

A Survey on Real Time Object Tracking

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ABSTRACT

This paper discusses a survey of various techniques in the field of object tracking and tracking in video for improving the security. Our goal is to review various techniques of detection of the moving object and after detection, tracking of moving object. Detection of the moving object is difficult task and most difficult task is to track the detected object. Detect the moving object is important task track that moving object is the most challenging part because require detail information of object like shape of object, location of object. In this survey I review various techniques like temporal frame differencing, background subtraction. Object tracking algorithm for moving object is a quite difficult. For tracking first detection is important low level task. In future aim to enhance the exiting method to improve the performance.

Keywords

Object detection, Background subtraction, Frame differencing, Object tracking, Video Surveillance.

1. INTRODUCTION

Computer Vision is a big concept and in that computer vision object tracking is one of the important concept. Object tracking starts from object which is an entity. There are certain steps for object tracking. Two most important terms in object tracking are object detection and object tracking; which are related to each other. Object tracking can be performed in following ways.

Point

Some objects are very small, so this point representation is useful to tracking the objects which are located in in very small region.

Geometric shapes

Another type of representation is shape, in this type of representation object is represent by rectangle or ellipse. If we want to represent a person standing on road, for represent this we draw one rectangle or ellipse around the person.

Object silhouette and contour

In this type of Representation we draw a boundary around the object. This boundary representation called contour and area or

Part inside contour called silhouette. And this Representation is mostly use for tracking large and complex object.

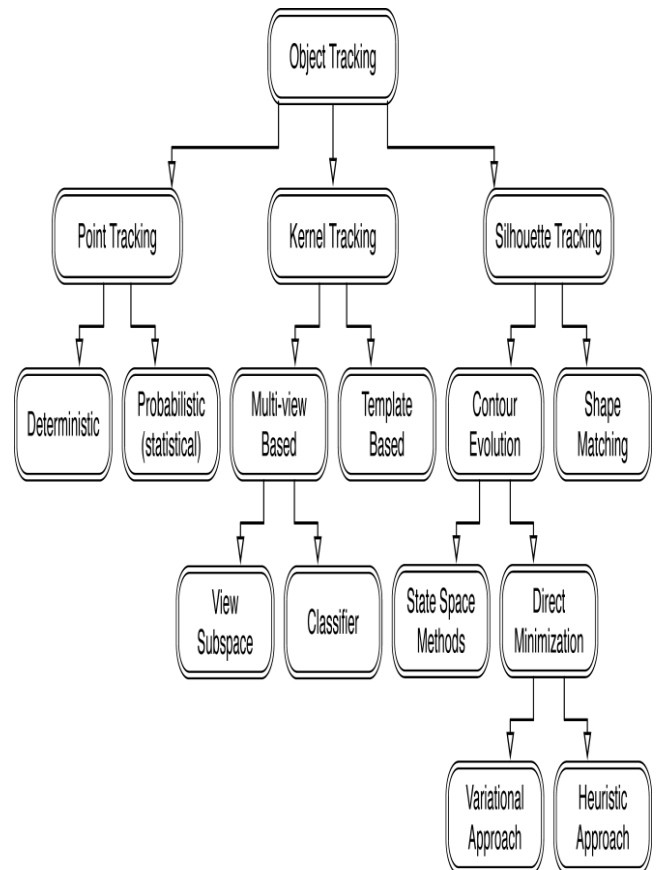


Figure 1.1 Object Representation types

2. RELATED WORK

Alper Yilmaz et al. classify tracking methods into different categories. They present an extensive survey of object tracking methods and also give a brief review of related topics. And divide the tracking methods into three categories based on the use of object representations, namely, methods establishing point correspondence, methods using primitive geometric models, and methods using contour evolution. All these classes require object detection at some point. For instance, the point trackers require detection in every frame, whereas geometric region or contours-based trackers require detection only when the object first appears in the scene. Recognizing the importance of object detection for tracking systems, also include a short discussion on popular object detection methods. Provide detailed summaries of object trackers, including discussion on the object representations,

motion models, and the parameter estimation schemes employed by the tracking algorithms. Moreover, we describe the context of use, degree of applicability, evaluation criteria, and qualitative comparisons of the tracking algorithms [1].

Darshak G. et al. presented a survey on various technique of video surveillance technique. and give review on various moving object detection and tracking system. for tracking of moving object first detection is an important task. They focus on detection of moving object. Because detection is the challenging task. As compare to tracking detection is an low level task. And tracking is the higher level task. They also presented a various technique of object tracking like Background subtraction with alpha, statistical method, Eigen background Subtraction and Temporal frame differencing to detect moving object. I also described tracking method based on point tracking, kernel tracking and silhouette tracking Also detail described background subtraction with alpha, temporal differencing, statistical methods. Detection techniques into various categories, here, they discuss the related issues, to the moving object detection technique. The drawback of temporal differencing is that it fails to extract all relevant pixels of a foreground object especially when the object has uniform texture or moves slowly. When a foreground object stops moving, temporal differencing method fails in detecting a change between consecutive frames and loses the track of the object. they presented detail of background subtraction method in deep because of its computational effectiveness and accuracy [2].

