New Development of Vehicle Abnormal Behavior Detection Method based on Intelligent Video Analysis

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Abstract

With the rapid increase in the number of motor vehicles in China, the contradiction between people, vehicles and road have become increasingly prominent.It is urgent to establish efficient Intelligent Transportation Systems. As a part of the ITS, vehicle abnormal behavior detection has important significance and practical value.With the technology development of image processing and pattern recognition, vehicle abnormal behavior detection based on video has more and more attention of researchers. On the basis of analysis of the research status, this paper reviews problems of vehicle abnormal behavior detection based on video.

Keywords:Vehicle Abnormal Behavior,Detection Method ,Intelligent Video,New Development.

1. Introduction

Intelligent Transportation System will be an inevitable trend of the road management system in the future. Abnormal behavior detection of vehicles in intersection is an important component of ITS, which have evident effect to improve transportation efficiency and road safety. Computer vision provides a new solution for ITS which is a hot spot currently in the domain of ITS. With the rapid economic development, the significant position of Intelligent Transportation System (ITS) in human economic and social activities is increasing. As the core function of ITS, the abnormal vehicle behavior detection algorithm plays an important role in people's daily life, social progress and economic development.

2. Vehicle Abnormal Behavior Detection Method based on Intelligent Video Analysis

A novel conception of virtual sensor is proposed for video based urban expressway monitoring system.Compared with traditional cameras,the new intelligent video sensor can carry out vehicle tracking and abnormal behavior detection. Abnormal detection algorithm finishes abnormal trajectories detection by probability model after training of self-organizing neural network using spatiotemporal trajectories data. The proposed algorithms are effectively running on the embedded chip video processing platform and feasible for robust detection of extra low or high speeding vehicles,illegal parking and illegal turning with low computational cost.

A system framework for abnormal vehicle behavior detection using traffic surveillance video is constructed.Improved background difference algorithm with the combination of three-frame difference algorithm is introduced for vehicle detection. The combination of algorithm and filter are used for vehicle target stracking. Vehicle centroids are extracted to draw the vehicle trajectory, then detection methods are proposed for movement direction judgment, illegal lane change, turning around, etc. The proposed system has high real-time and accuracy effects, and can be easily deployed, as well as costs low maintenance, which can meet the growing demand in today's intelligent transportation system.

An intelligent video analysis based vehicle abnormal behavior detection method was presented to handle the real-time problem in vehicle abnormal behavior detection.When vehicle abnormal behavior occurs,vehicle position,velocity and moving direction change rapidly.To extract the changes of the parameters mentioned above,the background subtraction approach was adapted to detect vehicles.Furthermore the meanshift algorithm was utilized to track the detected vehicles.Vehicles behavior decision can be concluded by weight fusion of the parameters.To verify the proposed method,experiments on real videos were operated.The proposed method can detect vehicle abnormal behavior effectively in real traffic scene.

The real- time update background is established by the average background model. The detection of moving vehicles can be realized by the process of background subtraction, binarization and mathematical morphology processing. In the process of the difference binary image, fixed threshold value is not sensitive to the external environment. Therefore, the algorithm of flexible adaptive threshold is proposed. Vehicle characteristics of center, the length and width of the circumscribed rectangle are extracted. These characteristics are matched by the method of establishing similarity function. On the basis of the feature matching, vehicle tracking is implemented by setting the ROI and track list. And the trajectories of moving vehicles are extracted according to the list of parameters. The specific abnormal behavior detection methods of the retrograde, speeding, illegal parking and running red lights have been proposed. The experiments of abnormal behavior detection are carried out based on different video material, and the results are given.

A deep and extensive study of the technology of detection vehicle abnormal behavior in intersection based on omni-

directional vision sensor is made.A new vehicle abnormal behavior detection system is designed based on the theory of computer vision. Then the system is introduced on three levels: low-level vision, middle-level vision and high-level vision. Mobile vehicle object is extracted by using the background difference algorithm which is based on mixture Gaussians model; Information of the motion status and trajectory of vehicle object is obtained by tracking; Finally in the high-level vision based on the traffic laws identing the abnormal behavior of vehicle is implementted by analysing and understanding the object movement mode. For ODVS has 360-degree panoramic view, vehicle abnormal behavior detection system can distinguish the state of vehicle and traffic lights at the same time, and detect vehicle abnormal behavior on all lanes. The complexity and cost of vehicle abnormal behavior detection system is reduce effectively by adopting proposed scheme. In order to track object under occlusions, a study of region-based tracking and feature-based tracking is made.Then combining the respective advantages of the two algorithms, a new algorithm which names feature tracking based on foreground detect is realized. A new vehicle abnormal behavior detection system is implemented by using Java language. System can not only detect vehicle violations such as red light running, speeding and converse running, but also recognize abnormal trajectory of vehicle. Vehicle abnormal behavior detection system provides support to the management department dealing with the traffic violations, help to improve the transport efficiency and ensure the security of road and drivers..

Some key issues of abnormal vehicle behavior in traffic video, including vehicle detection, vehicle tracking, trajectory pattern learning, and abnormal vehicle behavior detection. It proposes some new algorithms and application methods. Aiming at the vehicle detection under complex traffic scene, adaptive Gaussian mixture model was used to extract the moving object. The multi-structure and multi-scale morphological operators were proposed to obtain the complete vehicle edge.To solve the time-comsuming problem that the big time cost problem in traditional optical flow tracking algorithm, this thesis take advantage of the optical flow tracking method based on image pyramid, it can minimize the possibility that the moving targets in video don't meet the movement hypothesis, so as to achieve the rapid and accurate tracking. Then it pre-process the trajectory obtained by tracking, laid the foundation for later trajectory model learning. To solve the problem that behavior pattern recognition only depend on the spatial characteristics, a trajectory spatial model learning methods were proposed based on spectral clustering; using GMM model for the trajectory direction learning. An abnormal vehicle behavior detection method based on the normalized Bhattacharyya distance was proposed and the origin-destination direction pattern matching, the methods are used on the detection of abnormal location and direction in traffic video.

3. Conclusions

This paper analyzes the vehicle intelligent detection of abnormal behavior and the new method of traffic parameters collection,and constructs the model of alarm system on automatic incident detection.The system can make full use of traffic detection equipment as the data collector,furthermore,it increases accuracy and reliability and avoids occurring further incidents.

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