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Real Time Moving Object Detection Using C-Model with CNN

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***Abstract*- The object detection and tracking is the important steps of computer vision algorithm. The robust object detection is the challenge due to variations in the scenes. Another biggest challenge is to track the object in the occlusion conditions. Neural Networks has become one of the most demanded areas of Information Technology and it has been successfully applied to solving many issues of Artificial Intelligence, for example, speech recognition, computer vision, natural language processing, and data visualization. This thesis describes the developing the neural network model for object detection and tracking.**

The understanding of moving object based on vision has also developed rapidly. Its related technologies have been widely used in public transportation, square, government, bank and other scenes. At present, there are commonly used algorithms in moving object detection, including the difference method (background difference method and time difference method) and optical flow method and neural network. The difference method was based on the current video and the reference image subtraction to complete the detection. Hence in this approach, the moving objects detection using Caffe framework has been proposed. A novel Fast CNN based object tracking algorithm is used for robust object detection. The proposed approach is able to detect the object in different illumination and occlusion.

Index terms- Detection of moving objects; tracking of moving objects; behavior understanding, Neural Network, Caffe model, CNN

1. INTRODUCTION

In the field of computer vision, detection of moving objects from a video sequence, which is based on representing moving objects by a binary mask in each frame, is an important issue and interested in many vision based applications such as action recognition [1], traffic controlling [2], industrial inspection [3], human behavior identification [4], and intelligent video surveillance [5]. In many of these applications, a moving camera is inherently utilized. For example, in most intelligent video surveillance systems, we use camera movement techniques such as pan–tilt–zoom (PTZ) to better focus and track the targets [6]. Recently, progress in drone technology with using relatively cheap drones with advanced imaging capabilities promises vast future commercial applications [7]. Here, the camera may operate with various degrees of movement and autonomy. Besides, with advances in camera phone technology for mobile phones, more and more people are interested to capture video sequences with their mobile phone capable to detect and track the moving objects [8]. Here, the camera may have free movements. Even in capturing outdoor scenes by a fixed camera, the camera cannot completely be considered as stationary due to the non-controlled environment [9].

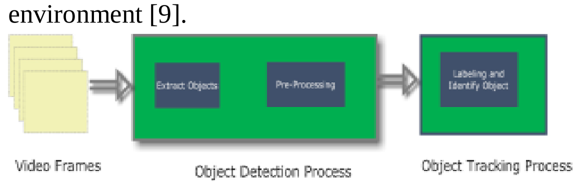

FIG.1 General framework of object detection and tracking in videos

II-DETECTION AND FEATURE EXTRACTION OF MOVING OBJECTS

The detection and feature extraction of moving objects is a basic work for effective understanding. The effect of detection and feature extraction will directly affect the accuracy of understanding. In last decade, number of approaches were proposed and demonstrated by different researchers for foreground detection and tracking. However these approaches were failed to resolve the problems like radical changes and target drift during tracking. The main challenge for moving object detection and tracking is to estimate the object position more accurately. Moving object detection is important step of the computer vision algorithm. It is used in different applications like video analysis, medical imaging and military application. Usually, frame contains background and foregrounds information. In this foreground object is represented by features points in the ROI and remaining features are consider as background. In general, surveillance system consists of two major steps such as moving object detection and motion estimation. The first step is the object detection and it is influenced by the background pixels information's. Video is irrelevant and redundant to the space and time hence the video data need to be compressed. Compression can be done with the spatial and temporal information minimization in the video. A number of researchers have a lot of methodologies that focus on detecting objects from a video sequence. Many of them use multiple techniques and there are combinations and intersections between different methodologies. Background subtraction is the method which extracts the interested moving object from the video frames [23]. The background subtraction is affected by mostly non-stationary background and illumination changes. In practice, this drawback can be removing by the optical flow algorithm but it is produces false alarm for tracking algorithms under cluttered conditions. In most of the cases of background subtraction, the object trackers are influenced by background information but it lead to the misclassification. Further the selection of robust classifier being the challenge to increase the accuracy of the algorithm.

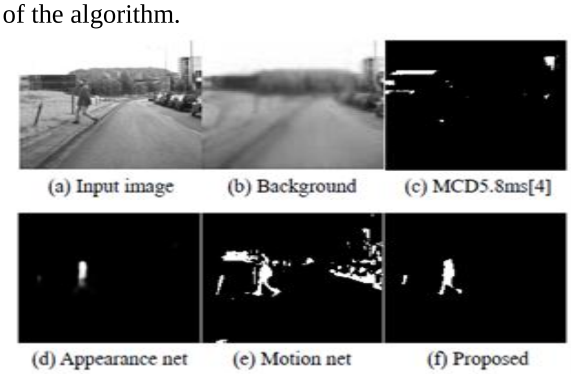

FIG. Issue in background modeling in a moving camera. Moving camera image in (a) often yields a noisy background model as shown in (b) due to severe camera motion. The background-centric approach is vulnerable to this situation as shown in (c). However, the proposed method is robust to this situation as shown in (f) by combining the appearance-based result in (d) and motion-based result in (e).