This article gives valuable information into this important research topic and encourages the new research in the area of moving object detection as well as in the field of computer vision. Here research on object tracking can be classified as point tracking, kernel tracking and contour tracking according to the representation method of a target object. Three methods in object representation play an important role. In point tracking approach, statistical filtering method has been used to estimating the state of target object. Kalman filter and particle filter are the most popular filtering method. In kernel tracking approach, various estimating methods are used to find corresponding region to target object [3].

Wei Zhong et al. presented a collaborative model of SDC and SGM method. They presented a better tracking methods depends on the generative and discriminative modules. Holistic and local representations are considered to deal with background and local patches. Generally with the help of holistic representation are used to generate discriminative classifier that will effectively deal with complex background. On the other hand for histogram generation local representation is useful. Histogram generation consider the spatial information among local patches. These SDC and SGM are collaboratively use for object detection. Sparsity-based discriminative classifier (SDC) is for foreground and background detection, and sparsity-based generative model (SGM) for object tracking. For SGM histogram based method is use. In this tracking system collaboration of SDC and SGM module make effective process for object racking [4].

3. METHODOLOGY

Now, we discuss about Moving object detection techniques and concept which are important in object detection and tracking. Concepts are like foreground and background pixel processing. How pixels are process for object tracking. How foreground and background are separated, which methods we can use for separating the foreground from background object.

With this concepts some important methods are there in object tracking like background subtraction, temporal differencing. These methods are having some advantages and disadvantages. All these things are explain in this section.

3.1 Moving Object

In real time object tracking system basic step is object detection. Object tracking system requires detect object in each and every frame or when object appears first time in video. This two type of mechanism is generally use by every tracking method. Most common method of object detection is use the information in single frame. But some of method use temporal information computed from frame sequence. It is like differences in frame, which highlight part of frame that change in consecutive frame. Then trackers work begins. After that tracker track that region from one frame to another frame. In real time detection mechanism some changes make system advance. In moving object detection important thing is detect human being so track the human by its body structure or face.

First and most important part is distinguishing moving object from stationary object. Moving object is called foreground object. Stationary object are like table, chair. But fan is also moving object it is continuously moving in circular fashion. That is why aim is to detect the human being with its body structure [6].

3.2 Foreground and Background

In real time object detection or in any type of object detection two important words are there mainly foreground and second one is background. In any image or video object which is track is the foreground object and rest of things are background. Foreground detection is important step because it distinguish moving object from the stationary background. With the help of foreground detection step system focus on important object and it help for some higher level processing like tracking. Automatically reduce computational time because then system only deals with those pixels which are belong to foreground. Some time in color image color of object is same as background part. Then it is difficult for some object detection system. This is also one kind of noise [7].

3.3 Pixel processing

After detecting foreground and separating it from background next work is to remove noise. Because it contain noise. To overcome this noise factor it requires some pixel-level processing. There are so many reasons for that noise like:

Background Color: color of foreground object is same background then it is difficult to track object. Sometime it causes failure of system. In terms of pixels, foreground pixels are of same color of background color pixels.

Light Factor: it is the noise cause by movement of light source. Due to movement of light source position of light source changes from one place to another place it really affect quality of image or video. If quality of image or video is good then tracking system work smoothly [9].

Like that there are so many reasons for noise. Low pass filter is a type of filter that is use for removing noise. In tracking system foreground pixels created. In that foreground pixels some pixels are noisy pixels that time filter play a role for removing that noisy pixels. For better tracking system or for better result in object tracking this noise removal process play an important role

4. METHODS FOR OBJECT TRACKING

4.1 Temporal differencing

Pixel-by-pixel difference in consecutive frame or in sequence of images is detected in temporal differencing. It gives better result for only dynamic scene changes in other word this method fail to detect non moving object in the scene, because in sequence of frame for non moving object there is no difference in pixel map. This is the biggest problem with temporal differencing method. This problem is Not only with non moving object but also with object which are move slowly. Because when object moves slowly then there is not much difference in pixel map. Temporal differencing is less complex method than other methods and produce better result only for dynamic scenes [3].

4.2 Background subtractions

Temporal differencing is the best method for tracking moving object in dynamic scene change only. But we know this method is completely failed to detect object which are move slowly. For that background subtraction is best method and better than temporal differencing. First step in background subtraction is detection of moving object. After detecting moving object next work is tracking that moving object. For detecting and tracking many more algorithms and processing required. Some pixel level processing is required. In first step foreground object is detected. Foreground object is the moving object. Then pixel map of foreground object is created. This creation of pixel map of foreground object is called pixel level processing [6].

