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A Review Analysis on Real Time Moving Object Detection and Object Tracking Using Surveillance Systems

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ABSTRACT

In this survey paper we present an approach to define the existence of moving object in the video frames and to keep the track of an object's motion and positioning. A static camera is used to grab the video. Video is actually sequence of images which are known as frames. We can identify the object using different algorithms and tracking can be defined by using different filters. Object detection and tracking can be classified using different properties of that object like color, size, texture, optical flow, edges position, shape, distance etc. Detected object can be of various categories such as humans, vehicles, birds, moving ball and other moving objects. Object tracking is used in several applications such as video surveillance, person identification, robot vision, behavior analysis, security, traffic monitoring, image retrieval, face detection, animation etc. This survey paper basically defines a brief survey of different object detection and tracking techniques using different algorithms.

INTRODUCTION

Videos are actually sequence of images, each of which Known as a frame, whenever any video is played our eyes are not able to capture the difference between two frames because of very less time interval between them. The content of two frames are closely related to each other so, for the purpose of object detection we need to apply image processing techniques to individual frames.

Process of these frames can be modeled in a hierarchical form using Image processing object detection and tracking methods. First we need to capture a video using a static camera. Extract the frames from that video so that we can apply different processing methods on the individual frames. In the next level, we apply the object detection methods like frame differencing, clustering methods and background subtraction on the raw pixels.

After this, we can classify the object according to its features and attributes such as color, edges, corners, size, position, lines, curves and regions. Object detection in videos is used to define the presence of an object in frame sequences and Object tracking is used to monitor spatial and temporal changes during a video sequence, including its features and attributes etc.

Object detection and tracking can be done by using frame differencing technique on the sequence of images which is taken at closely spaced time intervals. These two processes are closely related to each other

because tracking usually starts with detecting objects, while detection can be done using clustering, background subtraction techniques etc. Here are some steps for object detection and tracking using various methods:

- Video
- Frame Extraction
- Object Detection
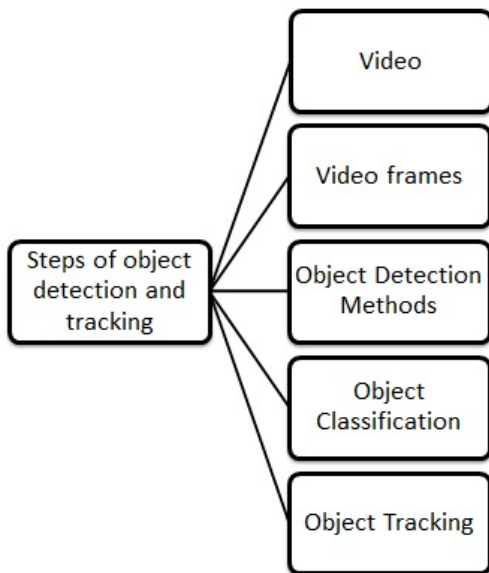- Object Classification
- Object Tracking

Figure 1: Object Detection and Tracking steps

I.VIDEO AND FRAME EXTRACTION

Video is a source that combines a sequence of frames to form a moving picture or we can say video is a recording of moving visual images. There is very less time interval between frames we can use many surveillance system to capture the video such as digital camera, CCTV Camera, other electronic equipment. These all equipment are used for the close observation of object and for security purpose.

Further we extract the frames from the videos for the detailed analysis of the content in the sequence of images. We compare each frame with the successor frame for the detection and tracking of object using different methods and techniques.

II.OBJECT DETECTIONMETHODOLOGY

Object detection process can be done by using various methods these methods are used to identify the object from the sequence of images. Here are some methods

- Frame differencing
- Background subtraction
- Clustering process

A. Frame differencing

The existence of moving objects is determined by the comparison between two consecutive images. Frame differencing technique is very simple and easy to define but it is generally difficult to achieve complete summary of moving object.

B. Background subtraction

Background subtraction is a extensively used tactic for detecting moving objects in videos from static cameras. Background subtraction method is basically used for the foreground detection.Where the foreground is extracted for the further processing such as noise removal, morphology etc.

C. Clustering process

Cluster analysis or clustering is the task of combining a set of object in which objects in the same set are more similar to each other than to those in other set. Using clustering process we can recognize the pattern of particular object that supposed to detect and we can retrieve information about the moving object from frame sequences

III.OBJECT CLASSIFICATION

The extracted moving section can be different objects such as humans, vehicles, birds, ball and other moving objects. Hence we use the shape features and attributes of motion regions. Some approaches to classify the objects are as follows:

- Color
- Shape
- Texture
- Position
- Edges

Some of it as follows:

A. Shape based classification:

Different symbols for shape of motion regions such as representations of points, blob, rectangular patches, box, object skeleton, elliptical patches are important in classification of moving objects. Input features to the frame is mixture of image-based and scene-based object factors such as image point area, apparent aspect ratio of point bounding package and camera zoom. Classification is performed on each point at every frame and results are kept in histogram.

