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A SURVEY ON EVENT DETECTION IN SURVEILLANCE VIDEOS

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ABSTRACT

Visual surveillance has been used to monitor security sensitive areas such as banks, department stores, highways, crowded public places and borders. Traditionally, the video outputs are processed online by human operators and saved for later use. The increase in the number of cameras in ordinary surveillance systems overloaded both the human operators and the storage devices with high volumes of data. This paper briefs about the methods to monitor and detect anomalous events and retrieve suspects. The main purpose of this survey is to look at current developments and capabilities of visual surveillance systems and assess the feasibility and challenges of using a visual surveillance system to automatically detect abnormal behavior, detect aggressive intent, and identify human subject. And it focuses on methods for action recognition and event detection.

KEYWORDS: Event Detection, Abnormal Behavior, Visual Surveillance.

Visual surveillance devices are used to collect information and to observe people, events and activities. Visual surveillance technologies, CCD cameras, night vision devices, are widely used in the visual surveillance market [Teddy Ko]. Visual surveillance is one of the active research topics in computer vision. It has a wide range of public safety and security applications, including access control, crowd flux statistics and congestion analysis, human behavior detection and analysis, etc, [Hu et.al., 2004]. Event detection and recognition requires considering the temporal feature of video [Teddy Ko].

Visual surveillance in dynamic sequence of image with multiple cameras, effort to detect, recognize and track particular objects from image sequences, and particularly to understand and describe object behaviors [Zabłocki et.al., 2014]. The main aim of visual surveillance is to develop automated visual surveillance system to replace the traditional passive video surveillance [Teddy Ko]. The goal of visual surveillance is to accomplish the entire surveillance task as automatically as possible [Teddy Ko]. An automated visual surveillance system includes the following stages: object detection, object classification, object tracking, behavior and activity analysis and understanding, person identification, and data fusion [Hu et.al., 2004]. Most of the visual surveillance system starts with object detection. Object detection is segmenting portions of moving objects from rest of an image [Hu et.al., 2004]. Further steps like object tracking and behavior analysis and recognition are depend on object detection. The interested object can be detected by the techniques of background modeling and motion segmentation [Benet et.al., 2010]. Background modeling can be done by background subtraction, optical flow, temporal differencing. Background subtraction is suitable for static background, temporal differencing for dynamic background and Optical-flow uses flow vectors of moving objects over time to detect moving regions in an image sequence [Hu et.al., 2004].

Motion segmentation is aims to detect moving regions corresponding to moving objects. Detected moving objects provide attention to the later processes like object tracking, behavior analysis. After the moving object is detected, the surveillance system is track moving objects from one frame to another frame in an image sequence. Tracking involves matching objects in consecutive frames using features like points, lines, silhouettes and blobs [Teddy Ko]. Behavior understanding is analysis and recognition of motion patterns. It is necessary to analyze the behaviors of people and determine whether their behaviors are normal or abnormal. The visual surveillance system has challenges like illumination variation, shaking branches, viewpoint variation, scale variation, and orientation variation [Hati et.al., 2013].

LITERATURE REVIEW

Many researchers were working on detecting the event and recognize the behavior in the videos. Many works has been done in action recognition.

An automated visual surveillance system requires a combination of image processing and artificial intelligence techniques. Image processing techniques are providing low level image features and artificial intelligence techniques provide expert decisions [Teddy Ko]. Based on modeling and classification of human activities with certain rules the doubtful human behavior is detected. Due to uncertainty and complex nature of

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human movement modeling and classification of human activities are not trivial [Hu et.al., 2004]. Partition the observed human movements into some discrete states and then classify them appropriately. A novel approach using Asynchronous Hidden Markov Model (AHMM) was developed by Weiyao Lin *et al* [Andriyenko et.al., 2012] for automatic recognition of group activities and it can handle symmetric and asymmetric group activities.

