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OBJECT DETECTION USING CONVOLUTIONAL NEURAL NETWORK

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Abstract: Object detection and recognition systems have gained significant interest of researchers due to vast advancement in the field of computer vision technology. Although there are number of object recognition systems implemented in past researches, there still remains a constant demand for new, better and accurate recognition systems. Current detection systems make use of classifiers to perform detection. We are implementing a machine learning model which can detect objects using the concept of Convolutional neural networks (CNNs). This enables us to detect objects with very high accuracy.

Keywords: Neural Network, Opencv, YOLO, Non-Max Suppression

INTRODUCTION

Humans glance at an image and instantly know what objects are in the image, where they are, and how they interact. The human visual system is fast and accurate, allowing us to perform complex tasks like driving with little conscious thought. Fast, accurate algorithms for object detection would allow computers to drive cars without specialized sensors, enable assistive devices to convey real-time scene information to human users, and unlock the potential for general purpose, responsive robotic systems. Current detection systems repurpose classifiers to perform detection. To detect an object, these systems take a classifier for that object and evaluate it at various locations and scales in a test image. Such systems may provide poor results when two different images look similar. On the other hand, neural networks can also be implemented which provide accurate results for all kinds of images.

1. RELATED WORK

Sandeep Kumar, Aman Balyan and Manvi Chawla proposed Object Detection and Recognition in Images**.** Object Recognition is a technology in the field of computer vision. It is considered to be one of the difficult and challenging tasks in computer vision. Many approaches have been proposed in the past, and a model with a new approach which is not only fast but also reliable. Easynet model has been compared with various other models as well. Easynet model looks at the whole image at test time so its predictions are informed by global context. At the prediction time; the model generates scores for the presence of the object in a particular category. It makes predictions with a Single network evaluation. Here object detection is a regression problem to spatially separated bounding boxes and associated class probabilities.

Christian Szegedy Alexander Toshev Dumitru Erhan proposed Deep Neural Networks for Object Detection. Deep Neural Networks (DNNs) have recently shown outstanding performance on image classification tasks. In this paper we go one step further and address the problem of object detection using DNNs, that is not only classifying but also precisely localizing objects of various classes. We present a simple and yet powerful formulation of object detection as a regression problem to object bounding box masks. We define a multi-scale inference procedure which is able to produce high-resolution object detections at a low cost by a few network applications. State-of-the-art performance of the approach is shown on Pascal VOC.

Juan Wu, Bo Peng, Zhenxiang Huang and Jietao Xie proposed Computer Vision-Based Object Detection and Classification**.**Computer vision techniques become particularly important in agriculture applications due to their fast response, high accuracy and strong adaptability. Two of the most demanding and widely studied applications relate to object detection and classification. The task is challenging due to variations in product quality differences under certain complicate circumstances influenced by nature and human. Research in these fields has resulted in a wealth of processing and analysis methods. In this paper, we explicitly explore current advances in the field of object detecting and categorizing based on computer vision, and a comparison of these methods is given.

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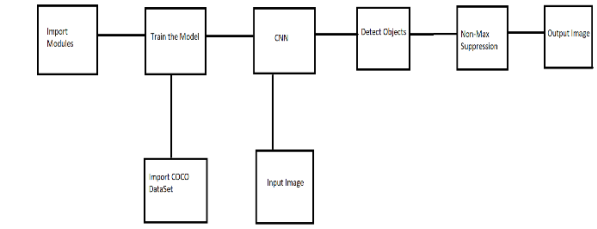
Sheng Ding, Kun Zhao proposed daily Objects Detection Based on Deep Neural Network. With the rapid development of deep learning, great breakthroughs have been made in the field of object detection. In this article, the deep learning algorithm is applied to the detection of daily objects, and some progress has been made in this direction. Compared with traditional object detection methods, the daily objects detection method based on deep learning is faster and more accurate. The main research work of this article: 1. collect a small data set of daily objects; 2. in the TensorFlow framework to build different models of object detection, and use this data set training model; 3. the training process and effect of the model are improved by fine-tuning the model parameters.

2.METHODOLOGY

2.1PROPOSED ARCHITECTURE



2.2PROPOSED SYSTEM

The proposed system tries to overcome the drawbacks of the existing approaches. Neural network is an emerging technique in Machine learning which has advanced techniques within itself. Those techniques have been used in this project. The initial step of the system is to divide the input image into a grid of size 13x13. OpenCV has been used for this step. The further steps involve detection of objects from each cell. Some objects may spread across multiple cells and hence they get detected multiple times. As a result, multiple boxes will be drawn around a single object. To remove the additional boxes and leave one box which best fits the objects, we use an algorithm called Non-Max Suppression Algorithm.

Advantages:
80 objects can be detected using this machine learning model.
Accuracy has been increased a lot due to the use of YOLOV3 which is a type of neural network.

2.3 PROPOSED ALGORITHM

YOLO ALGORITHM

```
def detect():
net = cv2.dnn.readNet("yolov3.weights", "yolov3.cfg")
  classes = []
  with open("coco.names", "r") as f:
    classes = [line.strip() for line in f.readlines()]
  layer_names = net.getLayerNames()
  output_layers = [layer_names[i[0] - 1] for i in net.getUnconnectedOutLayers()]
  colors = np.random.uniform(0, 255, size=(len(classes), 3))
  img = cv2.imread(filename)
  height, width, channels = img.shape
  blob = cv2.dnn.blobFromImage(img, 0.00392, (416, 416), (0, 0, 0), True, crop=False)
  net.setInput(blob)
  outs = net.forward(output_layers)
```

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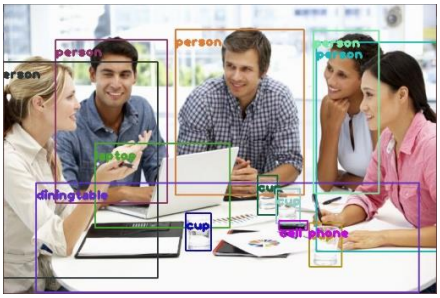
RESULTS

Input Image:

Output image:



Input image:

Output image:

3. CONCLUSION

Object detection is breaking into a wide range of industries, with use cases ranging from personal security to productivity in the workplace. Object detection and recognition is applied in many areas of computer vision, including image retrieval, security, surveillance, automated vehicle systems and machine inspection. Significant challenges stay on the field of object recognition. The possibilities are endless when it comes to future use cases for object detection. Some of the applications are optical character recognition, self driving cars, tracking objects, face detection and face recognition, activity recognition**.** As we can foresee many applications of object detection, designing of systems to detect objects of

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an image has been given a lot of importance. The proposed algorithm can detect 80 day-to-day objects in real-time and also with high accuracy.

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