Automation using Machine Learning and Object Detection

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Abstract - A major challenge in many of the object detection systems is the dependency on other computer vision techniques for helping the deep learning-based approach, which leads to slow and non-optimal performance. In this paper, a completely deep learning- based approach is used to solve the problem of object detection in an end-to-end fashion. The paper aims to incorporate state-of-the-art technique for detecting the object placed in front of the webcam with the goal of achieving high accuracy with a real-time performance using deep learning. Based on the detected image several preprogrammed robots are used to transport the object in the detected image from the place where humans cannot work flawlessly to the desired location efficiently. This paper comes with the combination of deep learning and robotics which can be used in several areas such as mines, construction sites, steel factories etc where human works in a risky environment. The network is trained on the most publicly available data set, on which an object detection challenge is conducted annually.

Keyword:- Machine Learning, object detection, Single shot detection, automation, robotics.

I. INTRODUCTION

Efficient and accurate object detection has been an important topic in the advancement of computer vision systems. With the advent of deep learning techniques, the accuracy for object detection has increased drastically. A major challenge in many of the object detection systems is the dependency on other computer vision techniques for helping the deep learning- based approach, which leads to slow and non-optimal performance. The main aim of object detection is to find the exact location of an object in each picture accurately and mark the object with the appropriate category. To be very clear, the problem that object detection seeks to solve involves determining where and what the object is. In this paper, a completely deep learning-based approach is used to solve the problem of object detection in an end-to-end fashion. Once the image in front of the camera is detected accurately then based on that image a conveyor belt containing the particular item shown in the image will get triggered. This trigger of conveyor belt will make it roll and the item above the belt will move forward and eventually fall on the robot carrier placed underneath the conveyor belt. Once the item is in the carrier robot, the robot will move forward following a line and reach the desired destination. Upon picking up the item from the robot carrier at the destination, the robot will move in reverse direction and will halt at the initial position. This paper comes with the combination of deep learning and robotics which can be used in several areas such as mines, construction sites, steel factories etc where human works in a risky environment. The following challenges have been identified. 1. The need to distinguish between similar objects. 2. Identification of multiple objects in a single frame, where some objects might be only partially visible, and others are overlapping. 3. Collecting and pre-processing of datas for training. The network used here in this paper can be enforced on unified detection YOLO [4] or Single shot detection (SSD) [5]. The network is trained on the most publicly available dataset, on which an object detection challenge is conducted annually. The resulting system will be fast and accurate, thus aiding those applications which require object detection.

II. LITERATURE SURVEY

2.1. R-CNN (Region based convolutional neural network)
[1] :- To find a way around the problem of choosing a vast

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