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A Novel Approach for Object Detection and Tracking from Video Using Support Vector Machine

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ABSTRACT

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. Object tracking in video processing 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. T. Kalman filter cannot separate the moving object in multiple object tracking so we use background separation techniques. Background separation algorithm separate moving object from the background based on white and black pixels. Support Vector Machines classifier is used to recognize the tracked object. SVM classifier are supervised learning that associates with machine learning algorithm that analyse and recognize the data used for classification.

***Keywords*::—** *SVM, image processing, Segmentation, MATLAB, Tracking*

I. INTRODUCTION

Tracking is closely related to constructing correspondences between frames. Traditional tracking approaches focus on finding low-level correspondences based on image evidence. Online models for low-level correspondences are generally employed to adapt to the changing appearances of the target. However, one notable shortcoming of these online models is that they are constructed and updated based on the previous appearance of the target without much semantic understanding. Image processing is any form of signal processing for which the input is an image, such as a photograph or video frame; the output of image processing may be either an image or a set of characteristics or parameters related to the image. Image processing usually refers to digital image processing, but optical and analog image processing also are possible. This article is about general techniques that apply to all of them. The acquisition of images or producing the input image in the first place is referred to as imaging. Image processing refers to processing of a 2D picture by a computer. Difficulties in tracking objects can arise due to abrupt object motion, changing appearance patterns of both the object and the scene, non-rigid object structures, object-to-object and object-to-scene occlusions, and camera motion.

II. STEPS IN OBJECT TRACKING

The process of object tracking is summarized in the block diagram below:

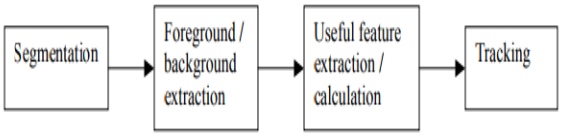

Figure 1. Process of Object Tracking is Summarized

Basic steps in object tracking can be listed as:

1. Segmentation
2. Foreground / background extraction
3. Camera modeling
4. Feature extraction and tracking

Tracking is usually performed in the context of higher-level applications that require the location and/or shape of the object in every frame. There are three in video analysis: Detections of moving objects of interest tracking of such object from frame to frame. Analysis of object tracked to recognize their behavior. The use of object tracking is pertinent in the task of motion-based recognition, automated surveillance, video indexing, human computer interaction etc. First progress presentation on video object tracking with classification and recognition of object. Video object tracking combines two phases of analysis: Recognition and classification of moving objects and tracking of moving objects. Object recognition - in computer vision is the task of finding and identifying objects in an image or video sequence. Humans recognize a multitude of objects in images with little effort, despite the fact that the image of the objects may vary somewhat in different view points, in many different sizes / scale or even when they are translated or rotated. Objects can even be recognized when they are partially obstructed from view. This task is still a challenge for computer vision systems. Object detection in videos involves verifying the presence of an object in image sequences and possibly locating it precisely for recognition. Object tracking is to monitor an object spatial and temporal changes during a video sequence, including its presence, position, size, shape, etc. This is done by solving the temporal correspondence problem, the problem of matching the target region in successive frames of a sequence of images taken at closely-spaced time intervals. These two processes are closely related because tracking usually starts with detecting objects, while detecting an object repeatedly in subsequent image sequence is often necessary to help and verify tracking.

