International Journal of Current Trends in Engineering & Technology
ISSN: 2395-3152
Volume: 02, Issue: 04 (MAY-JUN, 2016)

Review on Vehicle Video Detection and Tracking

Astha Dixit[1], Manoj Verma[2], Kailash Patidar[3]
Computer Science & engineering Department
SSSIST, Sehore, India
[1]dastha67@gmail.com, [2]manoj.verma1511@gmail.com, [3]kailashPatidar123@gmail.com

Abstract — in the present work we have discussed about the practically important problem of vehicle video based detection and tracking. We have done the review on the problem of vehicle video detection and tracking. The method of video detection deals with a sequence of video frames. A solution based on the partitioning a video into blocks of equal length and detecting objects in the first and last frames of the block is proposed.

Keyword — Object detection, Tracking, contour.

I. INTRODUCTION

Now a day's Object detection and tracking has becomes very much essential. Object detection and tracking is used in various surveillance system applications such as Traffic Monitoring, understanding of human activity, observation of people and vehicles within a busy environment, Security in Shopping Malls or Offices etc. Various techniques and algorithm has been developed to detect and track the motion of the video objects but those has some advantages and disadvantages [1]. Image processing is a term which indicates the processing on image or video frame which is taken as an input and the result set of processing is may be a set of related parameters of an image. The purpose of image processing is visualization which is to observe the objects that are not visible. Analysis of human motion is one of the most recent and popular research topics in digital image processing. In which the movement of human is the important part of human detection and motion analysis, the aim is to detect the motions of human from the background image in a video sequences. Object Tracking is a process of locating the object to associate the target in successive video frame over time and it finds wide scale applications in the field of security and surveillance, video communication, augmented reality, traffic control, medical imaging etc. Object Tracking is a complex process to be implemented in hardware mainly because of the amount of data associated with the video. Videos are actually sequences of images, each of which called a frame, displayed in fast enough frequency so that human eyes can percept the continuity of its content. It is obvious that all image processing techniques can be applied to individual frames. Besides, the contents of two consecutive frames are usually closely related [2]. The identification of regions of interest is typically the first step in many computer vision applications including event detection, video surveillance, and robotics. A general object detection algorithm may be desirable, but it is extremely difficult to properly handle unknown objects or objects with significant variations in color, shape and texture [3]. Therefore, many practical computer vision systems assume a fixed camera environment, which makes the object detection process much more straight forward.

Xu et al. [4] had 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. [5] had 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.

Chen et al. [6] had modeled an active contour based object tracking by Neural Fuzzy network. Contour based model is used to extract object's feature vector. For training and recognizing moving objects their approach uses the self-constructing neural fuzzy inference network. In this paper, they have taken the histograms of the silhouette of human body in horizontal and vertical projection and then transform it by Discrete Fourier Transform (DFT).

Ling et al. [7] had given an object tracking approach based on contours. The object rough location is found though multi-feature fusion strategy. For accurate and robust object contour tracking, they have extracted the contours with the help of region-based object contour extraction. In their model the object rough location is obtained by color histogram and Harris corner features fusion method. In the particle filer method they have used the Harris corner feature fusion method. Their model of region-based temporal differencing is applied in object contour detection step, and the resultant is the rough location tracking result.

Zhao et al. [8] had presented an algorithm in which they first calculate the average of the values of the gray of the continuous multi-frame image in the dynamic image, and then get background image obtained by the statistical average of the continuous image sequence, that is, the continuous interception of the N-frame images are summed, and find the average. In this case, weight of object information has been increasing, and also restrains the static back-ground. Eventually the motion detection image contains both the target contour and more target information of the tar-get contour point from the background image, so as to achieve separating the moving target from the image. The simulation results show the effectiveness of the proposed algorithm.

Arunachalam et al. [9] had presented the advance techniques for object detection and tracking in video. Most visual surveillance systems start with motion detection. Motion detection methods attempt to locate connected regions of pixels that represent the moving objects within the scene; different approaches include frame-to-frame difference, background subtraction and motion analysis. The motion detection can be achieved by Principle Component Analysis (PCA) and then separate an objects from background using background subtraction. The detected object can be segmented. Segmentation consists of two schemes: one for spatial segmentation and the other for temporal segmentation. Tracking approach can be done in each frame of detected Object. Pixel label problem can be alleviated by the MAP (Maximum a Posteriori) technique.

