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A Review on Object Detection using Open CV Method

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Abstract: Due to object detection's close relationship with video analysis and image understanding, it has attracted much research attention in recent years. Traditional object detection methods are built on handcrafted features and shallow trainable architectures. Their performance easily stagnates by constructing complex ensembles which combine multiple low-level image features with high-level context from object detectors and scene classifiers. With the rapid development in deep learning, more powerful tools, which are able to learn semantic, high-level, deeper features, are introduced to address the problems existing in traditional architectures. These models behave differently in network architecture, training strategy and optimization function, etc. In this paper, we provide a review on python based object detection frameworks. We focus on typical generic object detection architectures along with some modifications and useful tricks to improve detection performance further. As distinct specific detection tasks exhibit different characteristics, we also briefly survey several specific tasks, including salient object detection, face detection and pedestrian detection. Experimental analyses are also provided to compare various methods and draw some meaningful conclusions. Finally, several promising directions and tasks are provided to serve as guidelines for future work in both object detection and relevant neural network based learning systems.

Keywords: Object, Detection, Python OpenCV

I. Literature Survey:

Bhumika Gupta (2017) et a;. proposed object detection is a well-known computer technology connected with computer vision and image processing that focuses on detecting objects or its instances of a certain class (such as humans, flowers, animals) in digital images and videos. There are various applications of object detection that have been well researched including face detection, character recognition, and vehicle calculator. Object detection can be used for various purposes including retrieval and surveillance. In this study, various basic concepts used in object detection while making use of OpenCV library of python 2.7, improving the efficiency and accuracy of object detection are presented.

Kartik Umesh Sharma (2017) et al, proposed an object detection system finds objects of the real world present either in a digital image or a video, where the object can belong to any class of objects namely humans, cars, etc. In order to detect an object in an image or a video the system needs to have a few components in order to complete the task of detecting an object, they are a model database, a feature detector, a hypothesiser and a hypothesiser verifier. This paper presents a review of the various techniques that are used to detect an object, localise an object, categorise an object, extract features, appearance information, and many more, in images and videos. The comments are drawn based on the studied literature and key issues are also identified relevant to the object detection. Information about the source codes and online datasets is provided to facilitate the new researcher in object detection area. An idea about the possible solution for the multi class object detection is also presented. This paper is suitable for the researchers who are the beginners in this domain.

Mukesh Tiwari (2017) et al. presented object detection and tracking is one of the critical areas of research due to routine change in motion of object and variation in scene size, occlusions, appearance variations, and ego-motion and illumination changes. Specifically, feature selection is the vital role in object tracking. It is related to many real time applications like vehicle perception, video surveillance and so on. In order to overcome the issue of detection, tracking related to object movement and appearance. Most of the algorithm focuses on the tracking algorithm to smoothen the video sequence. On the other hand, few methods use the prior available information about object shape, color, texture and so on. Tracking algorithm which combines above stated parameters of objects is discussed and analyzed in this research. The goal of this paper is to analyze and review the previous approach towards object tracking and detection using video sequences through different phases. Also, identify the gap and suggest a new approach to improve the tracking of object over video frame.

Aishwarya Sarkale (2018) et al. proposed humans have a great capability to distinguish objects by their vision. But, for machines object detection is an issue. Thus, Neural Networks have been introduced in the field of computer science. Neural Networks are also called as 'Artificial Neural Networks'. Artificial Neural Networks are computational models of the brain which helps in object detection and recognition. This paper describes and demonstrates the different types of Neural Networks such as ANN, KNN, FASTER R-CNN, 3D-CNN, RNN etc. with their

accuracies. From the study of various research papers, the accuracies of different Neural Networks are discussed and compared and it can be concluded that in the given test cases, the ANN gives the best accuracy for the object detection.

Karanbir Chahal (2018) et al. proposed Object detection is the identification of an object in the image along with its localization and classification. It has wide spread applications and is a critical component for vision based software systems. This paper seeks to perform a rigorous survey of modern object detection algorithms that use deep learning. As part of the survey, the topics explored include various algorithms, quality metrics, speed/size trade offs and training methodologies. This paper focuses on the two types of object detection algorithms- the SSD class of single step detectors and the Faster R-CNN class of two step detectors. Techniques to construct detectors that are portable and fast on low powered devices are also addressed by exploring new light weight convolutional base architectures. Ultimately, a rigorous review of the strengths and weaknesses of each detector leads us to the present state of the art.

