Live Object Detection api using Tensorflow on Raspberrypi

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Abstract : In the previous couple of years the numerous researchers are working for the improvement of the machine learning. As of late Google released tensorflow for machine learning application. Tensorflow is one of the generally utilized libraries for actualizing Machine learning and different calculations including vast number of scientific activities. It's a standout amongst the most well known Machine Learning libraries on GitHub. Google utilizes Tensorflow for actualizing Machine learning in all applications. The principle favourable position of tensorflow is, it is open source code can without much of a stretch programmable by numerous users. Tensorflow has better help for distributed systems too. The fundamental area of application is image recognition and the object detection. The principle target of this project is implementation of object detection agenda by utilizing tensorflow and Raspberrypi as the frame work. As the world searching for the more intelligent way, this will be useful to actualize and also applicable for the real time applications.

Key Words **- Tensorflow, Rasberrypi, Pi camera, Object detection API.**
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I.INTRODUCTION

a. **Object Detection**: An Object Detection for the most part manages the finding of constant occasions, for example, faces, structures, autos, electronic gadgets and so forth., in the picture or the video. It is prepared by utilizing PC innovation identified with PC vision and the image processing. The essential thought of this recognition is depending on the arrangement of the object, as we understand that the each challenge has its own particular extraordinary features that helper in portraying the class of the particular one. With the objective that the inquiry class recognition uses these remarkable features, for example, in case we need to portray the round challenge we for the most part centred around the particular partition from an inside are searched for, likewise for squares, dissents that are inverse at corners and have ascend to side length are also required. A comparative circumstance is used for stand up to distinguishing confirmation where all the face features can be found and moreover the skin shading and detachment between eyes can be found.

b. **Object Classification** Objects can be classified into vehicles, flying creatures, trees, electronic contraptions, books and moving items. The best approaches to sort the items are structure and movement based characterization.[2]

c. **TensorFlow**: It is an open source programming library for first class numerical calculation. Its versatile engineering premits basic sending of calculation over a variety of stages (CPUs, GPUs, TPUs), and from work territories to gatherings of servers to adaptable and edge gadgets. At first made by examiners and designers from the Google Brain aggregate inside Google's AI affiliation, it goes with strong help for machine learning and significant learning and the versatile numerical count focus is used transversely finished various other sensible spaces.

d. **Raspberry Pi**: it is a development of negligible single-board PCs made in the United Kingdom by the Raspberry Pi Foundation to drive the instructing of essential programming working in schools and in making countries. The primary model wound up significantly more inescapable than foreseen, offering outside its objective exhibit for uses, for example mechanical couple of embellishments have been combined into two or three official and easygoing gatherings. A couple of times of Raspberry Pi's have been released. All models feature a Broadcom structure on a chip (SoC) with an organized ARM great central getting ready unit (CPU) and on-chip plans taking care of unit (GPU).

II.LITERATURE SURVEY

1. **Object detection in sports: TensorFlow Object Detection API case study:**

This paper deals with the object detection in sports. Using machine learning here the author trained a particular play ground, players and a soccer ball. As the empire work, it will capture the ball and players in the ground.

2. **A Survey on Object Detection and Tracking Methods:**

This paper deals with the object detection in a video. The author surveyed the different algorithms for this agenda. Detection is performed to check existence of objects in video furthermore, decisively find that object. Tracking should be possible using spatial observing objects and transient changes amid video grouping alongside the object presence, structure and so on.

III.PROPOSED WORK

The principal inspiration behind this project is to live object detection using tensorflow on raspberry pi stack up that results the characterization of things autonomously of the live stream video and can be used for the persistent and real time applications. The packages used for this work are

Protobuf: This is likewise known as Protocol Buffers, those are a technique for serializing organized information. It is valuable in creating projects to speak with each other over a wire or for putting away information. The technique includes an interface portrayal dialect that depicts the structure of a few information and a program that creates source code from that portrayal for producing or parsing a flood of bytes that speaks to the organized information.

