IJRAR.ORG E-ISSN: 2348-1269, P-ISSN: 2349-5138

INTERNATIONAL JOURNAL OF RESEARCH AND ANALYTICAL REVIEWS (IJRAR) | IJRAR.ORG

An International Open Access, Peer-reviewed, Refereed Journal

REAL TIME OBJECT DETECTION AND RECOGNITION USING MOBILENET-SSD WITH OPENCV

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Abstract: Real time object detection is an immense, vibrant and complex area of computer vision. Assuming there is a single object to be distinguished in an image, it is known as Image Localization and in the event that there are various objects in an image, then, at that point, it is Object Detection. Mobile networks and binary neural networks are the most generally involved techniques for current deep learning models to perform different tasks on embedded systems. In this paper, we develop a method to distinguish an item thinking about the deep learning pre-prepared model MobileNet for Single Shot Multi-Box Detector (SSD). This algorithm is used for real-time detection and forwebcam streaming to detect object in a video stream. Subsequently, we utilize an object detection module that can identify what is in the video stream. To carry out the module, we join the MobileNet and the SSD framework for a quick and efficient deep learning-based strategy for object identification.

I. INTRODUCTION

Object detection is one of the most important fields of exploration in computer vision today. It is an augmentation of image classification the objective is to identify one or more classes of objects in a picture and with the help of bounding boxes locate their presence. Consequently, object detection carries an important role in many real-world applications like image recovery and video surveillance. The main purpose of our analysis is to elaborate the accuracy of an object detection technique SSD and the pre-trained deep learning model MobileNet and additionally feature a portion of the notable elements that make this method stand out. The trial results show that the Average Precision (AP) of the algorithm to recognize various classes as vehicle, person and chair is 99.76%, 97.76% and 71.07%, separately. This improves the accuracy of behavior detection at a handling speed which is needed for the real-time location and the necessities of day by day observing indoor and outside. The mix of MobileNet into the SSD framework forms one of the center parts of our work.

However, MobileNet with the effective SSD framework has been a hot exploration point in recent times, to a great extent because of managing the functional limits of running strong neural nets on low-end devices like cell phones/laptops to additionally expand the horde of conceivable outcomes with respect to real-time applications.

II. MOTIVATION

Object detection is breaking into a wide scope of industries, with use cases going from personal security to efficiency in the working environment. Object detection and recognition is applied in numerous areas of computer vision, including image recovery, security surveillance, automated vehicle systems. For a vehicle to choose what to do what to do next: speed up, apply brakes or turn, it needs to know where all the objects are around the vehicle and what those objects are That requires object detection.

III. PROBLEM STATEMENT

To detect Object in Real Time Faster, Accurately with Less memory consumption and reduce traffic consumption over Web Servers for classification of Image.

