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A Survey on Object Detect, Track and Identify Using Video Surveillance

Chandrashekhar D.Badgujar[1], Dipali P.Sapkal[2]
[1,2](Computer Science and Engineering G.H.R.E.M, Jalgoan)

Abstract— *Network video surveillance has been a popular security application for many years. Target tracking in a cluttered environment remains one of the challenging problems of video surveillance. The task of target tracking is a key component of video surveillance and monitoring systems. It provides input to high-level processing such as recognition, access control or re-identification or is used to initialize the analysis and classification of human activities. Intelligent and automated security surveillance systems have become an active research area in recent time due to an increasing demand for such systems in public areas such as airports, underground stations and mass events. In this context, tracking of stationary foreground regions is one of the most critical requirements for surveillance systems based on the tracking of abandoned or stolen objects or parked vehicles. Object tracking based techniques are the most popular choice to detect stationary foreground objects because they work reasonably well when the camera is stationary and the change in ambient lighting is gradual, and they also represent the most popular choice to separate foreground objects from the current frame. In this paper, we did the literature survey on different technique and finally carried out our methodology for the same situation.*

Keywords – *Object tracking,* ***surveillance, Detection, Computer Vision.***

I. Introduction

Object tracking is a technique or method used to track the number and direction of objects traversing a certain passage or entrance per unit time. The resolution of the measurement is entirely dependent on the sophistication of the technology employed. The device is often used at public places such as railway stations, shopping malls; air ports etc so that the movement of each individual object can be analyzed. Many different technologies are used in tracking devices, such as infrared beams, computer vision and thermal imaging. Ours is computer vision.

There are various reasons for object tracking. One such usage is people counting. In retail stores, counting is done as a form of intelligence-gathering. The use of people counting systems in the retail environment is necessary to calculate the Conversion Rate, i.e. the percentage of a store's visitors that makes purchases. This is the key performance indicator of a store's performance and is far superior to traditional methods, which only take into account sales data. Traffic counts and The introduction of the paper should explain the nature of the problem, previous work, purpose, and the contribution of the paper. The contents of each section may be provided to understand easily about the paper.

conversion rates together tell how got to your sales i.e. if year-over-year sales are down, did fewer people visit my store, or did fewer people buy? Although traffic counting is widely accepted as essential for retailers, it is estimated that less than 25% of major retailers track traffic in their stores. Since staff requirements are often directly related to density of visitor traffic, accurate visitor counting is essential in the process of optimizing staff shifts. For many locations such as bars or factories, it is essential to know how many people are inside the building at any given time, so that in the event of an evacuation due to fire they can all be accounted for. This can only be automated with the use of extremely accurate people counting systems. Although, no people counting system is 100% accurate and therefore must not be entirely relied upon for the purposes of health and safety, an electronic people counting system offers a more accurate means of managing occupancy than tally counting by hand. Many public organizations use visitor counts as evidence when making applications for finance. In cases where tickets are not sold, such as in museums and libraries, counting is either automated, or staff keep a log of how many clients use different services. Second and the most important use of this technique is to track a particular object of our interest and to maintain a record of status of that object which can be analyzed for further information like for example in case of suspicious left language detection in public places like railway stations etc. and in video surveillance systems to keep track of the movements of suspicious activities.

II. Object Detection

Robust and reliable detection and tracking has attracted a lot of attention in recent years, driven by applications such as pedestrian protection, vehicle platooning and autonomous driving (Sun et al., 2006). This is a difficult problem, which becomes even harder when the sensors (e.g. Optical sensors, radar, laser scanners) are mounted on the vehicle rather than being fixed, such as in traffic monitoring systems. Effective detection and tracking require accurate measurements of object position and motion, even when the sensor itself is moving. Range sensors are well suited to this problem because a first order motion correction can be made by simply subtracting out self-motion from range measurements. Unfortunately, merely subtracting out ego-motion does not eliminate all the effects of motion because the perceived object's shape seems to change as different aspects of the object come into view, and this change can easily be misinterpreted as motion. Plus, the perceived appearance of an object depends on its pose, and can also be affected by nearby objects. Finally, complex outdoor environments frequently involve cluttered backgrounds, unpredictable interaction between traffic participants, and are difficult to control. The following figure shows that a person gets detected through a moving camera or it can be detected by using stationary camera.

