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"Moving Object Tracking In Videos: A Survey"

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ABSTRACT:- ***In this paper we presents a new approach for object based method in Video tracking. In this approach it fill/restore the missing/occluded part of background as well as moving fore objects of a video taken by a both stationary and mobile camera. This method differs from previous methods on video processing which work on 3 dimensional data. This method slices the image sequences along with motion manifold of travelling object, so that it reduces the search area for 3 dimensional by making conversion in 2 dimensional. To advance the computational efficiency based on geometric video analysis system approaches to touch up real videos under perspective distortion for the common camera motions, such as panning of camera, tilting angle, and zooming ratio. Result demonstration on algorithm is that it performs comparably better on 3 dimensional based methods, and however it modifies the recent repairing techniques to background damaged videos with projective effects, as well as velocity changes. To improve the performance of an object-based video tracking scheme that can solve the spatial consistency problem as well as the temporal continuity problem simultaneously. It comprised in three steps virtual contour construction, Key-posture selection and mapping and Synthetic posture generation. It improve the accuracy and efficiency of an object-based video tracking to make an intelligent tracking system.***

Keywords—Moving Target's Fundamental Frequency (MTFF), Approximate Greatest Common Divisor (AGCD, Initial Fundamental Frequency (IFF), Symmetric Average Magnitude Sum Function (SAMSF).

I. INTRODUCTION

"A method of following an object through successive image frames to determine how it is moving relative to other objects. This is most commonly done by measuring the position of the centroid of the object in (x, y) in successive frames." The process of finding instances of real-world objects such as faces, vehicles, and buildings. Object tracking is estimating the trajectory of an object in the image plane as it moves around a scene. Object Recognition, Detection and tracking has found various applications in the field of traffic surveillance, Retail shops, Airports, Hospitals, Banks etc., It has a wide spectrum of promising applications, including access control in special areas, human identification at a distance, crowd flux statistics and congestion analysis, detection of anomalous behaviors, and interactive surveillance using multiple cameras, etc. In general, the processing framework of visual surveillance in dynamic scenes includes the following stages: modeling of environments, detection of motion, classification of moving objects, tracking, understanding and description of behaviors, human identification, and fusion of data from multiple cameras. 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.

II. PRESENT THEORY AND PRACTICES

Bing-Fei Wu proposed 'Adaptive Vehicle Detector Approach for Complex Environments', in this method, a vehicle detection approach for complex environments is presented. This paper proposes methods for solving problems of vehicle detection in traffic jams and complex weather conditions such as sunny days, rainy days, cloudy days, sunrise time, sunset time, or nighttime. In recent research, there have been many well-known vehicle detectors that utilize background extraction methods to recognize vehicles. In these studies, the background image needs to continuously be updated; otherwise, the luminance variation will impact the detection quality. The vehicle detection under various environments will have many difficulties such as illumination vibrations, shadow effects, and vehicle overlapping problems that appear in traffic jams. The main contribution of this paper is to propose an adaptive vehicle detection approach in complex environments to directly detect vehicles without extracting and updating a reference background image in complex environments. In the proposed approach, histogram extension addresses the removal of the effects of weather and light impact. The gray-level differential value method is utilized to directly extract moving objects from the images. Finally, tracking and error compensation are applied to refine the target tracking quality. In addition, many useful traffic parameters are evaluated. These useful traffic parameters, including traffic flows, velocity, and vehicle classifications, can help to control traffic and provide drivers with good guidance. Experimental results show that the proposed methods are robust, accurate, and powerful enough to overcome complex weather conditions and traffic jams.

Raghuraman Gopalan proposed 'A Learning Approach Towards Detection And Tracking Of Lane Markings', road scene analysis is a challenging problem that has applications in autonomous navigation of vehicles. An integral component of this system is the robust detection and tracking of lane markings. It is a hard problem primarily due to large appearance variations in lane markings caused by factors such as occlusion (traffic on the road), shadows (from objects like trees), and changing lighting conditions of the scene (transition from day to night). In this paper, we address these issues through a learning- based approach using visual inputs from a camera mounted in front of a vehicle. We propose the following: 1) a pixel-hierarchy feature descriptor to model the contextual information shared by lane markings with the surrounding road region; 2) a robust boosting algorithm to select relevant contextual features for detecting lane markings; and 3) particle filters to track the lane markings, without knowledge of vehicle speed, by assuming the lane markings to be static through the video sequence and then learning the possible road scene variations from the statistics of tracked model parameters. We investigate the effectiveness of our algorithm on challenging daylight and night-time road video sequences.