IV. SYSTEM ARCHITECTURE

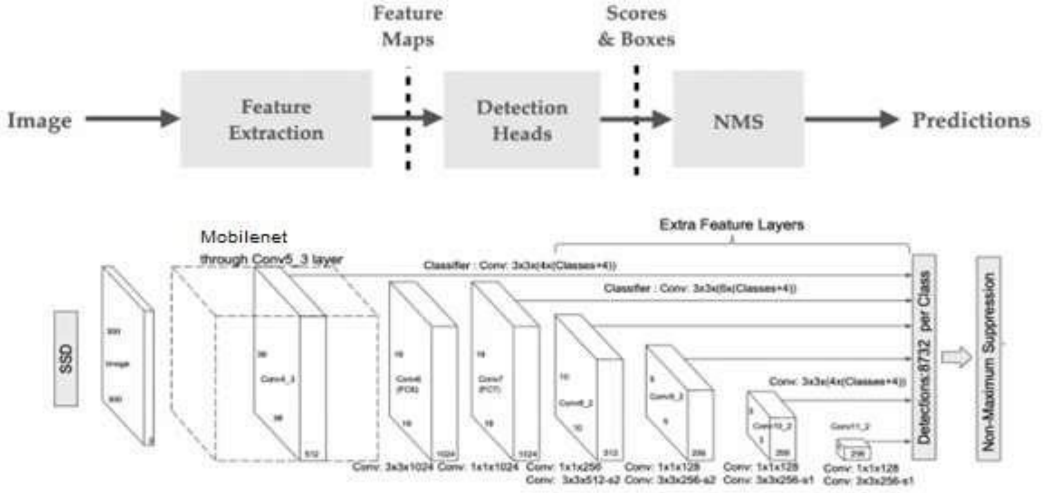


Fig. 1 System Architecture

The Fig-1 shows the Architecture Diagram of the Mobilenet-SSD Model. Real Time Video is given as the input to the system and it is nothing but a stream of images. As the name suggests Single Shot Detector, the input goes through the network only once and the result of detected object with Bounding Boxes and Labels are obtained.

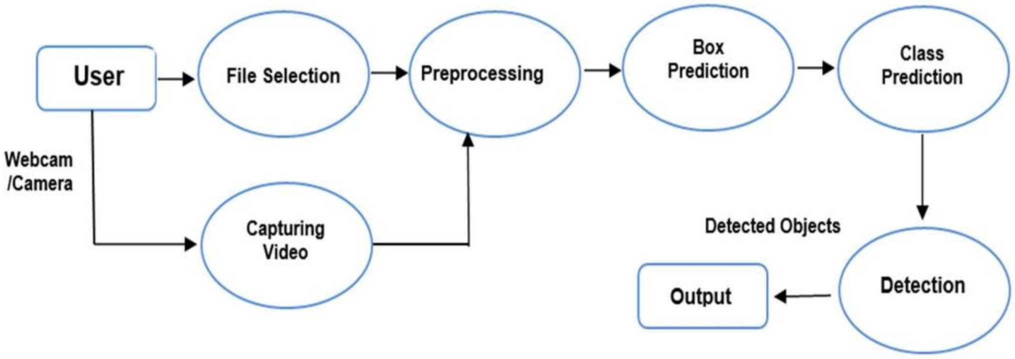


Fig. 2 Data Flow Diagram

The Fig-2 Shows the Flow of data in the System. Initially User will be given the options to choose the type of the File to be given to the System as an input. Thus, User can either choose option of File Selection or start the Camera/Webcam. User can choose either Image File or a Video File and, in the latter, User can start the Camera/Webcam. Once the input is selected Preprocessing is done, where the SXS grids are formed. The resultant thus formed with the grids is send to the Bounding Box Prediction process where the Bounding Boxes are drawn around the detected objects. Next the result from the previous process is sent to the Class Prediction where the Class of the object to which it belongs is predicted. At the end an image or a stream of images are generated for image and video or camera input respectively with Bounding Boxes and Labels are obtained as the Output.

V. ALGORITHM

Algorithm: -

Step 1: Take Real Time (Video) Input from Webcam / CCTV Camera

Step 2: Divide the Video into Frames.

Step 3: The input Frame/image is divided into SxS grid.

Step 4: For each cell it predicts B bounding boxes Each bounding box contains five elements: (x, y, w, h) and a box confidence score.

Step 5: SSD detects one object per grid cell only regardless of the number bounding boxes.

Step 6: If no objects exists then confidence score is zero Else confidence score should be greater or equal to threshold value.

Step 7. SSD then draws bounding box around the detected objects and predicts the class to which the object belongs

VI. Test Cases

The Table-1 shows the different Test Cases, the Expected as well as the Test Result.

Test Case ID	Test Conditions	Expected Result	Test Results
TC1	When camera /Webcam is chosen as input	Objects detected in the real time with bounding box, confidence score and predicted class.	SUCCESSFUL
TC2	When image is c hosen as input	Image with bounding box around the objects and predicted class.	SUCCESSFUL
TC3	When black and white image is taken as input	Image with bounding box around the objects and predicted class.	SUCCESSFUL
TC4	Image with far objects is taken as input	Image with detected objects.	UNSUCCESSFUL

Table -1: Test Cases with Results

VII. RESULT

This section describes different results obtained by giving various Test Cases described above.