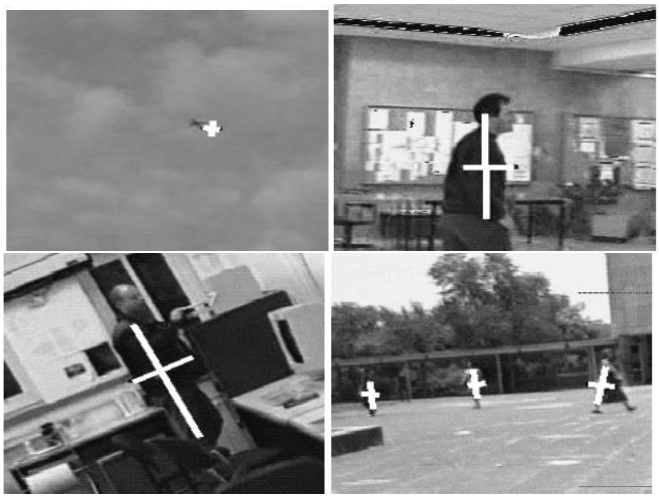

Fig. Example of moving Object Detection from a moving Camera

III. Object tracking

Object tracking is an important component of many computer vision systems. It is widely used in video surveillance, robotics, 3D image reconstruction, medical imaging, and human computer interface The growth of high-performance computers, the availability of high quality yet inexpensive video cameras, and the increasing need for automated video analysis has generated a great deal of interest in object tracking algorithms. There are three key steps in video analysis: detection of interesting moving objects, tracking of such objects from frame to frame, and analysis of tracks to recognize their behavior. The object tracking is pertinent in the tasks of:

1. Motion-based recognition, that is, human identification based on gait, automatic object detection, etc.
2. Automated surveillance that is, monitoring a scene to detect suspicious activities or unlikely events
3. Video indexing, that is, automatic annotation and retrieval of the videos in multimedia databases
4. Human-computer interaction, that is, gesture recognition, eye gaze tracking for data input to computers, etc.
5. Traffic monitoring, that is, real-time gathering of traffic statistics to direct traffic flow
6. Vehicle navigation that is, video-based path planning and obstacle avoidance capabilities.

The given fig. Shows an example of an Object tracking.

Fig. Object Tracking

IV. Object Identification

Object identification is the aim of our system which will estimate the exact count of an object which is moving or stationary. Object identification is the last step of our process gives the result which is seen at the first look.

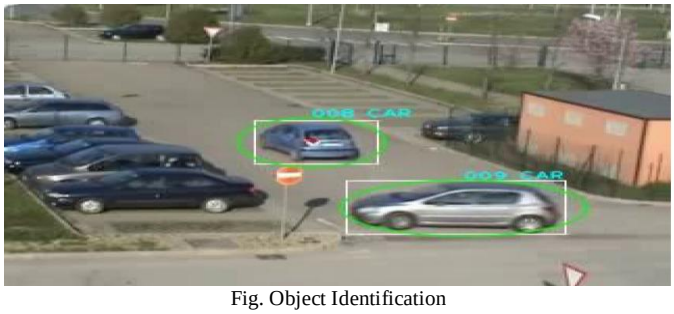

Fig. Object Identification

The above figure gives the count of an object in different colour text.

V. Related Work

In this paper, we show the exact meaning of object detection, tracking and identification and point out the general problems regarding the object detecting, tracking and identification. To track multiple objects, different methods are in use such methods have shown very good performance, considering more frames before making association decisions should generally help better overcome ambiguities caused by longer-term occlusions and false or missed detections. Many global approaches that use more information have been explored to overcome errors of detections.

In 1996 D.M.Gavrila & V.Philomin [1] Work on Real time object detection for "Smart" vehicles a method based on Distance Transforms. They demonstrated on challenging tasks in Real time, involving object detection from a moving vehicle. But some limitation exists such as Matching remains dependent on a reasonable contour segmentation, shape variation become larger, so it is not the appropriate method.

In 2000 Yu Zhong, Anil k. Jain, Fellow IEEE, M.P.Dubuisson-Jolly, Member IEEE [2] Track an object using Deformable Templates. They present an application of the prototype-based deformable template for tracking an object in image sequences from different sources. They use a criterion which combines two terms: the frame-to-frame deviations of the object shape and the fidelity of the modeled shape to the input image. The deformable template model utilizes the prior shape information which is extracted from the previous frames along with a systematic shape deformation scheme to model the object shape in a new frame. Unfortunately the proposed framework is quite general and there is need to improve the tracking result.