B. Color-based classification

In the frame sequences, color is relatively constant under viewpoint changes and it is easy to develop. Although color is not always applicable as the individual means of detecting and tracking objects, but for the computation color is a desirable feature for achievement when suitable.

To detect and track human or any other object in real-time color histogram based technique is used. Gaussian Mixture Model is created to define the color distribution within the sequence of frames and to segment the frames into background and objects.

C. Texture-based classification

Texture is used for classification as well as tracking purpose. This feature is used to recognize the region or object in which we are interested. It is a measurement

of the intensity difference of a surface which enumerates properties such as symmetry and smoothness.

As compare to other color and texture features are widely used to detect and track the object.

IV. OBJECT TRACKING

Object tracking is an essential concern in object motion analysis. It is a higher level computer visualization problem. Tracking can be done using object detection and object classification methods in consecutive frames using different feature of object like motion, shape, color, texture and methods like frame differencing background subtraction and clustering.

Object tracking is the procedure to track the object by tracing its position in every frame of the video in surveillance system. In tracking approach, the objects are characterized using the attributes or presentation models.

The model designated to represent object shape limits the type of motion. For example , if an object is represented as a point, then only a translational model can be used and ellipse for geometric shape representation for the object. These representations can approximate the motion of inflexible objects in the scene. For a floppy object, silhouette or contour is the most expressive representation. Various object tracking methods are defined as follows.

- Point Tracking
- Kernel Based Tracking
- Silhouette Based Tracking

1. Point Tracking

In this objects detected in successive frames are represented by points, for this it reads the video frames and selects the object region than it detects the interest points in that object region.

The relationship of the points is based on the preceding object region which contains object position and motion. This approach involves an exterior mechanism to detect the objects in every frame.
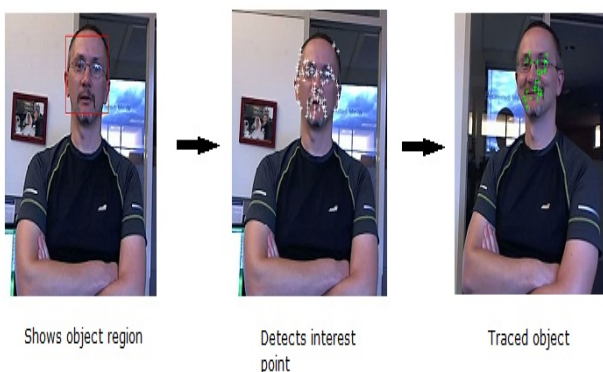

Shows object region   Detects interest point   Traced object

Figure 2: Point Based Tracking

2. Kernel Based Tracking

Kernel refers to the object figure and appearance. For example, the kernel can be a rectangular template or an elliptical form with a related histogram. Objects are tracked by computing the motion of the kernel in successive frames.

This motion is usually in the form of a parametric conversion such as translation, rotation, and affine.

Figure3: Kernel Based Tracking

3. Silhouette Based Tracking

Silhouette Based tracking can done by guessing the object region in each frame. Silhouette tracking methods use the statistics encoded inside the object region. This statistics can be in the form of appearance compactness and contour models which are usually in the form of edge maps.

Given the object models, silhouettes are tracked by either shape matching or evolution.
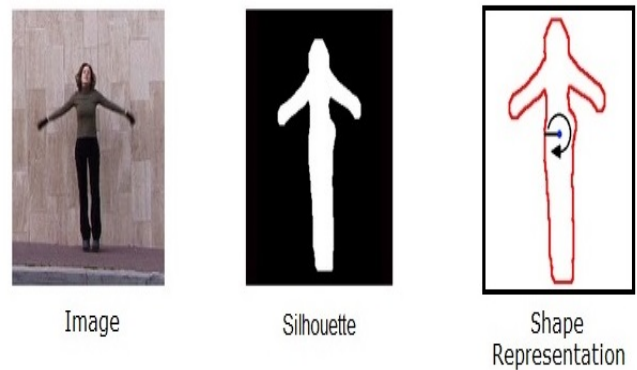

Image   Silhouette   Shape Representation

Figure4: Silhouette Based Tracking

CONCLUSION:

This paper is a detailed survey of the object detection and tracking methods. In this paper various steps are explained which are helpful in detection and tracking of object. We have included discussion on popular methods for the same. A detailed summary of standards for feature selection, object classification, object detection and object tracking methods is presented which can give valuable vision into this important research topic.

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