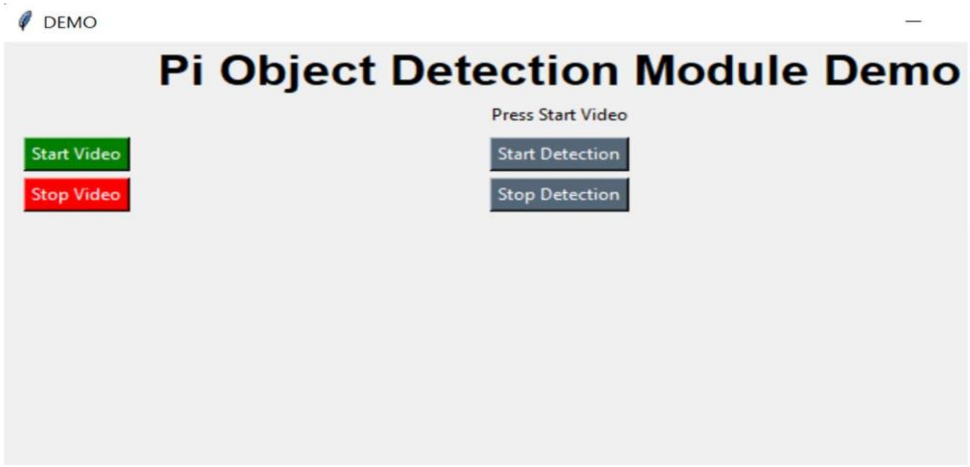


Fig 3: - Application User Interface

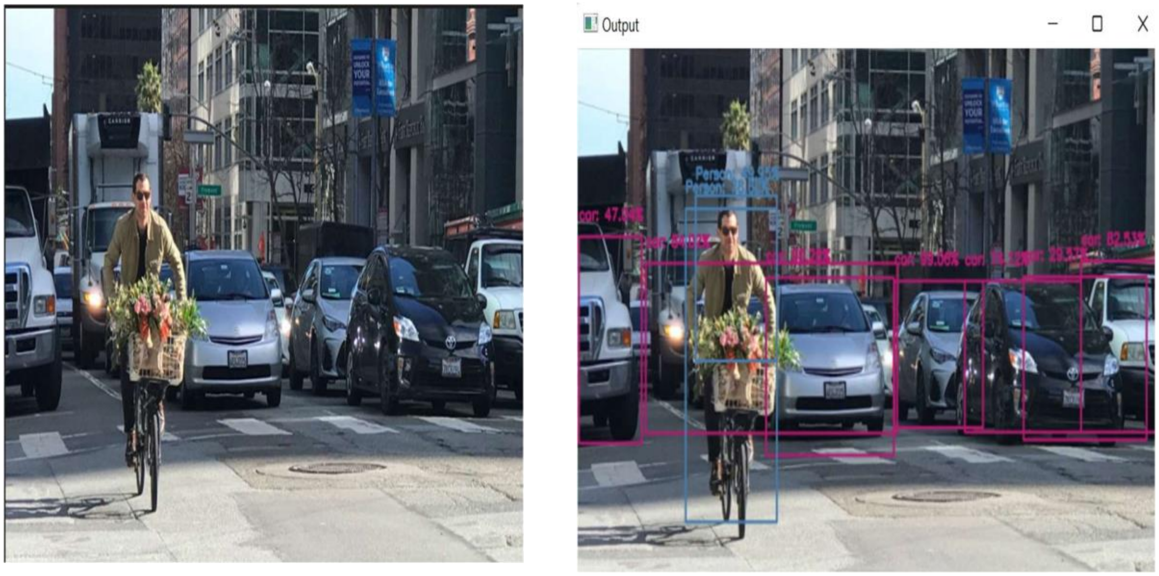
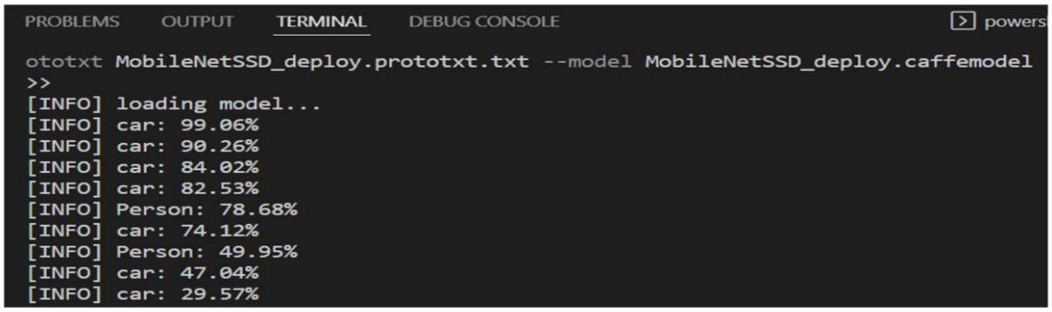


