MOVING OBJECT DETECTION BY USING OPTICAL FLOW

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ABSTRACT

Applications like surveillance, robotics etc the computer and machine vision are the important and useful area of research. As one of the vital part of computer vision, object tracking plays a critical role in numerous lines of research such as human and non-human activity recognition, 3D representation and 3D reconstruction, augmented reality, video surveillance, and robotics etc.
In the past decades for the object detection and tracking many researchers have developed their own algorithms, but developing a robust tracker is still a challenging task due to many intrinsic and extrinsic limitations like appearance change of a target object (anthropometric variations), change in view point, cluttered background, varying illumination, camera motion, and occlusions etc.
This proposed algorithm detects and tracks the objects present the video. As video is nothing but the sequence of images or frames, the tracker should track the object from these consecutive frames successfully. Optical flow algorithm is used for object tracking.

INTRODUCTION

Real-time moving object detection, classification and tracking capabilities we present an object detecting and tracking system. The system is accomplished of operating on both colour and grey scale input videos captured by stationary and moving cameras. In the proposed system moving object detection and tracking is handled by the famous computer vision techniques called an optical flow. The tracking system works in indoor and outdoor environments with better accuracy by using this technique. The optical flow calculates the motion between two image frames which are taken at different time intervals in the video. The optical flow describes the direction and time pixels in consequent frames. The motion vector provides accurate motion estimation of an object in the successive frames of the videos. The captured video frames are filtered by using median filter. The median filter removes the noise component added during capturing and processing. This makes the proposed system robust in the presence of noise. It also raises the overall efficiency of tracker.
Multiple moving objects detection and tracking system is performed by using these techniques in the captured video. In many promising applications the real time moving object detection and tracking is a very profitable domain. Recognizing the movement of an object in a video is a challenging task due to many parameters like movement of an object, change in the shape of an object, camera motion, noise etc. Due to this, it draws attentions of several researchers, institutions and commercial organizations. To develop a robust system with real-time moving object detection, classification and tracking capabilities is our main inspiration in studying this problem.

LITERATURE SURVEY

The concept object detection and tracking is first implemented by the department of defence in U.S. in 1885. Since then huge research has done and still going on about tracking of objects in input videos. The object tracking system using Kalman filter and Optical flow is proposed in [1].The tracking algorithm is designed to track multiple moving objects in the input video. The optical flow is used as object detection mechanism. The function of Kalman filter is to estimate the object position in the successive frames of the video. The optical flow describes the direction and time pixels in a time sequence of two consequent dimensional velocity vectors, carrying direction and the velocity of motion is assigned to each pixel in a given place of the picture. For making computation simpler and quicker the real world three dimensional (3-D+time) objects to a (2- D+ time) case. Then the image is described by 2-D dynamic brightness function of I(x, y, t). Optical flow estimation is used in computer vision to characterize and quantify the motion of objects in a video stream, often for motion-based object detection and tracking systems. The experimental brightness of any object point is constant over time. Close to points in the image plane move in a similar manner (the velocity smoothness constraint). Suppose we have a continuous image; fx, y, t) refers to the gray-level of (x, y) at time t. Representing a dynamic image as a function of position and time permits it to be expressed.
Kalman filter is region based method for finding the regions of object in the next frame. The centre of object is finding first, and then uses Kalman filter for predict the position of it in the next frame. A Kalman filter is used to estimate the state of linear system where the state is assumed to be distributed by a Gaussian. Kalman filtering is composed of two steps, prediction and correction .For the motion model of a moving object (which contains some kind of dynamic noise), and some noisy observations about its position, the Kalman filter provides an optimal estimate of its position at each time step. The optimality is guaranteed if all noise is Gaussian. Then the filter minimizes the mean square error of the estimated parameters (e.g. position, velocity). The Kalman filter is an online process, meaning

that new observations are processed as they arrive. To formulate a Kalman filter problem, It requires a discrete time linear dynamic system with additive white noise that models unpredictable disturbances. While optical flow algorithm tracks multiple objects but it is failed to track if there is change in intensity of moving objects. It was not able to track occluded objects also.