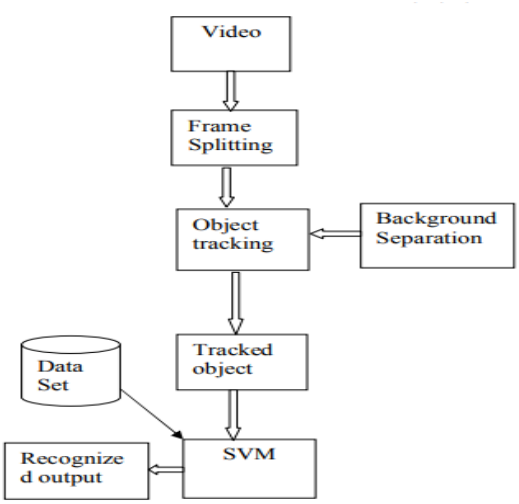

Figure 2 : System Architecture of Video Tracking

Object Tracking Extracting the background image from sequences of frames is a very important task in order to help tracker detect motion. This task is repeated from time to time in order to incorporate any changes in the illumination of the tracking scene. There are several methods used to extract the background image from a sequence of frames but three are the most popular. These are based on statistical characteristics on the pixels of the frames: mean, median and highest appearance frequency methods. In all methods, every pixel of the background image is separately calculated using the mean or the median or the highest appearance frequency value from the series of frames.

III. Background Separation

Background subtraction, also known as Foreground Detection, is a technique in the fields of image processing and computer vision wherein an image's foreground is extracted for further processing (object recognition etc.). Generally an image's regions of interest are objects (humans, cars, text etc.) in its foreground. After the stage of image preprocessing (which may include image denoising etc.) object localisation is required subtraction is mostly done if the image in question is a part of a video stream. which may make use of this technique. Background subtraction is a widely used approach for detecting moving objects in videos from static cameras. The rationale in the approach is that of detecting the moving objects from the difference between the current frame and a reference frame, often called "background image", or "background model"

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IV. Literature Review

Xu and Ahuja [2] proposed a contour based object tracking algorithm to track object contours in video sequences. In their algorithm, they segmented the active contour using the graph-cut image segmentation method. The resulting contour of the previous frame is taken as initialization in each frame. New object contour is found out with the help of intensity information of current frame and difference of current frame and the previous frame.

Dokladal et al.[3] the proposed approach is active contour based object tracking. For the driver‟s-face tracking problem they used the combination of feature-weighted gradient and contours of the object. In the segmentation step they computed the gradient of an image. They proposed a gradient-based attraction field for object tracking.

Li et al. [4] proposed a corner feature based object tracking method using Adaptive Kalman Filter. To represent moving object corner feature are firstly used. Then, the number of corner point variation across consecutive frames to is used to automatically adjust the estimateparameters of Kalman Filter.

Xue et al. [5] uses the discriminative features which are chosen by object/background separation, using a voting strategy. With the help of discriminative features they presented an improved mean-shift algorithm for object tracking.

Xu et al.[6] presented a new method for supervised object segmentation in video sequence. In the proposed method the user input object outline is considered as video object. In moving object tracking, the model incorporated the object's region segmentation and the motion estimation. Active contour model is also employed for contour fine-tuning.

V. PROPOSED IMPLEMENTATION

The Algorithm for Object Detection

1. Initially the first frame is considered as thbackground (bg).
2. For each pixel of the next input frame (fr) Subtractthe pixel intensity value from the background image.

   Difference = fr-bg

   IF(Difference> Threshold)

   fg = bg

   ELSE

   fg = 0

   3 .

   For each pixel of the background

   IF (fg> bg)

   bg=bg+1

   ELSE

   bg=bg-1

4. Perform certain Morphological operations on the extracted image „fg" to improve the image quality.
5. Calculate the Centroid (c1,c2) of the binary imagefg. The result of this operation is a set of two integers which determine the position of the moving object in the given frame.
6. Use Median Filter to improve the accuracy of the obtained centroid values.
7. Get the next input frame and Goto (Step 2).
8. Assume each pixel moves but does not change intensity.
9. Pixel at location (x, y) in frame1 is pixel at (x+Δx, y+Δy) in frame2
10. Pixel at location (x, y) in frame1 is pixel at (x+Δx, y+Δy) in frame2
11. Support Vector Machines classifier is used to recognize the tracked object. SVM classifier are supervised learning that associates with machine learning algorithm that analyse and recognize the data used for classification. SVM uses Median filter which makes the system more robust by tracking and reduce the noise introduced by inaccurate detections.
12. Then Compute the Euclidean distance for one dimension. The distance between two points in one dimension is simply the absolute value of the difference between their coordinates.
13. Then initialize Tracks function creates an array of tracks, where each track is a structure representing moving object in the video. The purpose of the structure is to maintain the state of a tracked object. The state consists of information used for detection to track assignment, track termination, and display using bounding box.
14. Then Median filter is applied for image process, we need to reduce noise before image processing, median filter algorithms determine the principles of an odd pixel window W, window size of each pixel arranged according to Gray, middle gray value instead of the original F(i,j) the gray value, gray value as the center of the window g(i,j). G(i,j)=median{F(i-k,j-l),(k,l € w)}