Figure gives detail about how moving object detection is performed, starting from video frame to moving object. In video or image if there is a person just standing not moving anywhere then that time if we use the temporal differencing then it will not work. For this kind of situation background subtraction is better method.

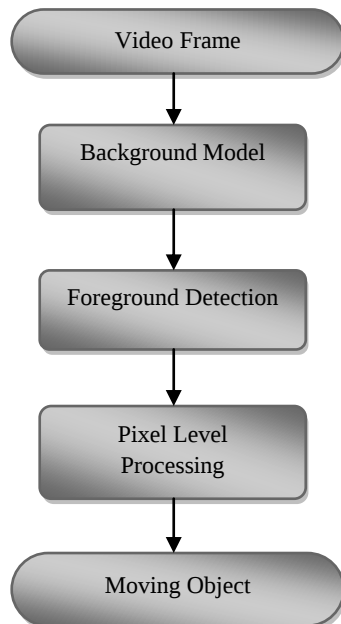


Figure 2. Object detection steps

There are so many methods are there for object tracking each and every method has its own characteristics and it work according to it. We have so many options but background subtraction work very well. It works on pixels. Method which

is used by background subtraction is shows in fig 2. Another method which is related to background subtraction and this method is also work on every pixel. This is a statistical method [7].

4.3 Statistical Methods

Statistical method is motivated by background subtraction method. This method is used to take out change region from background. Like background subtraction method this method is also work on pixels of an image. It works on every pixel one by one to construct the background model which is advanced. Background is updated dynamically with the help of that statistic. For each and every frame this method dynamically updates statistics of pixels that are related to the background image process [10].

5. CONCLUSION AND FUTURE WORK

In this paper, different object tracking techniques for moving object have been reviewed. By this study one can track the moving object in video. We also reviewed various techniques of object representation like point representation, geometric shape representation. Every representation method require different tracking method like point representation require detection in every frame and geometric representation require detection only when object first appears in the scene. Our study also discuss about comparison of different tracking methods. And drawback of some methods like temporal differencing, this method is not efficient for tracking those objects which are non-moving. Our study also discuss about various concepts which are important in object tracking, concepts like foreground object, background object etc. discuss about noise concept, and how noise is generated in object tracking. In future the performance of object tracking in video surveillance can be improved by adding some feature in tracking system. There should be automatic start and stop of tracking system. By this we can enhance the existing system.

6. REFERENCES

- [1] W. Zhong, H. Lu, and M.-H. Yang, "Robust object tracking via sparsitybased collaborative model," in *Proc. IEEE Conf. Comput. Vis. Pattern Recognit.*, Jun. 2012, pp. 1838–1845.
- [2] X. Jia, H. Lu, and M.-H. Yang, "Visual tracking via adaptive structural local sparse appearance model," in *Proc. IEEE Conf. Comput. Vis. Pattern Recognit.*, Jun. 2012, pp. 1822–1829.
- [3] Kinjal A Joshi, Darshak G. Thakore, "A Survey on Moving Object Detection and Tracking in Video Surveillance System," in *International Journal of Soft Computing and Engineering (IJSCE)*, ISSN: 2231-2307, Volume-2, Issue-3, July 2012.
- [4] A. Yilmaz, O. Javed, and M. Shah, "Object tracking: A survey," *ACM Comput. Surveys*, vol. 38, no. 4, pp. 1–45, 2006.
- [5] T. Zhang, B. Ghanem, S. Liu, and N. Ahuja, "Robust visual tracking via multi-task sparse learning," in *Proc. IEEE Conf. Comput. Vis. Pattern Recognit.*, Jun. 2012, pp. 2042–2049.
- [6] J. Santner, C. Leistner, A. Saffari, T. Pock, and H. Bischof, "PROST: Parallel robust online simple tracking," in *Proc. IEEE Conf. Comput. Vis. Pattern Recognit.*, Jun. 2010, pp. 723–730.

- [7] X. Mei and H. Ling, "Robust visual tracking using L1 minimization," in *Proc. IEEE 12th Int. Conf. Comput. Vis.*, Oct. 2009, pp. 1436–1443.
- [8] B. Liu, J. Huang, L. Yang, and C. Kulikowsk, "Robust tracking using local sparse appearance model and k-selection," in *Proc. IEEE Conf. Comput. Vis. Pattern Recognit.*, Jun. 2011, pp. 1313–1320.
- [9] R. Liu, J. Cheng, and H. Lu, "A robust boosting tracker with minimum error bound in a co-training framework. In ICCV, 2009."
- [10] F. Tang, S. Brennan, Q. Zhao, and H. Tao, co tracking using semi supervised support vector machine. In ICCV, 2007.