Y.-N. Li et al. have proposed a fast shot detection framework employing pre-processing techniques including thresholding and bisection-based comparisons to eliminate non-boundary regions [2]. The factors that lead to high detection speed in the proposed framework are three folds. On Simulations and comparisons, significant speed up is achieved in the proposed framework, while the precision and recall rates can get in a satisfactory level. Taeho Kim and Kang-Hyun Jo proposed how to generate background model and detect moving objects based on multiple background model [3]. The multiple background models is effectively estimate background scene for each frame, it has weakness when a background is temporally changed. This method is good to detect moving object even though camera will move. However, this approach has disadvantages of camera shaking and moving objects. In spite of this limitation, proposed algorithm successfully generates multiple background models and detect moving object with low cost.

A fast coarse-to-fine video shot segmentation algorithm has been proposed by Liu and Jian-Xun Li [4]. The camera motion, object motion and gradual shot transition can be differentiated through this method. The proposed algorithm is based on the statistical properties of the characteristics, hence compared to the single characteristic detection algorithm; the computational complexity is reduced effectively. This algorithm is reduces both the computational complexity and error detections caused by the camera/object motion effectively.

S. Araki, T. Matsuoka, N. Yokoy a, and H. Takemura proposed the algorithm for Real-time tracking of multiple moving object contours in moving camera image sequences [5]. In this the new method is used for detection and tracking of moving objects from a moving camera image sequence using robust statistics and to find out active contour models for showing the moving object by contours. For tracking moving objects active contour models are also promising.

METHODOLOGY

A] OBJECT TRACKING- A process of locating one or more moving objects over time is called as object detection and tracking. It plays vital role in applications like surveillance, vehicle navigation and autonomous robot navigation, 3D representation and reconstruction etc. Object detection involves locating objects in the frame of a video sequence. Every tracking method requires an object detection mechanism either in every frame or when the object first appears in the video. There are three key steps in object tracking:- [6][7]

B] OBJECT DETECTION- First step for analysis of video is object detection. For object detection there are various techniques used they are as follows.

1] Frame differencing
2] Points
3] Background Subtraction

C] OBJECT CLASSIFICATION- Object classification step classifies the detected objects into predefined classes such as human, vehicle, animal, clutter, floating clouds, swaying tree and other moving objects etc. following are the 4 types for object classification.

1] Shape based classification
2] Motion based classification
3] Colour based classification
4] Texture based classification

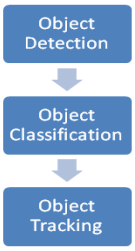

Figure 3.1: Key Steps in object tracking

RESULT & DISCUSSION

With different types of input videos the performance of object detection and tracking system is tested. The input videos with different categories are applied to the proposed tracker. The qualitative analysis and quantitative analysis this is two types of performance analysis.

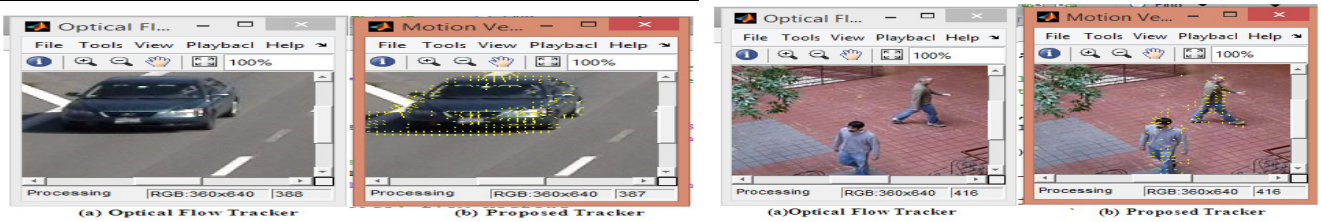

Fig.4.1 Comparison with single object moving with high objects Fig.4.2 Comparison for multiple moving speed

CONCLUSION

Object detection, object segmentation and finally object tracking this are different steps in object detection and tracking. The detection is done by using optical flow in our project. The proposed system has outperformed in the environments like tracking of single and multiple objects, for view point variations. Similarly it is capable of detecting human and non-human (car, train etc.).

FUTURE SCOPE

The proposed system can be modified further to detect and track the objects with very high speed.

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