A Survey of Background Subtraction and Shadow Removal for Multiple Human Tracking

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***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 detection, background subtraction, shadow removal and occlusion detection. 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.**

***Index Terms* - Video Surveillance, Background Subtraction, Shadow removal technique, Object tracking, Occlusion detection**

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]

Human object tracking can be defined as the process of segmenting an object of interest from a video scene and keeping track of its motion, orientation, occlusion etc. in order to extract useful information. Moving object tracking process follows the segmentation step and is more or less equivalent to the „recognition" step in the image processing. Detection of moving objects in video streams is the first relevant step of information extraction in many computer vision applications, including traffic monitoring, automated remote video surveillance, and people tracking.[2]

Human body motion analysis is one of the most important technologies which modern bio-mechanics combines with computer vision and has been mostly used in human-computer interaction, virtual reality and other various fields. The most important part of human body motion analysis is the moving human body detection. Our purpose is to detect the moving human body from the background image in video sequences and then perform the target classification, tracking the human body and behavior understanding.

In this paper, we present a shadow removal technique which effectively eliminates a human shadow cast from an unknown direction of light source. Our algorithm improves the shadow detection accuracy by imposing the spatial constraint between the foreground sub regions of human and shadow. The existence of human shadows is a general problem in tracking and recognizing human activities. Shadows not only distort the color properties of the area being shaded but also complicate the edge structure of the figure as a whole. There are several factors that together determine the appearance of a shadow, or example, the view point of camera, the angle of incidence, the light intensity, and the number of light sources, etc.

II. BACKGROUND SUBTRACTION

Background subtraction is the common method to segment out the interested objects in a frame. It is one of the most useful method which uses the difference of the current image and the background image to detect the motion region, and it is generally able to data included object information. The key of this method lies in the initialization and update of the background.[3]

Background subtraction is a popular technique to segment out the interested objects in a frame. This technique involves subtracting an image that contains the object, with the previous background image that has no foreground objects of interest. The area of the image plane where there is a significant difference within these images indicates the pixel location of the moving objects. These objects, which are represented by groups of pixel, are then separated from the background image by using threshold technique.[3]

In detection of the moving object, the pixels judged as belonging to the moving object maintain the original background gray values, not be updated. For the pixels which are judged to be the background.

III. PROPOSED DIAGRAM

The mode model was chosen to perform the background modeling, which provides better results. If the absolute difference between the current pixel and the mode modeled background pixel is larger than a threshold, then that pixel is considered as foreground object . Black and white values of current frames pixels subtracted with that of background modeling frame. The mean of absolute difference of red value, green value and blue value are found. If the absolute difference greater than threshold, indicates the foreground pixels else background pixels.