In 2001 Christopher Rasmussen and Gregory D.Hager, **Member IEEE [3]** Use probabilistic Data Association methods for tracking complex visual objects. The proposed framework improves tracking performance in many different visual environments. The algorithm is applied to three different tracking modalities homogeneous regions, textured regions, and snakes and extensible defined for straightforward inclusion of other methods. Second, we add the capacity to track multiple objects by adapting to vision a joint PDAF which oversees correspondence choices between same-modality trackers and image features. We then derive a related technique that allows mixed tracker modalities and handles object overlaps robustly. Finally, they represent complex objects as conjunctions of cues that are diverse both geometrically (e.g., parts) and qualitatively (e.g. attributes). But they fail to rationalize the selection of visual cues used for object tracking based on image conditions.

In 2004 Douglas stark and Jesse Davis [4] were Track and Detect object with an SDAC Wireless Sensor Network They faces many difficulties encountered in developing this system such as
1.Debugging the hardware;
2. Firmware in each module;
3. Providing adequate power isolation to each module.

In 2005 Bing Han, William Roberts & Group [5] Track an unsupervised object using Robust Feature based algorithm. They focus on unsupervised object tracking, i.e., without prior knowledge about the object to be tracked. To address this problem, they take a feature-based approach, i.e., using feature points (or landmark points) to represent objects. Feature-based object tracking consists of feature extraction and feature

correspondence. Feature correspondence is particularly challenging since a feature point in one image may have many similar points in another image, resulting in ambiguity in feature correspondence. To resolve the ambiguity, algorithms, which use exhaustive search and correlation over a large neighborhood, have been proposed. However, these algorithms incur high computational complexity, which is not suitable for real-time tracking.. It provides superior performance over the existing methods; it has proven computationally inexpensive and robust to various types of object motion. But it does not implemented for Real time.

In same year, 2005 Dan Schonfeld and Magdi Mohamed [6] Track "Real-Time interactively Distributed Object using a Magnetic-Inertia potential Model." This method is performs very well solving both "Error Merge" and "Labeling" problems. They propose to model the interactive likelihood densities by a "gravitation" and "magnetic" repulsion scheme and relax the common first-order Markov chain assumption by using an "Inertia" Markov chain. Model represents the cumulative effect of virtual physical forces that objects undergo while interacting with others. Their preliminary work has demonstrated that the proposed approach is far superior to existing methods not only in robustness but also in speed. But, it needs to spend time on weighting using image features.

In 2006 Richard, John and Jesse [7] Track a Robust Real Time non-rigid objects based on color Thresholding, user selected region of the initial frames using K-means Algorithm. But they were not combining other features of the video such as edges and texture together with color information.
Again In 2006 Giorgio Panin and Alosis Knoll **[8]** present a fully Automatic Real Time 3D object tracking using Active Contour and Appearance Models which uses CCD Algorithm. This method is beneficial for object tracking. But this method is not suited for tracking complex object such as body parts like faces and hands.

In 2007 Bastian Leibe,Konrad Schindler and Luc Van Gool [9] Present a Novel approach for multi-object tracking which consider an object detection and space time trajectory estimation as a coupled optimization problem,. Track multiple objects i.e. Complex objects. But have following problems trajectory initialization and target following. This get reduces only but not removed.

In 2007 Masayuki Hiromoto, Kentaro Wakahara, Hiroki Sugano [10] presents a hardware architecture suitable for object detection by Viola and Jones based on AdaBoost based detection with Haar like Features. The architecture realizes rapid and robust detection with two major features: hybrid parallel execution and an image scaling method. The first exploits the cascade structure of classifiers, in which classifiers located near the beginning of the cascade are used more frequently than subsequent classifiers. It has high detection rate, fast processing. But, it needs to improve hardware.

In 2008 Yuhua Zhend and Yan Meng [11] Track and detect an object using Bayes constrained particle swarm optimization techniques, which is robust enough to adapt to the dynamic environment. It is having several issues such as more object features need to be embedded to train the object model under different environment and light conditions. There is needed to make structure of weak classifiers to more adaptive by extending those classifiers.

In 2009 A.Prem Kumar, T.N.Rickesh, R.Venkatesh Babu and R.Hariharan [12] Track an object using Radial Basis Function Network. A robust algorithm for object tracking has been implemented using OpenCV libraries. The pixel-based color features are used to develop classifiers. The algorithm has been tested on various video samples under different conditions, and the results are analyzed. But, it may fail due to following reasons. The RBF Network could be redesign and threshold scale changes; it needs to feed multiple cameras.