Cucchiara et al. [10] had proposed an approach for detecting Vehicles in urban traffic scenes by means of rule-based reasoning on visual data. The strength of the approach is its formal separation between the low- level image processing modules (used for extracting visual data under various illumination conditions) and the high- level module, which provides a general purpose knowledge-based framework for tracking vehicles in the scene. The image-processing modules extract visual data from the scene by spatio-temporal analysis during daytime and by morphological analysis of headlights at night. The high- level module is designed as a forward chaining production rule system, working on symbolic data, i.e., vehicles and their attributes (area, pattern, direction, and others) and exploiting a set of heuristic rules tuned to urban traffic conditions. The synergy between the artificial intelligence techniques of the high- level and the low- level image analysis techniques provides the system with flexibility and robustness.

Nanda et al. [11] had presented a novel algorithm for moving object detection and tracking. The proposed algorithm includes two schemes: one for spatio-temporal spatial segmentation and the other for temporal segmentation. A combination of these schemes is used to identify moving objects and to track them. A compound Markov random field (MRF) model is used as the prior image attribute model, which takes care of the spatial distribution of color, temporal color coherence and edge map in the temporal frames to obtain a spatio-temporal spatial segmentation. In this scheme, segmentation is considered as a pixel labeling problem and is solved using the maximum a posteriori probability (MAP) estimation technique. The MRFMAP framework is computation intensive due to random initialization.

In our recent work, Dixit et al. [1], we have discussed the various approaches with their merits and demerits for video object detection and tracking. In the present work, we discussed about the practically important problem of vehicle video based detection and tracking.

II. RELATED WORK

A review and classification of the existing methods of video based object detection problem are provided in [12]. The problem includes object detection in frames and their subsequent tracking. The object tracking methods fall into several categories [13]:

Feature points tracking objects are represented in consecutive frames by sets of corresponding feature points. Deterministic methods reduce the problem to the minimization of point descriptor compliance function, probabilistic use an approach based on the concept of state space. Typical examples are methods based on the Kalman and particle filters [14–20].

Kernel tracking is the shape of an object or its appearance described by a geometrical primitive (a template of a rectangular or oval shape, a projection of a three-dimensional model). As a rule, methods of this group are applied, if motion is determined by an ordinary shift, turn or affine transformation. In practice, tracking of components is performed using mean shift and its continuous modification (CAM Shift) [21].

Silhouette tracking is a contour or a set of interconnected simple geometrical primitives limiting tracked regions. There are separate methods for matching and tracking segments containing an object [22], and methods of tracking of a contour. Tracking of fragments is carried out by calculation of an optical flow for inner points of a region [23-24].

III. PROBLEM IN VBVD

Video Based Vehicle Detection **is** method of video detection deals with a sequence of video frames. Let us assume that the object location is defined by the bounding box placement [12]. Then the problem consists in mapping each frame into a set of objects locations and finding relevant vehicle location in pairs of consecutive frames to reconstruct tracks of vehicles. Thus, a *track* is an ordered sequence of locations of the same object in a corresponding set of video frames. As a vehicle can be overlapped completely by other traffic participants, vehicle location is not necessarily seen in consecutive frames [12]. A formal description of the mathematical problem definition is provided in.

IV. METHOD FOR VBVD

As discussed by Kustikova and Gergel, in [24], the idea of the proposed method is to divide a video into blocks of images of equal length and then to execute processing of each block. Let us assume that the set of all vehicle locations in the first frame of a block is constructed during the previous iteration. It includes a subset of locations seen in the previous frames, and a subset of objects locations found by the detection algorithm for the first time (could contain false positives). Then it is necessary to detect vehicles in the last frame of the block, match the sets of locations in the first and last frames of the block and reconstruct the vehicle locations in intermediate frames. As a result of reconstruction existing tracks are continued or new ones are created. A more detailed description of the method is provided in [12].

V. CONCLUSION

In this work we have done the review on the problem of vehicle video detection and tracking based on the already published work [25]. A solution based on the partitioning a video into blocks of equal length and detecting objects in the first and last frames of the block is proposed. Matching of vehicle locations in the first and last frames helps detect pairs of locations of the same object. Reconstruction of vehicle locations in the intermediate frames allows restoring separate parts of motion tracks. Combination of consecutive segments by matching makes it possible to reconstruct a complete track.

REFERENCES

[1]. Astha Dixit, Manoj Verma, Kailash Patidar, Survey on Video Object Detection & Tracking, International Journal of Current Trends in Engineering & Technology, Vol. 02, Issue: 02, April 2016.

[2]. Abhishek Kumar Chauhan, Prashant Krishan, Moving Object Tracking Using Gaussian Mixture Model and Optical Flow, International Journal of Advanced Research in Computer Science and Software Engineering, April 2013.

[3]. Cheng-Laing Lai; Kai-Wei Lin, Automatic path modeling by image processing techniques,

Machine Learning and Cybernetics (ICMLC), Vol.5, pp.2589-2594, 11-14 July 2010.