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Python: It is an interpreted high-state programming dialect for universally useful programming. Made by Guido van Rossum and first discharged in 1991, Python has an outline logic that stresses code lucidness, prominently utilizing critical whitespace. It gives builds that empower clear programming on both little and expansive scales. It includes a dynamic kind framework and programmed memory administration. It bolsters different programming ideal models, including object-situated, basic, practical and procedural, and has an extensive and thorough standard library.

Pil: Python Imaging Library (curtailed as PIL) (in more up to date forms known as Pillow) is a free library for the Python programming dialect that includes bolster for opening, controlling, and sparing a wide range of picture record groups. It is accessible for Windows, Mac OS X and Linux.

Lxml: It is the most component rich and simple to-use library for preparing XML and HTML in the   Python language.

TF-Slim: It is a library that makes building, preparing and assessment neural systems basic.

The Jupyter Notebook: It is an open-source web application that enables you to make and offer archives that contain live code, conditions, perceptions and account content.

Matplotlib: It is a Python 2D plotting library which produces distribution quality figures in an assortment of printed copy groups what's more, intelligent conditions crosswise over stages.

Tensorflow: It is an open-source software library for dataflow programming across a range of assignments. It is an emblematic math library, and is likewise utilized for machine learning applications such as neural systems [1].
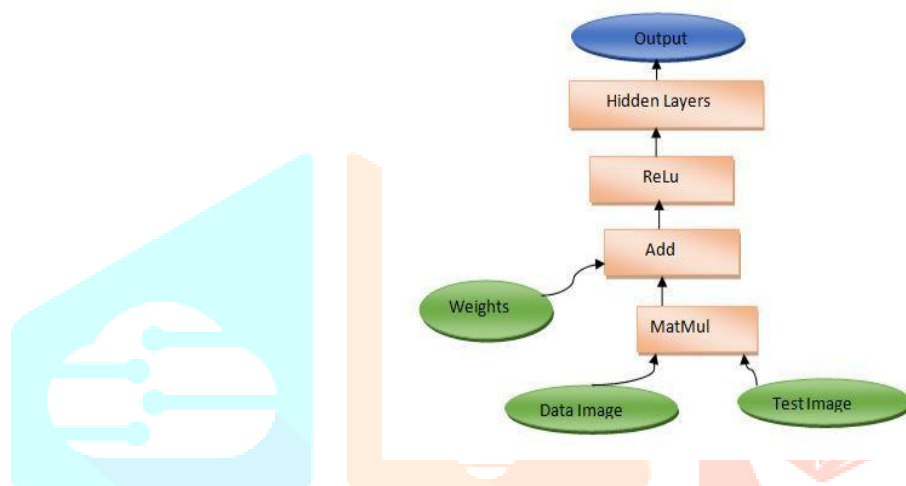

Figure 1: Computational graph

As appeared in figure the data image and the test image will be thought about and when it is coordinates consummately then the specific picture will be identified. Before correlation as the benefits of the tensorflow, at any given moment part of data will be prepared all things considered every one of the information will be gathered as framework and gathered by utilizing matrix application in such case MatMul of tensorflow will be happens. Later all the gathered information will be added to the weights (from past yield of the framework) with a specific end goal to get precise outcomes. Nonlinearity factors will be linearized by utilizing Relu, and feds to the different shrouded layers of the framework, progressively the concealed layers increasingly the exactness of yield will be come about.

Cython: It is an optimizing static compiler for both the Python programming language and the expanded Cython programming language (based on Pyrex).

Cocoapi: It is Apple's nearby inquiry orchestrated application programming interface (API) for their working structure macOS.

Numpy: It is a library for the Python programming language, including support for vast multi-dimensional arrays and matrices, alongside a huge accumulation of high-level mathematical functions to work on these clusters.

Utils : Python Utils is an accumulation of little Python capacities and classes which make normal patterns shorter and simpler.

IV.METHODOLOGY

1) Implementation process for the windows10

• Tensorflow installation.

• Add Libraries to PYTHONPATH.

• Testing the Installation.

• Compile the all models and protobuffers. (in order to support the all platforms)

• Compile jupyter note book.

• Run the models (database) through jupyter note book.