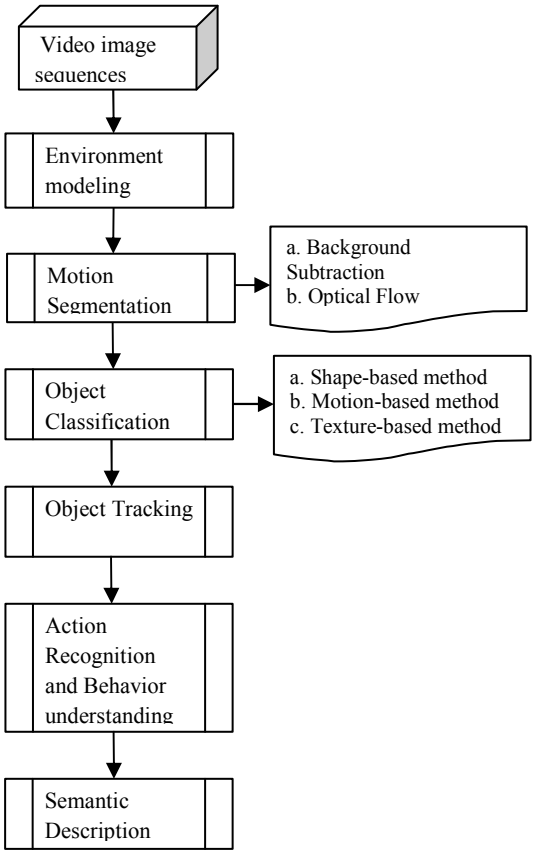

Figure 1: Block diagram of Visual Surveillance System

Miguel *et al* [SanMiguel and Martınez, 2010] presented a feedback-based approach for event detection in video surveillance that improves the detection accuracy and dynamically adapts the computational effort. [Michel Merler *et al*., 2012] proposed semantic model vectors, an intermediate level semantic representation and also presented an end-to-end video event detection system. Svetlana Lazebnik, proposed a method for recognize the scene categories based on global geometric. [Briassouli and Kompatsiaris, 2008] proposed the system that find the pixels where the activities occurs by changing the statistics of luminance between the frames and also find the ratio based change detection technique where the activities occurs. [Shen *et al*. 2008] used a subspace technique to achieve fast and accurate video event detection. The statistical approach, syntactic approach, and description-based approach for hierarchical recognition and recognition of human-object interactions and group activities are discussed [Aggarwal and Ryoo, 2011]. A general framework for anomalous event detection in uncrowded scenes has been developed [Li et al. 2012]. [Lao et al. 2009] developed a flexible framework for semantic analysis of human behavior.

In the general visual surveillance process framework as shown in Fig. 1, the motion detection, segmentation and object classification are usually grouped as low-level processing. Object tracking, Action recognition & behavior understanding and semantic description are known as high-level processing. In [Wang et.al., 2003] considered tracking process is an intermediate-level processing. In [Bremond et.al., 2006] split the process into lower and higher level processes as shown in Fig.2.

I. EVENT DETECTION

In [Regazzoni et.al., 2010 and Lao et.al., 2010] discussed the detection of suspicious human behavior is important in an automated visual surveillance systems. Event Recognition methods follows model based approach and appearance based approach. Event detection is one of the most important aspects for the different types of domain specific application. The event detection method consists of the following two steps 1) generating videos content representation 2) decision making process for detection [Xie et.al. 2003, Xu and Chang 2007, Shyu et.al., 2008, Xu et.al., 2006]. In [Andersson et.al., 2013] Unsupervised Kmeans clustering algorithm and the semi-supervised hidden Markov model (HMM) are used to automatically detect anomalous motion patterns in crowds.

In [Cong et.al., 2013] it focuses on the video anomaly detection which plays a critical role in the intelligent video surveillance. The authors consider both spatial and temporal contexts of abnormal event detection in the system. In [Park and Yoo 2012] it presents a spatial-temporal hierarchical topic model. The model is used to represent a crowded traffic scene in the process of irregular behavior. The author proposed a non-object statistical algorithm which gives an ability to detect

locally and globally occurring behaviors over time and space.

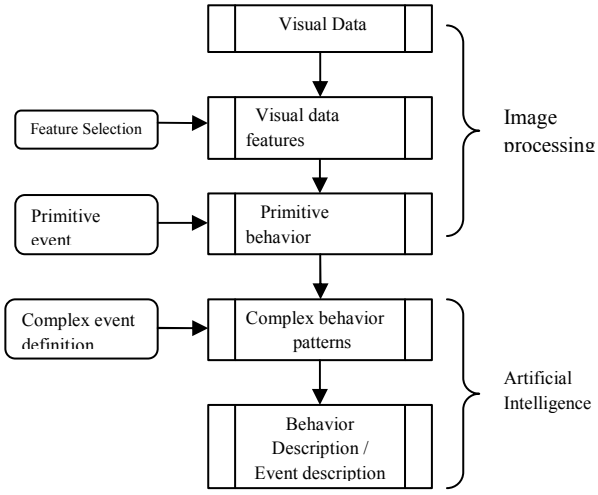

Figure 2: Schematic diagram for Event identification

CONCLUSION

This paper describes some of the intelligent video surveillance systems. Nowadays, video surveillance systems are becoming more intelligent and automated; it reduces human operator's involvement. Additionally, the newly designed algorithm increases the performance of video surveillance systems.

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