V. RESULT

Object detection is a process of confirming a change in position of an object relative to its surroundings or the change in the surroundings relative to an object. Results of moving object detection in the continuous graph are shown in below figure.

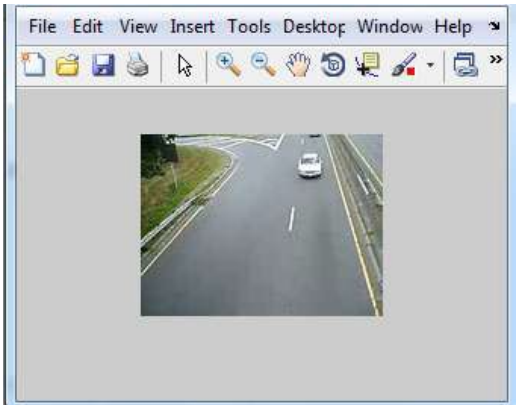

Figure 2 : Input video frame moving object

Figure 2 shows the sample video frames taken for testing the algorithm, First we take the input video for track the object then it converts video in frame using Morphological operator.

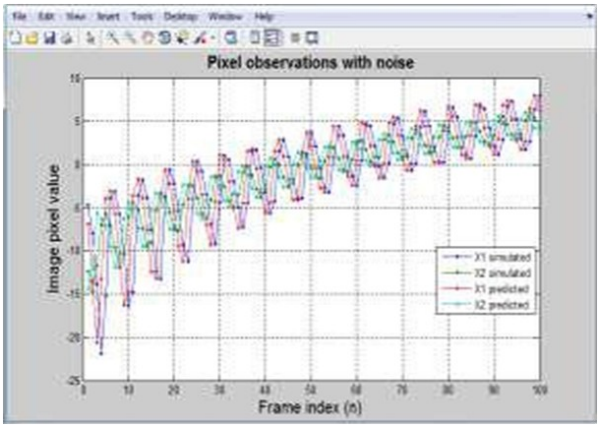

Figure 3 : Pixel Observation with Noise of Moving Object

Figure 3 shows the noise of moving object, we can see that in above figure x1(in blue line), x2 (in green line) are simulated and x1 (in red line), x2 (in cyan line) are predicted. The predicted value is always better than simulated value in pixel observation of noise.

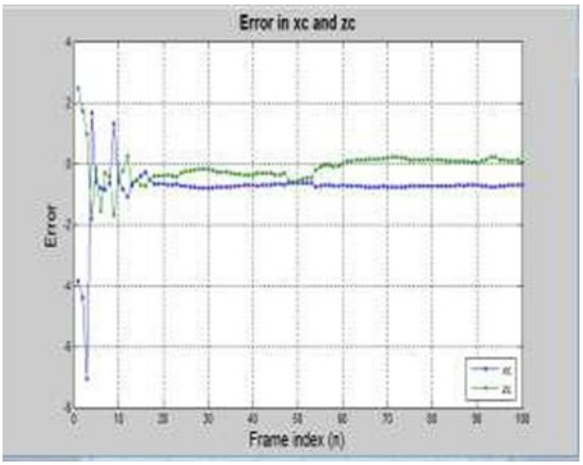

Figure 4 : Error in XC & ZC of moving object

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