Mao Shan proposed 'Probabilistic Long-Term Vehicle Motion Prediction And Tracking In Large Environments', vehicle position tracking and prediction over large an area is of significant importance in many industrial applications, such as mining operations. In a small area, this can easily be achieved by providing vehicles with a constant communication link to a control center and having the vehicles broadcast their position. The problem dramatically changes when vehicles operate within a large environment of potentially hundreds of square kilometers and in difficult terrain. This paper presents algorithms for long-term vehicle motion prediction and tracking based on a multiple-model approach. It incorporates a probabilistic vehicle model that includes the structure of the environment. The prediction algorithm evaluates the vehicle position using acceleration, speed, and timing profiles built for the particular environment and considers the probability that the vehicle will stop. A limited number of data collection points distributed around the field are used to update the vehicle

position estimate when in communication range, and prediction is used at points in between. A particle filter is used to estimate the vehicle position using both positive and negative information (whether communication is possible) in the fusion stage. The algorithms presented are validated with experimental results using data collected from a large-scale mining operation.

Jingchang Huang proposed 'A Practical Fundamental Frequency Extraction Algorithm For Motion Parameters Estimation Of Moving Targets', in this paper, a practical method is proposed for a moving target's fundamental frequency (MTFF) extraction from its acoustic signal. This method is developed for the application of motion parameters estimation. Starting from the analysis of the target frequency model and the acoustic Doppler model, the characteristics of moving target's signal are discussed. Based on the signatures of target's acoustic signal, a new approximate greatest common divisor (AGCD) method is developed to obtain an initial fundamental frequency (IFF). Then, the corresponding harmonic number associated with the IFF is determined by maximizing an objective function formulated as an impulse-train-weighted symmetric average magnitude sum function (SAMSF) of the observed signal. The frequency of the SAMSF is determined by target's acoustic signal, the period of the impulse train is controlled by the estimated IFF harmonic, and the maximization of the objective function is carried out through a time-domain matching of periodicity of the impulse train with that of the SAMSF. Finally, a precise fundamental frequency is achieved based on the obtained IFF and its harmonic number. In order to demonstrate the effectiveness of the proposed method, experiments are conducted on wheeled vehicles, tracked vehicles, and propeller-driven aircrafts. Evaluation of the algorithm performance in comparison with other traditional methods indicates that the proposed MTFF is practical for the fundamental frequency extraction of moving targets.

Rita Cucchiara proposed 'Image Analysis and Rule-Based Reasoning for a Traffic Monitoring System', the paper presents an approach for detecting 1Vehicles 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.

Ronan O'Malley proposed 'Rear-Lamp Vehicle Detection And Tracking In Low-Exposure Color Video For Night Conditions', automated detection of vehicles in front is an integral component of many advanced driver-assistance systems (ADAS), such as collision mitigation, automatic cruise control (ACC), and automatic headlamp dimming. We present a novel image processing system to detect and track vehicle rear-lamp pairs in forward-facing color video. A standard low-cost camera with a complementary metal–oxide semiconductor (CMOS) sensor and Bayer red–green–blue (RGB) color filter is used and could be utilized for full-color image display or other color image processing applications. The appearance of rear lamps in video and imagery can dramatically change, depending on camera hardware; therefore, we suggest a camera-configuration process that optimizes the appearance of rear lamps for segmentation. Rear-facing lamps are segmented from low-exposure forward-facing color video using a red-color threshold. Unlike previous work in the area, which uses subjective color threshold boundaries, our color threshold is directly derived from automotive regulations and adapted for real-world conditions in the hue–saturation–value (HSV) color space. Lamps are paired using color cross-correlation symmetry analysis and tracked using Kalman filtering. A tracking-based detection stage is introduced to improve robustness and to deal with distortions caused by other light sources and perspective distortion, which are common in automotive environments. Results that demonstrate the system's high detection rates, operating distance, and robustness to different lighting conditions and

Road environments are presented.