• Run the commands (code) using jupyter notebook.

• Using cv2 we can detect the all objects.

According to the application interface programming should be introduce different packages for the object detection. Here in this procedure the most recent adaptation of tensorflow ought to introduce in python stage. Later include the each reliant libraries in PYTHONPATH. In the exact following stage establishment test is required. Proto supports are utilizes for serializing the organized information. so all the cloned database ought to be accumulate the proto buffers, so as to the whole code should run

jupyter notebook is required so that the serialized information ought to be compile with jupyter notebook. Later at whatever point, we run the code the object detection programming interface will be brought about windows.

2) Whereas for the implementation on Raspberrypi

- Upgrade raspberrypi
- Mount swap memory (USB drive).
- Install bazel package (depending package).
- Install tensorflow.
- Install cv2 and other dependent packages.
- Interface Pi camera.
- Compile the all models and protobuffers. (In order to support the all platforms).
- Compile jupyter note book.
- Run the models (database) through jupyter note book.
- Run the commands (code) using Python IDLE.

Using cv2 and pi camera we can detect the all objects. The raspberrypi is the scaled down measured PC. From the earliest starting point itself the working frameworks ought to be redesigned for each application. The raspberrypi require reserve memory for this application for that should mount the swap memory by utilizing the USB drive or the SD card. Before introducing the different packages, depending package ought to be introduced, Bazel is the one of the depending packages utilized for the raspberrypi. At the point when the depending package was introduced the whole packages should have been introduced. Here Pi camera was utilized to record the whole video, so interface the Pi camera. Later stage establishment test is required. Proto supports are utilizes for serializing the organized information. so all the cloned database ought to be accumulate the proto buffers, so as to the whole code should run jupyter notebook is required so that the serialized information ought to be compile with jupyter notebook. After the entire code will be run in IDLE editor.

V.RESULTS

The total agenda of object detection using tensorflow on both raspberrypi and windows is done and the results are shown:
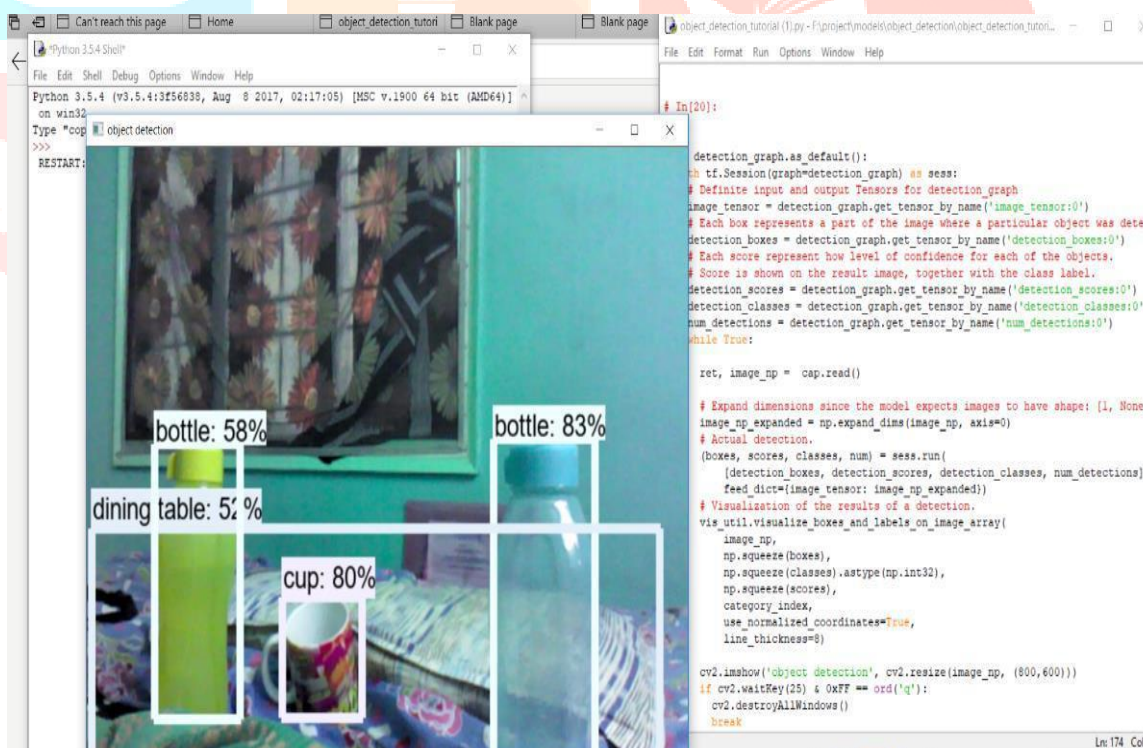

