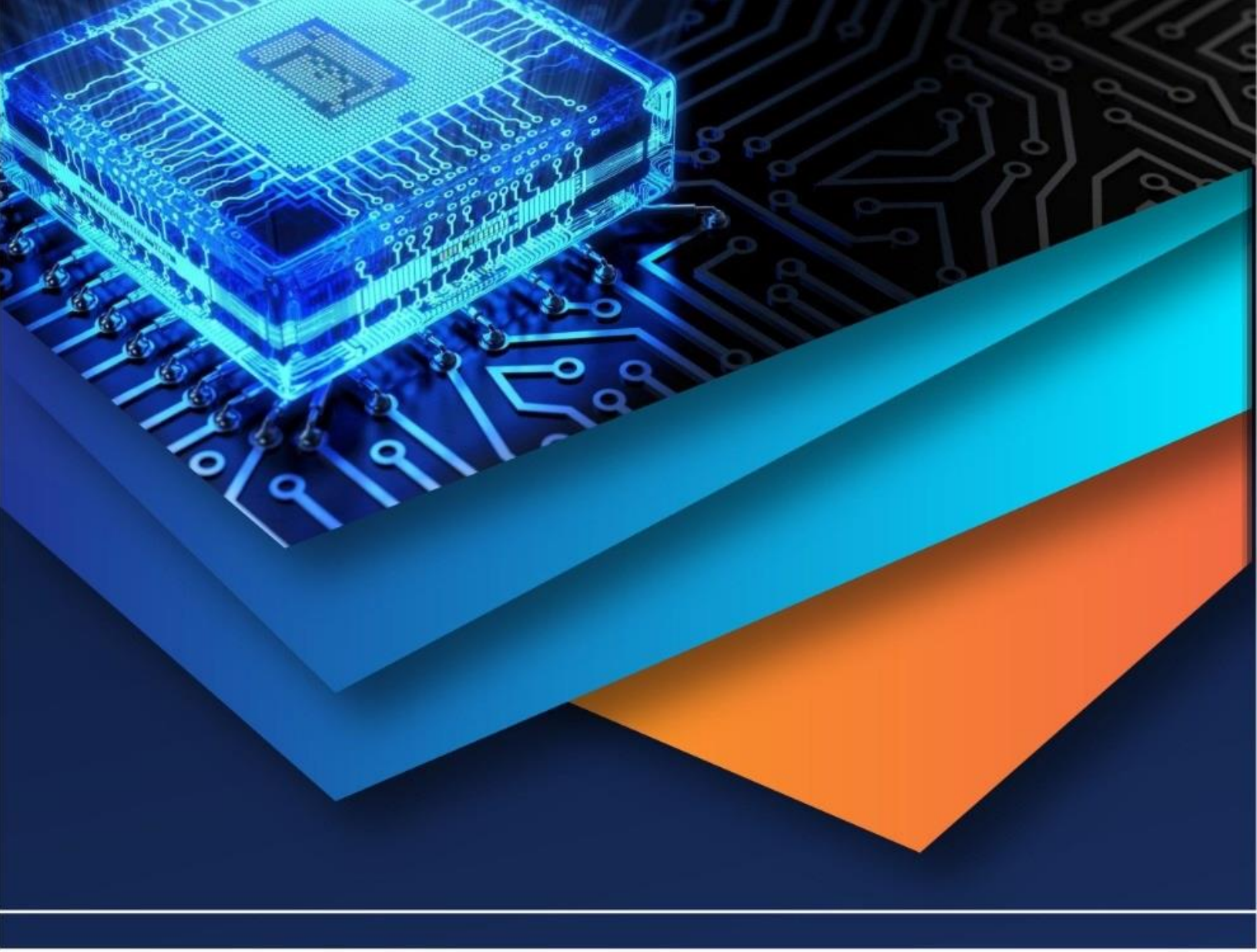

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