Chandrashekhar D .Badgujar proposed 'A Survey On Object Detect, Track And Identify Using Video Surveillance', 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.

Behjat Siddiquie proposed 'Large-Scale Vehicle Detection, Indexing, And Search In Urban Surveillance Videos', they present a novel approach for visual detection and attribute-based search of vehicles in crowded surveillance scenes. Here two dimensions addressed a large scale processing: 1) large scale indexing, where hundreds of billions of events need to be archived per month to enable effective search and 2) learning vehicle detectors with large-scale feature selection, using a feature pool containing millions of feature elaborators. Their method for vehicle detection also explicitly models occlusions and multiple vehicle types (e.g., buses, trucks, SUVs, cars), while requiring very few human presence. It runs quite efficiently at an average of 66 Hz on a conventional laptop computer. Once a vehicle is detected and tracked over the video, fine-grained attributes are extracted and ingested into a database to facilitate future search queries such as "Show me all blue trucks larger than 7 ft. length traveling at high speed northbound last Saturday, from 2 pm to 5 pm". We perform a comprehensive quantitative analysis to validate our approach, showing its usefulness in realistic urban surveillance settings.

Rashmit A. Khilar proposed 'A Survey On Object Recognition, Detection And Tracking In Video', to find and identify objects in an image or video sequence is object recognition. In two steps object tracking is categorized: Object detection and object tracking. The process of finding instances of real-world objects such as faces, vehicles, and buildings. Estimating the trajectory of an object in the image plane as it moves around a scene is object tracking. Various application of object Recognition, Detection and tracking has been found in the field of traffic surveillance, Retail shops, Airports, Hospitals, Banks etc., This survey provides various techniques or methods that are used to recognize, detect and track objects in the shadowed or remote region, crowded area, multi modality background, Occluded object, and deformable based objects. Finally various future studies have been recommended at the end of this survey. Various application of object Recognition, Detection and tracking has been found in the field of traffic surveillance.

Jacek Czyz proposed 'A Particle Filter For Joint Detection And Tracking Of Color Objects', for tracking deformable objects in image sequences with complex backgrounds color is a powerful feature. The color particle filter has proven to be an efficient method, simplified and robust tracking algorithm. In this survey, a hybrid valued sequential state estimation algorithm is presented, and its particle filter-based implementation, the standard color particle filter is extended in two ways. First, target detection and deletion are embedded in the particle filter without relying on an external track initialization and cancellation algorithm. Second, the algorithm is able to track multiple objects sharing the same color description while keeping the attractive properties of the original color particle filter. The performances of the proposed filter are evaluated qualitatively on various real-world video sequences with appearing and disappearing targets.

Christoph Hermes proposed 'Vehicle Tracking and Motion Prediction in Com1plex Urban Scenarios', the recognition of potentially hazardous situations on road intersections is a vigilant skill of future driver assistance systems.

In this context, this study focuses on the task of vehicle tracking in combination with a long term motion prediction (1–2 s into the future) in a changing scenario. A motion-attributed stereo point cloud obtained using computationally efficient feature-based methods represents the scene, relying on images of a stereo camera system built mounted on a vehicle. A two-stage mean-shift algorithm is used for detection and tracking of the traffic crowd. A hierarchical setup depending on the history of the tracked object is applied for prediction. This includes prediction by optical flow, a standard kinematic prediction, and a particle filter based motion pattern method relying on learned object trajectories. The evaluation shows that the proposed system is able to track the road users in a stable manner and predict their positions at least one order of magnitude more accurately than a standard kinematic prediction method.

