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Object Detection for Autonomous Cars using AI/ML

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Abstract— *The purpose of this project is to research the ethics for the acquisition of object detection for driverless cars. The world of Computer Vision is continuously rising with a rise in interaction between human and machine. Self-driving cars have deployed the utilization of GPS. Our paper proposes a result which will identify and rightly prognosticate objects round the driverless car. The aptitude to perceive and identify objects from camera perspective are the main aim of our paper. We have used MobileNet-SSD, an object discovery model that calculates the bounding boxes and categorizes an item from an inserted image. This paper plans to coach the reader to higher understand how autonomous cars scans its surroundings.*

Keywords— *object detection, image-processing, computer vision , object classification*

I. INTRODUCTION

Allowing computer to output digital information from photos or videos falls into the sector of computer vision (CV). Image Classification was considered as a recurrent drawback in computer vision and was flagged as unsolvable by many researchers that was until Lawrence Larry Roberts extracted 3D features from 2D perspective view of blocks. The potential to spot and recognize objects either in single or quite one image frame can gain extreme significance in various ways. While driving, the driver is unable to identify objects properly due to a lack of attention, light reflections, unknown objects, etc., which can result in car crashes. The idea of self-driving vehicles has been evolving with the advancement in ways associated with the task of relating and rooting features from the objects.

II. EASE OF USE

A. *Computer Vision(CV)*

Computer Vision is a field of AI allowing computers to amass meaningful information in digital images that works the same as human eye. Computer vision trains machines to perform these tasks, but it's job is to try and do it within a short period of time with cameras, data and algorithms instead of retina, optic nerve and a visible peridium. System trained for examining products or watching product assets can analyze thousands of products or process a moment, noticing all small defects and issues and also it can quickly surpass human capabilities.

III. EXISTING SYSTEM

In the existing system, the model makes use of the Camera Sensor. Assume a sunny day suddenly turns into a rainy and foggy day. In such cases, the sensor finds it hard to detect the target object. That is where the computer vision comes into play. Computer Vision is a field of Artificial Intelligence that trains computers to understand the visual world by training the model.

IV. PROPOSED SYSTEM

Accuracy plays an important role inprediction. Although many algorithms are available for this purpose, we will be using the SSD to classify the objects. We make use of different libraries to form a network and also use TensorFlow. Once the training is done our next objective will be to test the model for accuracy.

V. OBJECTIVES

- To detect, classify, and track the object for autonomous car.
- To Process the images frames to detects the object using a Lidar.
- To Deploy models in the cloud and determines the objects with good accuracy value.

VI. LITERATURE SURVEY SUMMARY

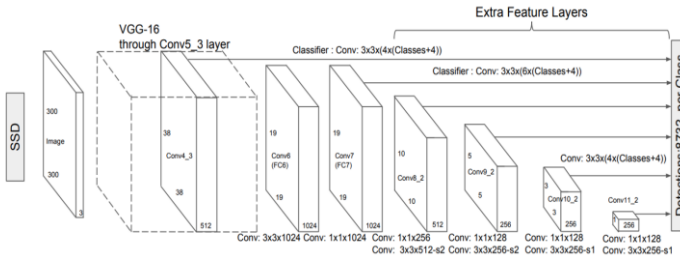
[1] Wang Junqiang, Li Jiansheng, Zhou Xuewen, and Zhang Xu proposed an improved version of SSD which aims at solving the trials and errors of a slow detection speed.

[2] J Jeong, P. Hyojin , K. Nojun proposes an object detection method that improve the accuracy of the standard SSD object detection algorithms in terms of precision and rapidness. The proposed network is suitable for sharing weights within the classifier network. This improves generalization performance and speeds up training. The suggested network has a state-of-the-art mean average precision, that is more superior to standard SSD, YOLO, Faster-RCNN and RFCN. It is also faster than Faster-RCNN and R-FCN

[3] S. Ren, Kaiming He, R. Girshick and Jian Sun proposes their work on the Regional Proposal Network(RPN) that correctly predicts the object bounds and confidence score of the objects at simultaneous positions.

[4] B. Liu, W. Zhao and Q. Sun evaluated the performance of Faster R-CNN, fast RCNN supported an experiment using pre trained models and also the experimental results showed the accuracy and detection of RCNN, Fast R-CNN and Faster R-CNN.

VII. ALGORITHM APPLIED



In our project, we've got made use of the SSD algorithm as its main purpose is real-time object detection. The object detection model includes

- Probability that there in an object
- Height of the bounding box
- Width of the bounding box

SSD includes a base VGG-16 network followed by multibox conv layers where VGG-16 employed for feature extraction. SSD defines a value for every feature map layer.

Ranging from the left, Conv4_3 detects objects at the rock bottom scale 0.2 (or 0.1 occasionally), and ascends sequentially to the right layer at the 0.9 scale. Combining the dimensional value with the target aspect ratios, we cipher the width and height of the default boxes. For layers making 6 prognostications, SSD starts with 5 target aspect ratios: 1, 2, 3, 1/2, and 1/3 also the width and the height of the default boxes are calculated as:

$$w = scale \cdot \sqrt{aspect\ ratio}$$

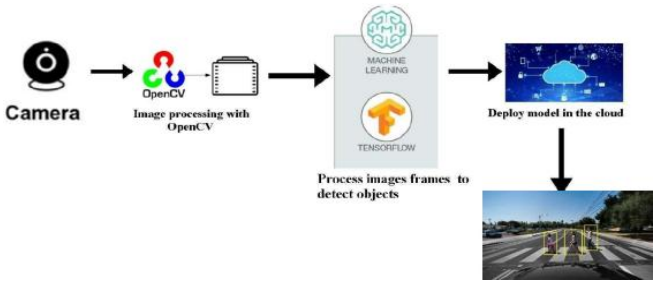
$$h = \frac{scale}{\sqrt{aspect\ ratio}}$$

than SSD adds an extra default box with scale:

$$\sqrt{scale \cdot scale\ at\ next\ level}$$

and aspect ratio = 1

VIII. METHODOLOGY DIAGRAM



In this paper, we have made use of the device web cam to detect the objects. Picking objects out of background image and propose the objects as belonging to a certain class human, in this case using a probability score and defining the boundaries of the proposed objects with x-y origin and height and length values. Open CV is a Library which is used to carry out image processing using python. This paper utilizes Open CV Library for object detection using the web camera. Since TensorFlow has a comprehensive, flexible ecosystem of tools, libraries and community resources, it makes our task much easier to create the machine learning model.

IX. CONCLUSION

The main aim of this paper is to demonstrate the ideas of how autonomous cars perceive real world objects through the camera using the SSD. From this paper, we come to a conclusion that the output of the SSD object identifies the mAP using a deep basic learning network, which are classifiers based on CNN, and uses convolution filters to finally find objects. Our implementation uses MobileNet as the primary network. Caffe is used as an in-depth learning framework. Caffe MobileNet SSD model trained in COCO data set and optimized for PASCAL VOC up to 72.8% mAP (mean average precision) was taken as the pre-trained model. The model was able to successfully detect objects of the classes' 'car', 'person', 'bus', 'motor bike', 'bicycle' and 'cow'. The bounding box was inconsistent in a high density and fast-moving traffic, but was accurate when the objects were close to the camera. However, the bounding boxes were consistent in the low-density traffic scenario and performed better than high density traffic scenario in terms of accuracy.

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