III-MOVING OBJECT DETECTION USING DEEP NEURAL NETWORK

As deep learning based technologies develop, the vehicle technology trend also has been rapidly changed to high technology with vision, sensor fusion. Especially, detection and classification technology field has been developed exactly and efficiently for autonomous self-driving system. Many filed of recognizing filed including human, motion, tracking objects; need to detect the objects mentally. The reason is that a self-driving environment is different with ADAS system in the side of assistance driving or not. Previous detection algorithm shows the comparatively good accuracy in the low line performance computing like as HOG, Haar-like feature and so on. Object detection is a technology that deals with recognizing classes of objects and their location. Many areas, including face detection, surveillance, and a self-driving car's vision system, need object detection as their core functionalities. Classic object detection systems use the scheme of feature-based methods, such as Haar-like features extraction, and histogram of oriented gradients (HOG) and linear support vector machine (SVM) algorithms. Until now, DARKNET based object detection is proper method to detection in real time. Additionally, comparatively DARKNET can be simply modified to adapt specific purpose.

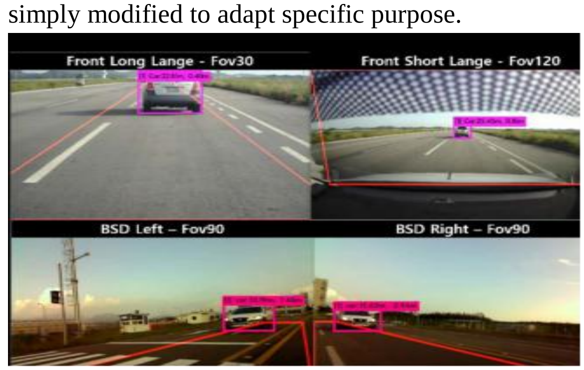

FIG. The results for multi-camera of object detection using YOLOv2

IV-MOTIVATION

There are many methods available for object detection which includes, frame differential method, background subtraction, and optical flow. Frame differential method calculates the absolute differences of the consecutive video frames followed by a threshold function to determine the changes. The goal of this method is to identify certain pixels in an image which is moving or static. If the threshold is not optimal, some of the frame differential methods, mentioned in [34], suffer from the problem of producing images which can corrupt by spot noises. Background subtraction method is used to detect moving object from the static background [35] [36]. This method uses the previous information of the image or some statistical information of the pixel in the video frames to build the background model. There are two main components in the frame pixels. The First component with the largest variance belongs to background pixels; the second component contains pixels of the foreground. After matching the components background model needs to be updated. Optical flow method uses optical flow field and features of an object in an image. For a moving object, optical flow method uses the 3D object velocity mapped into 2D imaging surface, which is also known as image velocity. If there is no moving object in the imaging scene the optical flow field vectors remain smooth over the entire area. Moving objects carry different velocity vectors in the background scene.

V-PROBLEM DESCRIPTION AND PROPOSED WORK

A) Problem Statements

Sparse optical flow tracking consists in detection of salient feature points in a video frame and subsequent tracking of the detected feature points in series of video frames. Due to imperfections of tracking algorithms some feature points can be lost. Initially, several feature points can be detected within the contour of a moving object. A considerable part of image patch around such a feature point belongs to background. While being tracked this feature point can leave the object region and enter the background region thus introducing uncertainty in moving object tracking. Besides, non-transparent obstacles can hide some parts of a moving object and make it difficult to track the moving object in a proper way. In order to increase tracking accuracy we propose a method for automatic recovery of the lost feature points by means of detection of new feature points within the object region. The main idea of the recovery method is based on exploitation of biological regeneration principles.

The work presented in this research will provide a wide overview on use of various object detection approaches for object detection and tracking in videos. Our study is driven by the desire to identify various approaches for object detection and tracking in videos and group most of them together for benefit of research community as a whole. To the best, most surveys research papers focus only on well known moving object detection and tracking approaches targeted at specific applications.

B) PROPOSED WORK

There are different approaches had been presented by different researchers starting from background subtraction to CNN? Some of the human tracking methods have been presented in the previous chapters. In survey, object feature point detection, background subtraction, segmentation and classification algorithms of previous research have been discussed.

Object tracking consist of three basic steps for pedestrian tracking: Object detection from sequence of frame, tracking and analysis of the tracking for particular purpose. There are three fundamental aspects of pedestrian tracking that are analogous to object tracking:

1) Detection of the pedestrian in the video frame,
2) Tracking of the detection, and
3) Analysis of the tracks for the specified purpose.

For tracking to be perfect, features which described the object is most important, hence the object detection plays vital role. This can be achieved by using deterministic or probilistic motion models and appearance based model. To achieve the better accuracy adaptations of the model have been presented in this thesis. The feature points were trained and update in the process of tracking. Only problem to track the object is that it requires large number of features which cannot be always be possible. Recently, the CNN is used to image classification and recognition to improve the significant performance. CNN is trained with millions of images of different classes. CNN are the learning method which exploits the spatial information of an image and learn the complex features automatically. CNN is intrusive to the variation of an input.

VI-CONCLUSION

In this paper, novel approach for object detection and tracking has been presented using convolutional neural network. The moving object detection is performed using TensorFlow object detection API. The object detection module robustly detects the object. The detected object is tracked using CNN algorithm. Considering human tracking as a special case of detection of objects, spatial and temporal classes the facilities were learned during offline training. The shift variant architecture has extended the use of conventional CNNs and combined the global features and local characteristics in a natural way. The proposed approach achieves the accuracy of 95.85% to 99.25%.
The comparative results prove that proposed model improved the overall detection accuracy and as compared to traditional existing techniques for object detection.

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