[4]. N Xu, N Ahuja, Object contour tracking using graph cuts based active contours, International Conference on Image Processing, Vol. 3, pp. 277-280, 2002.

[5]. P Dokladal, R Enficiaud, E. Dejnozkova, "Contour-based object tracking with gradient-based contour attraction field", EEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP 04) , pp. 17-20, 2004.

[6]. T. Chen, Object Tracking Based on Active Contour Model by Neural Fuzzy Network, IITA International Conference on Control Automation and Systems Engineering, pp. 570-574, 2009.

[7]. X. Lu, Li Song, Songyu Yu, Nam Ling, Object Contour Tracking Using Multi-feature Fusion based Particle Filter, IEEE Conference on Industrial Electronics and Applications (ICIEA), pp. 237 –242, 2012.

[8]. Kuihe Yang, Zhiming Cai, Lingling Zhao, Algorithm Research on Moving Object Detection of Surveillance Video Sequence, Optics and Photonics Journal, 3, 308-312, 2013.

[9]. V. Arunachalam, I. Sorimuthu, V. Rajagopal, B. Sankaragomathi, Automatic Fast Video Object Detection And Tracking On Video Surveillance System, ICTACT Journal On Image And Video Processing, Vol. 03, Issue 01, August 2012.

[10]. R. Cucchiara, M. Piccardi, P. Mello, Image analysis and rule-based reasoning for a traffic monitoring system, IEEE Trans. Intell. Transp. Syst., Vol. 1, no. 2, pp. 119–130, Jun 2000.

[11]. Badri Narayan Subudhi, Pradipta Kumar Nanda, Member, IEEE, and Ashish Ghosh, A Change Information Based Fast Algorithm for Video Object Detection and Tracking, IEEE Transactions On Circuits and Systems for Video Technology, Vol. 21, No. 7, July 2011.

[12]. V. D. Kustikova, I. B. Meyerov, and N. Yu. Zolotykh, Vehicle video detection method, Pattern Recogn. Image Anal. Adv. Math. Theory Appl. 24 (4), 588–592, 2014.

[13]. A. Yilmaz, O. Javed, and M. Shah, Object tracking: a survey, ACM Comput. Surveys 38 (4), Article 13, 2006.

[14]. C. Veenman, M. Reinders, and E. Backer, Resolving motion correspondence for densely moving points, IEEE Trans. Pattern Anal. Machine Intellig. 23 (1), 54–72, 2001.

[15]. A. Salarpour, A. Salarpour, M. Fathi, and D. MirHossein, Vehicle tracking using Kalman filter and features, Int. J. Signal Image Proc. 2 ,2011.

[16]. S. Dan, Zh. Baojun, and T. Linbo, A tracking algorithm based on SIFT and Kalman filter, in Proc. 2nd Int. Conf. on Computer Application and System Modeling, pp. 1563–1566, 2002.

[17]. N. Li, Corner feature based object tracking using Adaptive Kalman Filter, in Proc. 9th Int. Conf. on Signal Processing, 2008.

[18]. M. Isard and A. Blake, Condensation–conditional density propagation for visual tracking, Int. J. Comput. Vision 29 (1), 5–28 1998.

[19]. F. Gustafsson, F. Gunnarsson, N. Bergman, U. Forssell, J. Jansson, R. Karlsson, and P. J. Nordlund, Particle filters for positioning, navigation and tracking, IEEE Trans. Signal Processing 2, 425–437, 2002.

[20]. Particle Filter Object Tracking. http://blogs. oregonstate.edu/hess/code/particles.

[21]. D. Exner, E. Bruns, D. Kurz, and A. Grundhofer, Fast and robust CAM Shift tracking, in Proc. IEEE Computer Society Conf. on Computer Vision and Pattern Recognition Workshops (San Francisco, 2010), pp. 9–16.

[22]. K. She, G. Bebis, H. Gu, and R. Miller, Vehicle tracking using online fusion of colour and shape features, in Proc. 7th Int. IEEE Conf. on Intelligent Transportation Systems, pp. 731–736, 2004.

[23]. J. Shi and C. Tomasi, Good features to track, in Proc. Conf. on Computer Vision and Pattern Recognition, pp. 593–600, 1994.

[24]. Pyramidal implementation of the Lucas Kanade feature tracker http://robots. stanford.edu /cs223b04/algo_tracking.pdf.

[25]. V. D. Kustikova and V. P. Gergel, Vehicle Video Detection and Tracking Quality Analysis, Pattern Recognition and Image Analysis, Vol. 26, No. 1, pp. 155–160, 2016.