Fig 4: Image with Detected Object



```
ototxt MobileNetSSD_deploy.prototxt.txt --model MobileNetSSD_deploy.caffemodel
>>
[INFO] loading model...
[INFO] car: 99.06%
[INFO] car: 90.26%
[INFO] car: 84.02%
[INFO] car: 82.53%
[INFO] Person: 78.68%
[INFO] car: 74.12%
[INFO] Person: 49.95%
[INFO] car: 47.04%
[INFO] car: 29.57%
```

Fig 5: Console Output

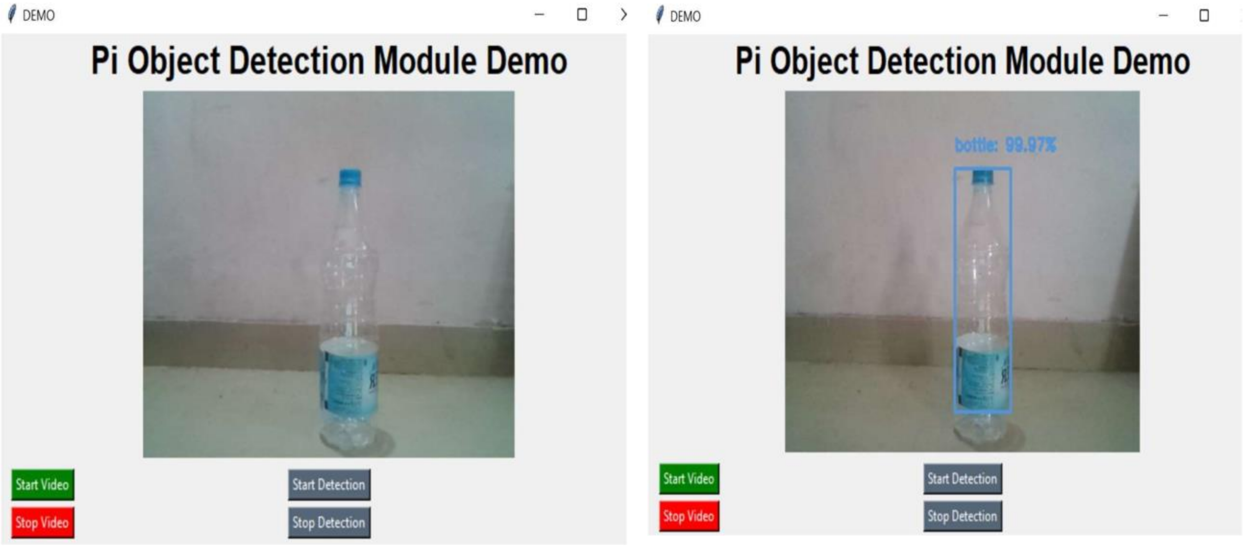


Fig 6: Output obtained in Real-Time

VIII. ADVANTAGES & APPLICATION

I. ADVANTAGES

I. Memory Efficient.

II. Low Power Consumption.

III. Optimized Software.

II. APPLICATION

I. Self-Driving car

II. Real time object detection.

III. Object Tracing.

IV. Object Classification.

IX. FUTURE SCOPE

Future enhancements can be focused by implementing the project on the system having GPU for faster results and better accuracy. we will continue to optimize our detection network model, including reducing memory usage and increasing network computing speed.

X. CONCLUSION

The project is developed with objective of detecting real time objects in video and camera with faster, Accurately with Less memory consumption and reduce traffic consumption over Web Servers for classification of Image. Bounding Boxes are drawn around the detected objects along with the label indicating the class to which the object belongs. We have used CPU for the processing in the project.

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