FIGURE 2: THE OBJECT DETECTION IMPLEMENTATION BY USING WINDOWS10 AND WEBCAM.

The above figure shows the implementation of the live object detection by using windows10 and webcam, but ourr main target is to implement on the raspberrypi board and pi camera.

FIGURE 3: IMPLEMENTATION OF THE ENTIRE PROCESS ON RASPBERRYPI BOARD.

In the above figure the raspberrypi board and pi camera interfacing setup is shown, where the entire program need to run.
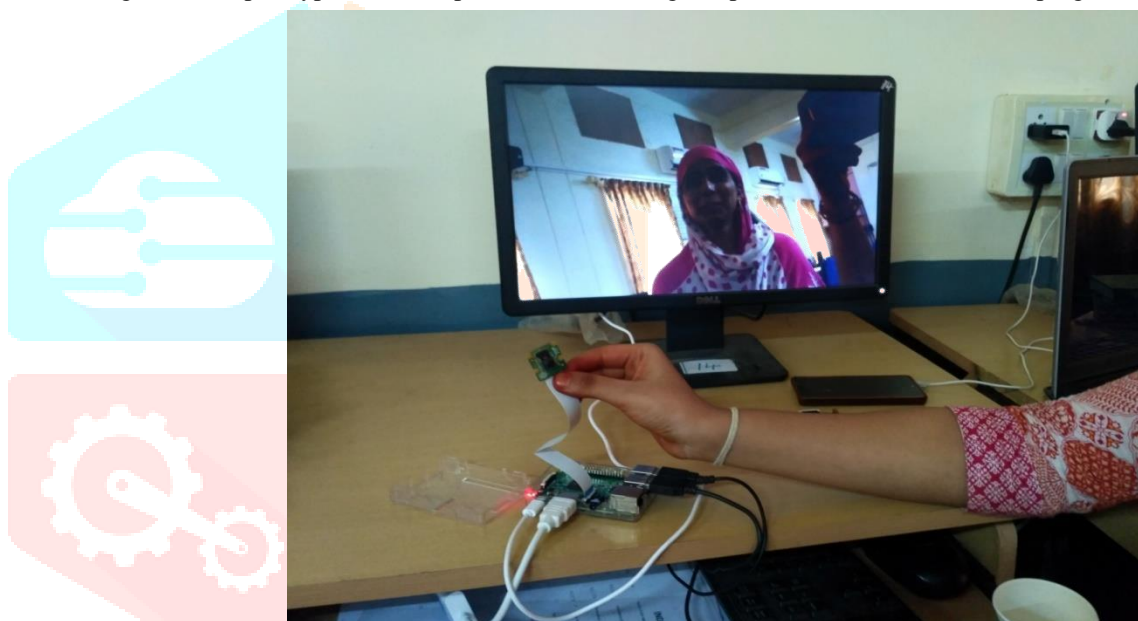

