

A Survey of Automatic Tracking Using Graph Technique in Parking Slot for Multiple Human Tracking

¹Ms.Dhanshree.P.Desai, ²Prof.Jasmine Jha

¹ME Scholar, ²Assistant Professor

¹PG Department

¹LJIET, Ahmedabad, India

Abstract - In Computer Vision, Visual Surveillance in dynamic scenes especially for Humans and Vehicles is currently one of the most active researches in this field. The main objective of this paper is to develop multiple human objects tracking approach based on motion estimation and appearance. The occlusion is one of the most common events in object tracking and object centroid for each object is used for detecting the occlusion and identifying each blob individually. Manual analysis of pedestrians and crowds is often impractical for massive datasets of surveillance videos. Automatic tracking of humans is one of the essential abilities for computerized analysis of such videos. For videos with low density, first we detect each person using a part-based human detector. Then, we employ a global data association method based on Generalized Graphs for tracking each individual in the whole video.

Index Terms - Video Surveillance, Part Based Detection, Data Association, Crowd Density, Tracking

I. INTRODUCTION

In the field of Computer Vision, Visual Surveillance in lively scenes attempts to detect, recognize, and track certain object from image sequences and more generally to understand and describe the blob's behavior. The aim to develop intelligent video surveillance to replace traditionally passive video surveillance that is proving to number of cameras exceeds the capability of human operators to monitor them. Multiple-human tracking in surveillance scenarios, with the assumptions that the camera is static, people walk on a ground plane and camera parameters can be obtained. Unlike most of the previous data association works that only consider how to ensure correct linking, we also attempt to improve the detections, and hence the tracklets, when reliable temporal information can be obtained.[4]

The number of surveillance cameras in urban area is increasing at a significant rate which results in massive amounts of videos to be analyzed. Observing crowds and pedestrians manually in such large amount of data is cumbersome and often impractical which makes automated methods extremely favorable for this purpose.

The density of pedestrians significantly impacts their appearance in a video. For instance, in the video with high density of crowds, people often occlude each other and usually few parts of the body of each individual are visible. On the other hand, the full body or a significant portion of the body of each pedestrian is visible in videos with low crowd-density. These different appearance characteristics require tracking methods which suite the density of the crowd. In this paper, we present two state of the art methods for tracking pedestrians in videos with low and high density of crowds.

For videos with low density of pedestrians, first we detect individuals in each video frame using a part-based human detector which efficiently handles occlusion. Later, we employ a global data association method based on Generalized Minimum Clique Graphs for tracking each person over the course of the whole video.

II. PEDESTRIAN TRACKING IN VIDEOS WITH LOW CROWD DENSITY

Human detection is a fundamental problem in video surveillance. Robust human tracking is highly dependent on reliable detection in each frame. Although human detection has been well studied in computer vision, most of the existing approaches are unsuitable for detecting targets with large variance in appearance. Therefore, robust human detection remains a challenge due to the highly articulated body postures, occlusion, background clutter and viewpoint changes.

Many approaches have been proposed for human detection over the last decade. In most of them, the problem is formulated as a binary sliding window classification, i.e. an image pyramid is constructed and a fixed size window is scanned over all of its levels to localize humans using a non-maximum suppression procedure.

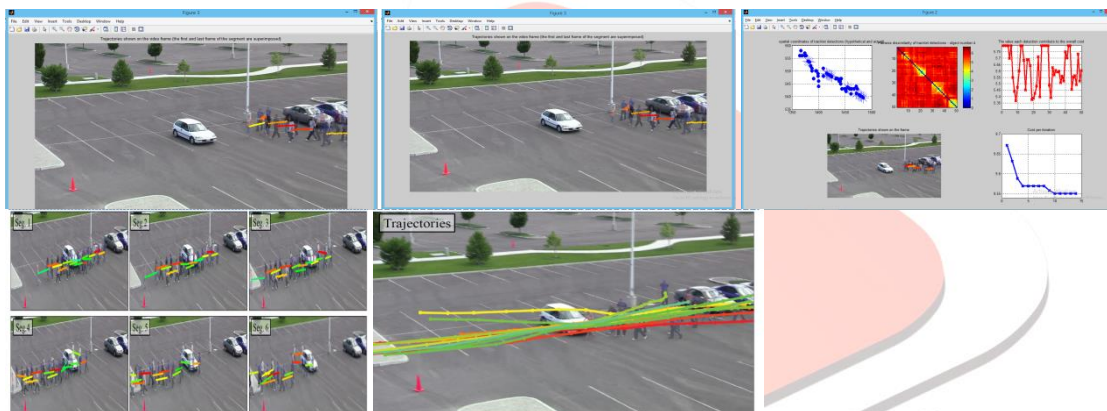
Using local features to learn body parts is another approach to human detection. Part-based approaches which model an object as a rigid order formable configuration of parts are shown to be very effective for occlusion handling. Felzenszwalb et al.[6] simultaneously learn parts and an object model. Their model is an enriched version of Dalal and Triggs' which uses a star structure part-based model defined by a root filter plus a set of parts associated using a deformation model. The score associated to each

star model is the summation of the scores of the root filter and parts at a given location and scale minus a deformation cost which measures the deviation of parts from their ideal location relative to the root. The scores of both parts and root are defined as the dot product of a learnt filter which belongs to that part and a set of extracted features for that specific location. The same set of features as [5], i.e. HOG, is used in [6] with the difference that principle component analysis has been applied to HOG features in order to reduce the dimensionality.

While the deformable part-based model has recently shown excellent performance in object detection, it achieves limited success when the human is occluded. In particular, the final score in [6] is computed using the score of all the parts without considering that some of them can be occluded by other pedestrians or static objects in the scene. The occlusion happens especially in crowded scenes such as the example shown in Fig. 2 which signifies the drawback of this method. Considering the score of the occluded parts in the final decision score may cause the algorithm to ignore most of the partially occluded humans in the final detection results. Therefore, some methods such as [9] rely on head detection only and disregard the rest of the body. To address this problem, we propose in [9] to infer occlusion information from the score of the parts and utilize only the ones with high confidence in their emergence. By looking at the score of each part, we find the most reliable set of parts that maximizes the probability of detection.

III. FINDING TRACKLETS OF PEDESTRIANS IN ONE VIDEO SEGMENT

In order to determine if a group of detections from different video frames belong to one person, we utilize two features for each detection: Appearance and Spatial Location. If the visual appearances of a group of detections are similar and the tracklet they form is smooth, we conclude that they belong to one identity. On the other hand, if the appearances of some of the detections are not similar to the rest or if the trajectory they form includes abrupt jumps, we infer that some of the detections must belong to other pedestrians. In order to perform this task,



IV. CONCLUSION

The human detector may fail to detect a pedestrian in one frame. This may happen due to several reasons such as occlusion, articulated pose or noise. Since it selects one detection from each frame, it will choose an incorrect node for the frames where a particular person does not have a detection. Therefore, we add hypothetical nodes to each cluster which are supposed to represent virtual detections for the cases where human detector failed. The appearance features and spatial locations of hypothetical nodes are calculated based on the other detections included in Vs.

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