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Object Detection Using Yolov3

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ABSTRACT: Most of the recent years all the vehicles are being driver-less and all vehicles must drive automatically through software embedded in microprocessors or microcontrollers. So, while vehicles driving automatically, they must detect the obstacles and other vehicles on the road to avoid collisions with other vehicles or obstacles. Autonomous driving will require increasingly reliable network mechanisms and redundant real-time implementations. Object recognition is an evolving research field in computer vision. Whether in the same scene or in multiple images, the ability to recognize and classify objects becomes more and more important in multiple ways, because the operator may even lose attention while driving, leading to a catastrophic collision. "You Only Look Once" v3 (YOLOv3) is one of the most widely used object recognition methods based on deep learning techniques. Using the k-means clustering method to estimate the initial width and height of the prediction. Using this method, the estimated width and height are sensitive to the center of the initial cluster, and processing is time-consuming

KEYWORDS: YOLO, IoU, Confidence.

I. INTRODUCTION

Object detection is a computer vision task that identifies the presence, position, and type of one or more items in a video or picture. This is a complicated problem that necessitates the development of methods for recognizing items (e.g., discovering them), detecting their location (e.g., where are they), and classifying them (e.g. what are they). Deep learning approaches have recently demonstrated superior real-time results for object detection on conventional benchmark datasets and in computer vision competitions. "YOLO" or "You Only Look Once" belongs Convolutional Neural Network family and YOLO consists of single CNN to detect all the objects in an image or a video. In this project, you'll learn how to use OpenCV to create a YOLOv3 model for object detection. YOLOv3 is the most recent variation of the YOLO-based Convolutional Neural Network family of models for object detection. The best-of-breed open source library implementation of the YOLOv3 is, the OpenCV library. How to use a pre-trained YOLOv3 to perform object localization and detection on new photographs.

II. METHODOLOGY

YOLO:

A single deep convolutional neural network is used in this method (originally a version of Google Net, later updated and renamed Darknet based on VGG) that decomposes the input into a grid of cells, with each cell directly predicting the bounding box and object classification. A large number of possible bounding boxes, which are combined in the post-processing stage to make the final prediction.

YOLOv1, YOLOv2, and YOLOv3 are the three versions of this approach available at the time of writing. The first version provides a general architecture, while the second version improves the design and uses predefined anchor blocks to improve the bounding box proposal, and the third version further improves the model architecture and learning process.

Although the accuracy of the model is close to but not as good as Region-based Convolutional Neural Networks (RCNN). Due to their high detection rate, which is frequently presented in real-time on a video or camera feeding input, they are particularly common in object detection

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YOLOv3 method to convert the object Recognition is regarded as a regression problem. A single convolutional neural network is used to directly predict the class probability and bounding box offset of the complete image. It completely eliminates region proposal generation and feature resampling, and encapsulates all stages into a single network to form a true end-to-end recognition system.

Datasets Used:

The dataset MS COCO is used in this project. The MS COCO dataset, which is used in the YOLOv3 approach, is an essential benchmark tool in the field of object recognition and detection. It has 117,264 training photos and more than 5000 test images, with 80 different object categories. The size of each image is 416 × 416.

We utilized the Python programming language to perform the Yolo algorithm in this project. The python packages we used in this project are:

1. NumPy: The Python package “NumPy” is used to work with dimensional arrays. Matrixes, Fourier transformations, and linear algebra functions are also included in this module.
2. Argparse: The "Argparse" module makes writing user-friendly command-line interfaces a breeze. The argparse module also generates help and usage messages automatically and generates errors when users provide invalid arguments to the program.
3. Time: The “Time” module provides various time-related functions.
4. Cv2: “Cv2” is part of OpenCV library. OpenCV is a library of Python bindings designed to solve computer vision problems.
5. OS: The OS module in Python contains functions for interfacing with the operating system. The OS module is a typical Python utility module. This module gives you a portable way to get to operating system-specific features. The “os” and “os.path” modules contain many functions for interfacing with the file system.

The output gives the name of the object detected and confidence score on the left top of the bounding box.

III.MODELING AND ANALYSIS

YOLOv3 uses logistic regression to predict the objectness score(confidence) for each bounding box. If the bounding box prior overlaps a ground truth object by more than any other bounding box prior, the confidence score should be 1.

Prior 1 overlaps the first ground truth object more than any other bounding box prior (has the highest IOU), while prior 2 overlaps the second ground truth object more than any other bounding box prior (has the highest IOU). Prior to each ground truth object, the system assigns one bounding box.

There is no loss in coordinate or class predictions if a bounding box prior is not assigned to a ground truth object, only objectness is lost.