In 2009 Du-Ming Tsai and Shing-ChinLai [13] were subtract background using ICA for indoor Surveillance. The proposed method is fast as the simple image different method. Background subtraction scheme involves two stages, one for training and the other for detection**.** The proposed ICA model can well separate two highly-correlated images. In the detection stage, the trained de-mixing vector is used to separate the foreground in a scene image with respect to the reference background image. Two sets of indoor examples that involve switching on/off room lights and opening/closing a door are demonstrated in the experiments**,** but, are not for outdoor surveillance.

In 2009 Murat Kunt and Group [14] detects and track objects across any network of cameras by using Cascade of Descriptors. They design a Master-Slave system to detect and track any objects in an N/W of uncalibrated fixed and mobile cameras. But only objects within a training data can be detected and they need to fixed camera.

In 2009 Swantje Johnson and Ashley Tews [15] Track Real-Time object and classify using a Static camera. They used motion segmentation, CONDENSATION method to track objects and many more. The system consists of several existing subsystems with improvements in the detection and classification phases. It is able to detect and classify people and vehicles outdoor in different weather conditions using a static camera, information about the objects such as location, trajectory and type is determined using a tracking and classification system. It tracks multiple objects. But, it computationally more expensive and fail to deal with complete object occlusion.

In 2010 Pheng Ann Heng(Sr. Mem.IEEE), Qian Chen and Group [16] Track Two-Stage object, a method based on Kernal and Active Contour. They can locate an object effectively in complex condition with camera motion, Partial occlusions, clutter etc the diffusion snake is used to evolve the object contour in order to improve the tracking precision. In the first object localization stage, the initial target position is predicted and evaluated by the Kalman filter and the Bhattacharyya coefficient, respectively. In the contour evolution stage, the active contour is evolved on the basis of an object feature image generated with the color information in the initial object region. In the process of the evolution, similarities of the target region are compared to ensure that the object contour evolves in the right way. They having following disadvantages

1. This method is time consuming;
2. Method can't effectively track the object when the color feature of the object is very similar to that of the background.

In 2010 Michael, Fabian Bastian and Group of IEEE member [17] Track and Detect "Online Multi-Person from a single Uncalibrated Camera using Partial Filter."The algorithm detects and tracks a large number of dynamically moving persons in complex scenes with occlusion. Their algorithm uses the continuous confidence of pedestrian detectors and online trained, instance-specific classifiers as a graded observation model. Thus, generic object category knowledge is complemented by instance-specific information. They analyze the influence of different algorithm components on the robustness It requires a more sophisticated framework than Partial Filtering.

In 2011 Amir Salarpour, Arezoo Salarpour, Mahmoud and MirHossein [18] Track "A Vehicle using Kalman Filter and Features." It detects all moving objects. The method can distinguish and tracking all vehicles individually and work in clutter scenes satisfactory. They detect all moving objects, and for tracking of vehicle they use the Kalman filter and color feature and distance of it from one frame to the next. So the method can distinguish and tracking all vehicles individually. This method has tracking problem such as .Appearance; .Disappearance; Occlusion.

VI. Problem Domain

In an object tracking and real-time object tracking system a no. of different problems arises such as

1. An object shape variation.
2. The proposed method can't effectively track the object
3. Generally, methods fail to rationalize the selection of visual cues
4. Difficulties arises while in Debugging, Firmware and power isolation
5. The given solutions are not for Real-Time Application.
6. Some may not track complex objects such as faces, hands etc.
7. Some systems have not improved hardware.
8. There is need to be extended Classifiers.
9. Threshold gets changing.
10. Tracking for both indoor and outdoor surveillance not carried out.
11. Expensive methods and fail to deal with complete object occlusion
12. Time require to track an object is more.

VII. Proposed Method

An object tracking which are distinctive is much easier since the objects can be tracked by using different method. The proposed method provides a real time application. For detecting it, we need to capture it through video surveillance first then after we can detect it using BGFG method with help of connected component analysis. The background is subtracted through background subtraction. Finally we identify an object by using viola John algorithm the proposed method is for indoor as well as outdoor surveillance. The method will identify a complex and complete object accurately and able to handle the problem of occlusion.

VIII. Conclusion

In this paper, we first shows the general meaning of object detecting, tracking and identification and do the literature survey of this things in real-time environment and non real time environment also introduce our approach of using computer vision.

The ultimate goal is to identify an object accurately using different framework and approaches in order to get final result.

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