OBSERVATIONAL TABLE OF DIFFERENT OBJECT TRACKING TECHNIQUES AND VARIOUS ASPECTS

Sr. No.	Authors	Year	Proposed method	Data Input	Parameters used for evaluation	Results
1	Bing-Fei	2012	Solving problems of vehicle detection in traffic jams and complex weather conditions such as sunny days, rainy days and cloudy days, sunrise time, sunset time, or night time.	Video sequences	1) Histogram extension 2) Gray-level differential 3) Tracking and error compensation	The proposed methods are robust, accurate, and powerful enough to overcome complex weather conditions and traffic jams.
2	R. Gopalan	2012	An integral component of autonomous navigation of vehicles system is the robust detection and tracking of lane markings.	Road video sequences.	Boosting, context, lane marking detection, outlier robustness, tracking and learning.	The utility of learning approaches for detection and tracking of lane markings using visual inputs from a camera mounted in front of a vehicle.
3	Mao Shan	2013	Algorithms for long-term vehicle motion prediction and tracking based on a multiple-model approach.	GPS(Global Positioning System)	Long-term motion prediction, negative information, particle filtering, statistical model, vehicle tracking.	It is possible to obtain consistent prediction of vehicle position for long periods of time.
4	Jingchang Huang	2014	The application of motion parameters estimation. Starting from the analysis of the target frequency model and the acoustic Doppler model,	Active radar Single ground-based microphone	Fundamental frequency, harmonics, impulse train, motion parameters, moving targets, multi-pitch, pitch.	Maximizing the objective function by matching the periodicity of the impulse train and that of the SAMSF through a time-domain SIM scheme provides the desired harmonic number for more accurate pitch estimation in practical

						environmental conditions.
5	Rita Cucchiara	2000	Its formal separation between low-level image processing modules (used for extracting visual data under various illumination conditions) and high-level module, which provides a general-purpose knowledge-based framework for tracking vehicles in scene.	Loop detectors, pneumatic sensors or cameras.	Image analysis, knowledge-based systems, traffic monitoring, vehicle tracking.	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.
6	Ronan O'Malley, Edward Jones	2010	A system that detects vehicles in front at night using a regular-color forward-facing camera.	Image, color video.	Computer vision, driver assistance, tail-lamp detection, vehicle detection, video processing.	Presented camera configuration process that addresses the issues of reproducing and verifying results, portability between different camera hardware, and ensuring lamp color information is not lost due to pixel saturation.
7	C. D. Badgujar D. P. Sapkal	2012	BGFG method	video surveillance	Object tracking, surveillance, Detection, Computer Vision.	Identify a complex and complete object accurately and able to handle problem of occlusion.
8	Rogerio Schmidt	2012	Vehicle retrieval based on fine-grained attributes	Urban environments	1. Quantitative analysis 2. Minimizing transaction/inquiry response time	Object retrieval using in challenging environment
9	R. Khilar	2012	Vehicle detection in traffic jams and complex weather conditions such as sunny days, rainy days, cloudy days, sunrise time, sunset time, or night time.	Video to be tracked	Color, height, weight, length of car.	Detected vehicle from traffic jam complex environment.
10	Jacek Czyz	2012	Robust detection and tracking an object particle filter- kalman filter.	Video from traffic	False negative and false positive.	Detection and tracking of lane markings using visual inputs from a camera.
11	C. Hermes	2013	Algorithms for long-term vehicle motion prediction and tracking based on a multiple-	Video frames	Video capture on road.	Vehicle position tracking and prediction over large areas is of significant importance

			model approach			in many industrial applications.
12	R. S. Feris	2012	Visual detection and attribute-based search of vehicles in crowded surveillance scenes.	video, fine-grained attributes	1)large- scale indexing 2)learning vehicle detectors	A comprehensive quantitative analysis was performed using real surveillance data.

III. CONCLUSION

This proposed system presents a framework for hole removal, signature removal and object tracking and scenarios in a video sequence. The proposed system is comprised in three steps virtual contour construction, Key-posture selection and mapping and Synthetic posture generation. For Object based video tracking, we modified patch based long term algorithm for getting improved results as compared to the previous methods. The experiment results will show that the proposed method removes objects with good quality in terms of the object's spatial consistency as well as temporal motion continuity. It avoids over-smoothing artifacts and compensates for insufficient available postures. The non-linearity of the occluded objects is also allowed to work. It may not compose sufficiently accurate postures, if an object moves nonlinearly during an occlusion period, due to virtual trajectories. The proposed method does not deal with the illumination change problem which occurs when speed is not uniform across the scene. It also helps to make an object based in trajectories method intelligent.

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