Richard Socher (2018) et al. proposed recent advances in 3D sensing technologies make it possible to easily record color and depth images which together can improve object recognition. Most current methods rely on very well-designed features for this new 3D modality. We introduce a model based on a combination of convolutional and recursive neural networks (CNN and RNN) for learning features and classifying RGB-D images. The CNN layer learns low-level translationally invariant features which are then given as inputs to multiple, fixed-tree RNNs in order to compose higher order features. RNN scan be seen as combining convolution and pooling into one efficient, hierarchical operation. Our main result is that even RNNs with random weights compose powerful features. Our model obtains state of the art performance on a standard RGB-D object data set while being more accurate and faster during training and testing than comparable architectures such as two-layer CNNs.

Yordanka Karayaneva (2018) et al. presented schools in many parts of the world use robots as social peers in order to interact with children and young students for a rich experience. Such use has shown significant enhancement of children's learning. This project uses the humanoid robot NAO which provides object recognition of colours, shapes, typed words, and handwritten digits and operators. The recognition of typed words provides performance of the corresponding movements in the sign language. Five classifiers including neural networks are used for the handwritten recognition of digits and operators. The accuracy of the object recognition algorithms are within the range of 82%-92% when tested on images captured by the robot including the movements which represent words in the sign language. The five classifiers for handwritten recognition produce highly accurate results which are within the range of 87%-98%. This project will serve as a promising provision for an affective touch for children and young students.

Abdul Muhsin M (2019) et al. proposed everybody deserve to live independently, especially those who disabled, with the last decades, technology gives attention to disabled to make them control their life as possible. In this work, assistive system for blind is suggested, to let him knows what is around him, by using YOLO for detecting objects within images and video streams quickly based on deep neural network to make accurate detection, and OpenCV under Python using Raspberry Pi3. The obtained results indicated the success of the proposed model in giving blind users the capability to move around in unfamiliar indoor outdoor environment, through a user friendly device by person and object identification model.

Geethapriya. S (2019) et al. proposed the Objective is to detect of objects using You Only Look Once (YOLO) approach. This method has several advantages as compared to other object detection algorithms. In other algorithms like Convolutional Neural Network, Fast Convolutional Neural Network the algorithm will not look at the image completely but in YOLO the algorithm looks the image completely by predicting the bounding boxes using convolutional network and the class probabilities for these boxes and detects the image faster as compared to other algorithms.

R. Sujeetha (2019) et al. proposed object detection and tracking could be a immense, vivacious however inconclusive and trending area of computer vision. Due to its immense use in official surveillances, tracking modules applied in security and lots of others applications have made researchers to devise a lot of optimized and specialized methods. However, problems are faced in implementing object detection and tracking in real-time; like tracking in real time and giving appropriate optimized results, over dynamic computation to find the efficient performance with respect to time factor, or multiple objects tracking create this task more difficult. Though, several techniques are devised but still lies a lot of scope of improvement, however during this literature review we've seen some illustrious and multiple ways of object detection and tracking. In this method we will be using Tensor Flow and Open CV library and CNN algorithm will be used and we will be labelling the detected layers with accuracy being checked at the same time .For validation purpose live input video will be taken for the same where objects will be getting detected and it can be simulated same for real-time through external hardware added. In the end we see the proper optimized and efficient algorithm for object tracking and detection.

II. Conclusion:

Due to its powerful learning ability and advantages in dealing with occlusion, scale transformation and background switches, deep learning based object detection has been a research hotspot in recent years. This paper provides a detailed review on deep learning based object detection frameworks which handle different sub-problems, such as occlusion, clutter and low resolution, with different degrees of modifications on R-CNN. The review starts on generic object detection pipelines which provide base architectures for other related tasks. Then, three other common tasks, namely salient object detection, face detection and pedestrian detection, are also briefly reviewed. Finally, we propose several promising future directions to gain a thorough understanding of the object detection landscape. This review is also meaningful for the developments in neural networks and related learning systems, which provides valuable insights and guidelines for future progress.

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