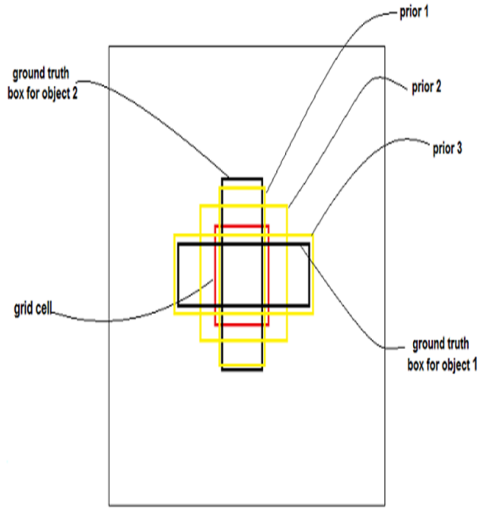

Figure 1: Finding IoU of the Object

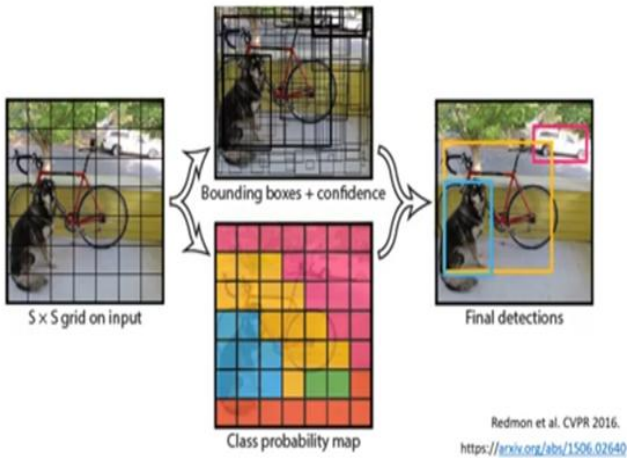

Figure 2. Real-time object detection

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For each grid cell, YOLO predicts several bounding boxes. We only want one of them to be responsible for the object in order to calculate the loss for true positives. We pick the one with the highest IOU (Intersection Over Union) with the ground truth for this reason. Each prediction improves the accuracy of specific sizes and aspect ratios.

Using sum-squared error, YOLO calculates the loss between the predictions and the ground truth. The loss function consists of localization loss, classification loss, and confidence loss.

IV.RESULTS AND DISCUSSION

By this project the real time objects can be detected like in the given below images. You can observe that the objects can be detected from the image and the objects have been provided with the names and its confidence level.

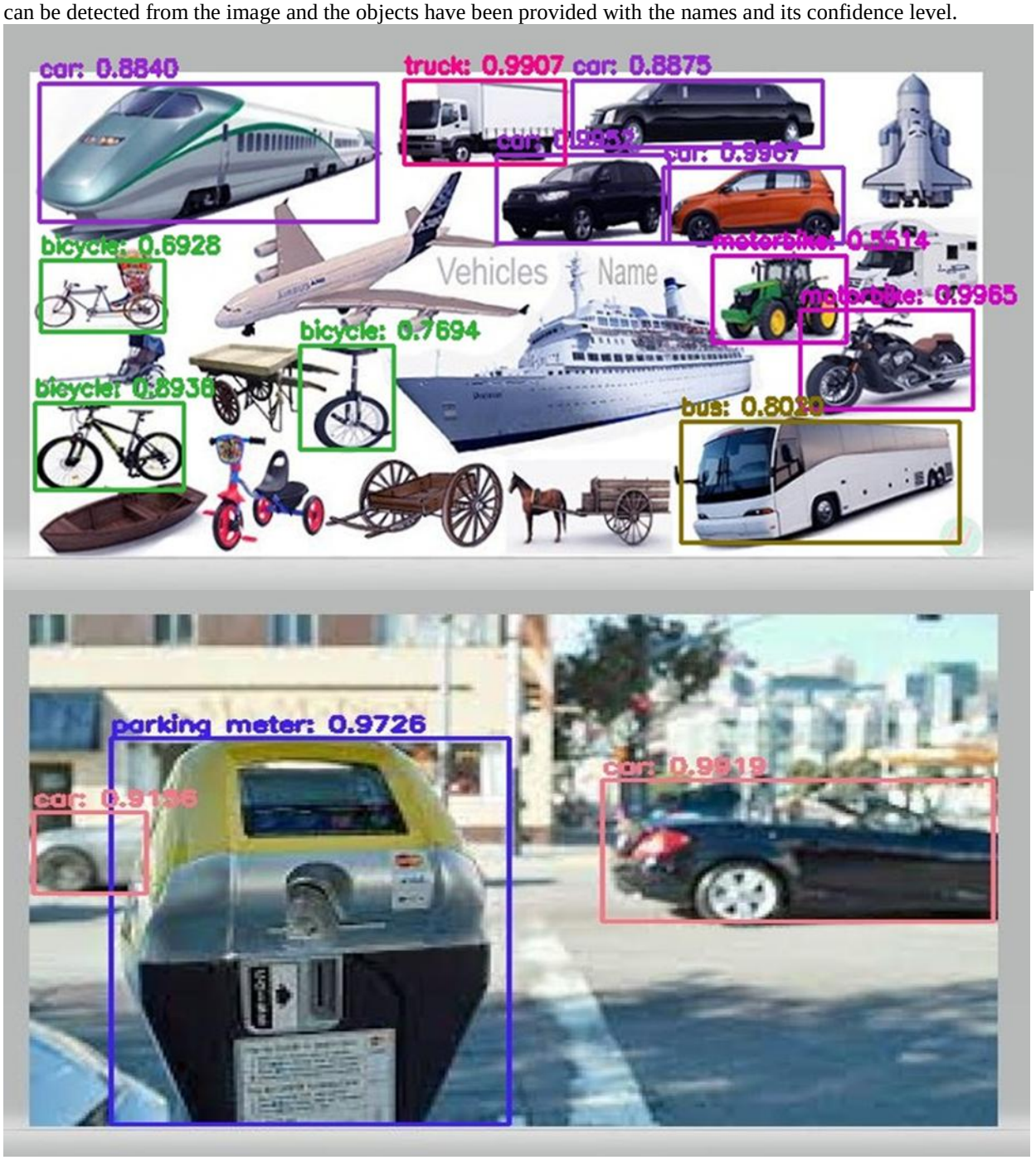

Figure 3: Objects detected in the images with their confidence

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V.CONCLUSION

So, we conclude that this project helps in the applications of the detecting the social distancing between people, to find the traffic flow in an area and to find the unauthorized access of objects in a restricted area. This project object detection using yolov3 will detect the objects faster than the normal convolutional neural network.

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