FIGURE 4: PI CAMERA INTERFACING

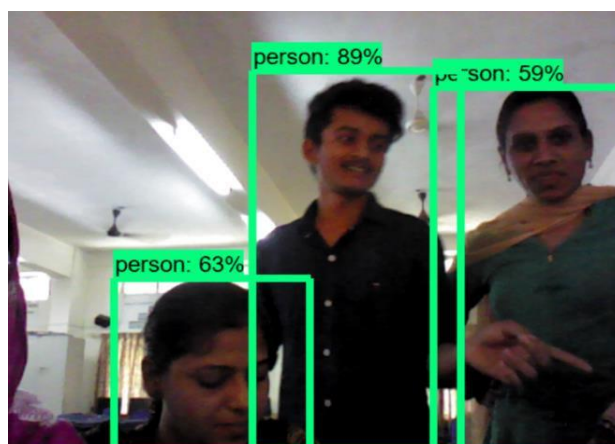Pi camera interfacing and enabling, the captured image can be seen in the monitor.
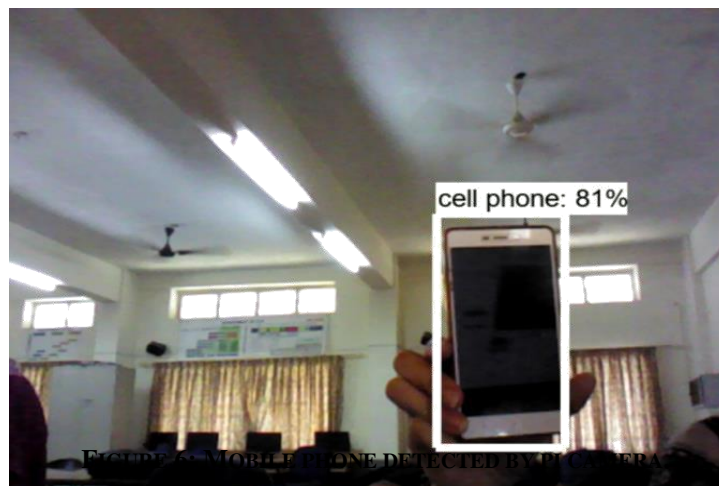

FIGURE 5: MULTIPLE HUMAN DETECTION BY PI CAMERA.

In the above fig we can observe at a time the no. of persons can be detected by using pi camera. The accuracy mainly depends on the internet speed and the position of the object / person from the camera.

FIGURE 6: MOBILE PHONE DETECTED BY PI CAMERA.

In the above figure we can observe that the cell phone is segmented and detected as the cell phone.
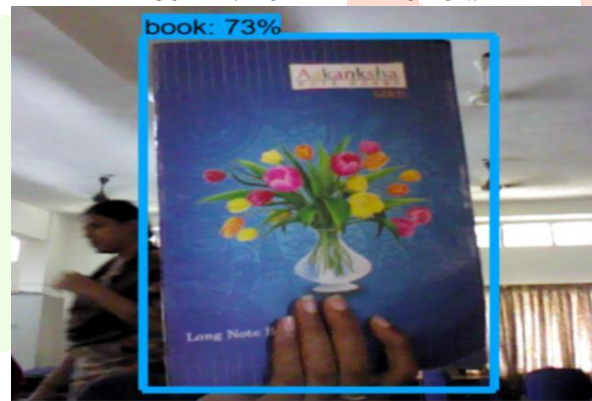

FIGURE 7: BOTTLE DETECTION.

FIGURE 8: BOOK WAS DETECTED.

VI. ACKNOWLEDGMENT

Live object detection using tensorflow on raspberrypi module is done for the object detection of the live video stream, on the small and specific board. It will be used in the real time application. It will be the one of the main application of the embedded systems. The latest version of the technology artificial intelligence used in the tensorflow. The main principle concept of the tensorflow is convolutional neural network. This system will be applicable for the artificial intelligence too that can be implemented or utilized in many industries.

REFERENCES

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[2] International Journal of Innovative Research in Computer and Communication Engineering (An ISO 3297: 2007 Certified Organization) Vol. 2, Issue 2, February 2014 Copyright to IJIRCCE www.ijircce.com 2970 A Survey on Object Detection and Tracking Methods Himani S. Parekh1 , Darshak G. Thakore 2 , Udesang K. Jaliya 3 P.G.Student, Department of Computer Engineering, B.V.M. Engineering College, V. V. Nagar, India1 Associate Professor, Department of Computer Engineering, B.V.M. Engineering College, V. V. Nagar, India2 Assistant Professor, Department of Information Technology, B.V.M. Engineering College, V. V. Nagar, India3