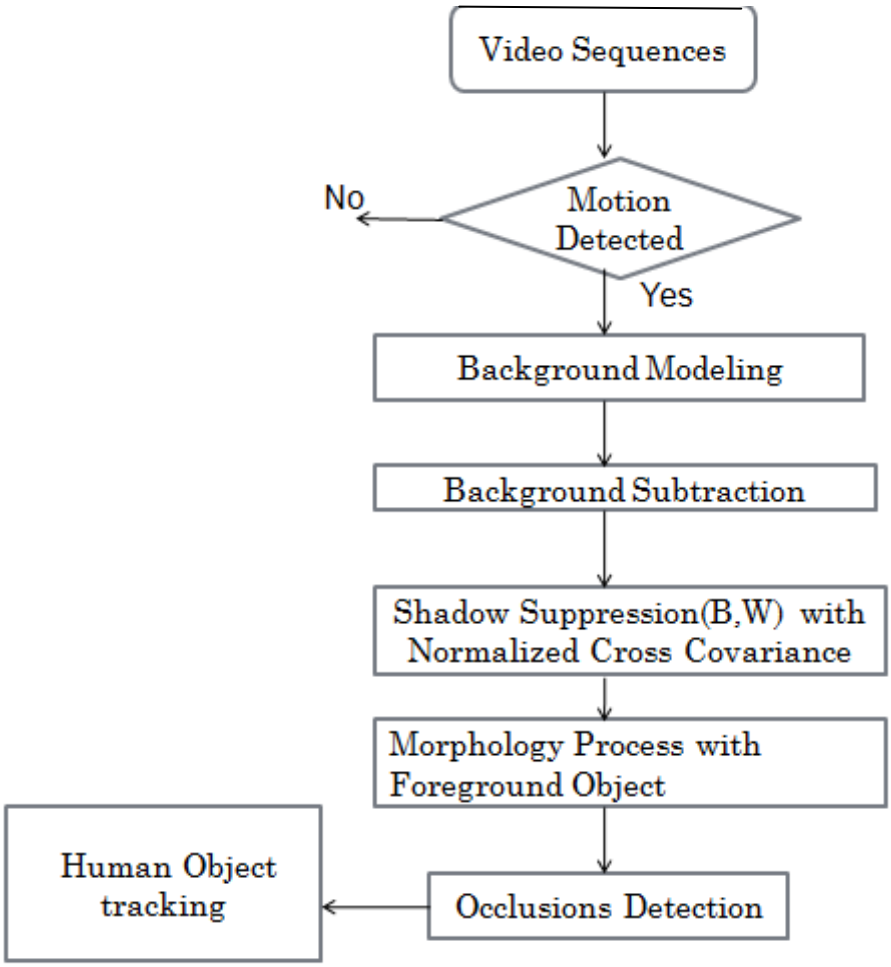

Figure :2.1: Flow Diagram OF Proposed System Shadow Detection and Multi Object tracking

IV. OBJECT TRACKING

Object tracking can be defined as the process of segmenting an object of interest from a video images and keeping track of its motion, orientation, occlusion etc. in order to extract useful information.

Steps in Human object tracking:[6]

1. Segmentation - Segmentation divides an image into constituent regions or objects that have similar features according to a set of predefined criteria. Segmentation process identifies the some specific components of the image.
2. Foreground extraction - Foreground extraction is the process which identifies the location of an object in the image. This is the process of separating the background and foreground of the image.
3. Background extraction - The motion detection system is the part of background subtraction that effectively extracts the shape of moving objects and subtracts average background from image. Once we know the background, extracting the foreground is matter of simple image subtraction.
4. Camera modeling - Camera is used to capture images. Camera modeling is an important aspect of each and every object tracking algorithm. The entire object tracking models which are already exists use a preset camera model. In words camera model is directly derived from the domain knowledge are required to adjust all the inputs. It needs the algorithm to model motion of all the cameras as well as to integrate the result from all the cameras.
5. Feature extraction and tracking - Feature extraction methods of constructing combination of the variable to get data with sufficient accuracy. This extracts meaningful information. This is involves simplifying the amount of resources required to described a large set of data accurately. This is an area of image processing that uses algorithms to detect and isolate various desired portions of a digitized image. A feature is a significant piece of information extracted from an image which provides more detailed understanding of the image.

V. SHADOW DETECTION AND REMOVAL TECHNIQUE

Saneem Ahemad implemented this method, In his Paper, Once the foreground object identified, each foreground pixels are checked whether they are part of a shadow or the object. This process is necessary, since, shadow of the some of the background object may get combined with the foreground object. This causes the object tracking task as a complicated task. [3]

For pixel ,) (xy in a shadowed region, the Normalized Cross Covariance (NCC) in a neighboring region ,) (xyB is found and the shadow can be detected using equation given below,

$$NCC(x, y) >= Lncc$$

Where Lncc is fixed threshold. If Lncc is low, several foreground pixels corresponding to moving objects may be misclassified as shadows. On the other hand, selecting a larger value for Lncc results in less false positives, but pixels related to actual shadows may not be detected.

VI. OCCLUSION DETECTION

While two moving objects coming closer to each other, the background subtracted frame shows it as a single object. This situation is called as occlusion and will create problem while tracking two objects. In this approach, an algorithm is proposed for detecting the occlusion. This approach will inform the frame number where the occlusion has taken place. In the number of object in the frame is increased suddenly shows the entry of new objects into the frame or separation of occluded objects. Consequently if there is a sudden reduction of number of objects present in the frame indicates the process of occlusion of two or more objects or the exit of the objects from the frame to the outside area.[6]

VII. CONCLUSION

In this paper, we surveyed the background subtraction method and shadow removal and occlusion detection for multiple human object tracking. Behavior analysis in video sequences is very difficult in this area. Occlusion of targets because of intersecting target paths and appearance similarity and shadow are quite common in such scenarios.

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