Detection and Recognition of Mixed Traffic for Driver Assistance System

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ABSTRACT- Driver-assistance systems that monitor driver intent, warn drivers or assist in vehicle guidance are all being actively considered. This paper present computer vision system designed for recognizing road boundary and a number of objects of interest including vehicles, pedestrians, motorcycles and bicycles. The system is designed using Hough transform and Kalman filters to improve the accuracy as well as robustness of the road environment recognition. A Kalman filter object can be configured for each physical object for multiple object tracking. To use the Kalman filter, the moving object must be track. The results are then used as the road contextual information for the following procedure, in which, particular objects of interest, including vehicles, pedestrians, motorcycles and bicycles, are recognized by using a multi-class object detector. The results in various typical but challenging scenarios show the effectiveness of the system.

Keywords— Computer vision toolbox, Video processing, Hough transform ,Kalman filters ,Region of interest, Object track ,Driver assistance system , Intelligent vehicles.

INTRODUCTION

Within the last few years, research into intelligent vehicles has expanded into applications that work with or for the human user. Computer vision system should be able to detect the drivable road boundary and obstacles. For some higher-level functions, it is also necessary to identify particular objects of interest, such as vehicles, pedestrians, motorcycles, and bicycles. The detection and recognition of such information are crucial for the successful deployment of the future intelligent vehicular technologies in the practical mixed traffic, in which, the intelligent vehicles have to share the road environment with all road users, such as pedestrians, motorbikes, bicycles and vehicles driven by human beings. Whereas computer vision can deliver a great amount of information, making it a powerful means for sensing the structure of the road environment and recognizing the on-road objects and traffic information. Therefore, computer vision is necessary and promising for the road detection and other applications related to intelligent vehicular technologies.

The novelty of this paper lies in the following two aspects: First, we formulize the drivable road boundary detection using Hough transform which not only improves the accuracy but also enhances the robustness for the estimation of the drivable road boundary. The detected road boundaries are used to verify which ones are needed to be tracked and which ones are not. Second, we recognize particular objects of interest by using the Kalman filter. It is use to predict a physical object's future location, to reduce noise in the detected location. The system development in order to improve traffic safety with respect to the road users Such framework can improve not only the accuracy but also the efficiency of the road environment recognition

REVIEW OF LITERATURE

Chunzhao Guo and Seiichi Mita, in their study, they recognizing a number of objects of interest in mixed traffic, in which, the host vehicle have to drive inside the road boundary and interact with other road First, it formulize the drivable road boundary detection as a global optimization problem in a Hidden Markov Model (HMM) associated with a semantic graph of the traffic scene Second, it recognize particular objects of interest by using the road contextual correlation based on the semantic graph with the detected road boundary Such framework can improve not only the accuracy but also the efficiency of the road environment recognition.

Joel C. McCall and Mohan M. Trivedi , in their study, motivate the development of the novel “video-based lane estimation and tracking” (VioLET) system. The system is designed using steerable filters for robust and accurate lane-marking detection. Steerable filters provide an efficient method for detecting circular- reflector markings, solid-line markings, and segmented-line markings under varying lighting and road conditions. They help in providing robustness to complex shadowing, lighting changes from overpasses and tunnels, and road-surface variations. They are efficient for lane-marking extraction because by computing only three separable convolutions, we can extract a wide variety of lane markings There are three major objectives of this paper The first is to present a framework for comparative discussion and development of lane-detection and position-estimation algorithms. The second is to present the novel "video-based lane estimation and tracking" (VioLET) system designed for driver assistance. The third is to present a detailed evaluation of the VioLET system

Michael Darms, Matthias Komar and Stefan Lueke , The paper presents an approach to estimate road boundaries based on static objects bounding the road. A map based environment description and an interpretation algorithm identifying the road boundaries in the map are used. Two approaches are presented for estimating the map, one based on a radar sensor, one on a mono video camera. Besides that two fusion approaches are described. The estimated boundaries are independent of road markings and as such can be used as orthogonal information with respect to detected markings. Results of practical test using the estimated road boundaries for a lane keeping system are presented.

Akihito Seki and Masatoshi Okutomi, in their study,Understanding the general road environment is a vital task for obstacle detection in complicated situations. That task is easier to perform for highway environments than for general roads because road environments are well-established in highways and obstacle classes are limited. On the other hand, general roads are not always well-established and various small obstacles, as well as larger ones, must be detected. For the purpose of discerning obstacles and road patterns, it is important to determine the relative positions of the camera and the road surface. This paper presents an efficient solution using a stereo-vision-based obstacle detection method for general roads. The relative position is estimated dynamically even without any clear lane markings. Additionally, obstacles are detected without applying explicit models. We present experimental results to demonstrate the effectiveness of our proposed method under various conditions.

Zehang Sun, George Bebis, and Ronald Miller ,in their study, presents a review of recent vision-based on-road vehicle detection systems. Our focus is on systems where the camera is mounted on the vehicle rather than being fixed such as in traffic/driveway monitoring systems. First, we discuss the problem of on-road vehicle detection using optical sensors followed by a brief review of intelligent vehicle research worldwide. Then, we discuss active and passive sensors to set the stage for vision-based vehicle detection. Methods aiming to quickly hypothesize the location of vehicles in an image as well as to verify the hypothesized locations are reviewed next. Integrating detection with tracking is also reviewed to illustrate the benefits of exploiting temporal continuity for vehicle detection

Akihiro Takeuchi, Seiichi Mita, David McAllester, in their study ,proposes a novel method for vehicle detection and tracking using a vehicle-mounted monocular camera. In this method, features of vehicles are learned as a deformable object model through the combination of a latent support vector machine (LSVM) and histograms of oriented gradients (HOG). The vehicle detector uses both global and local features as the deformable object model. Detected vehicles are tracked by using a particle filter with integrated likelihoods, such as the probability of vehicles estimated from the deformable object model and the intensity correlation between different picture frames.

SYSTEM DESIGN ARCHITECTURE :

Figure shows the diagram of the proposed Approach system .The system lies in two ways :Right image and Left image. The system is design using Hough transform and Kalman filter. With the Hough transform, we find the drivable road boundary. The resultant road boundary is then used as the road contextual information to enhance the performance for each processing step of the multi-object recognition, which detects the objects of interest by using Kalman filter.

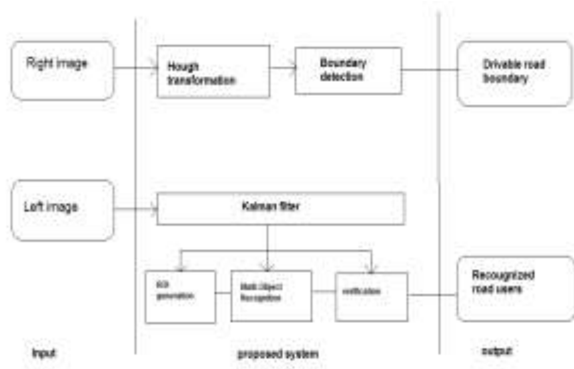


Fig. flow diagram of the proposed work

A) ROAD BOUNDARY DETECTION AND TRACKING :

Computer vision-based methods are widely used for road detection. They are more robust than the all. The detection of road boundary an Hough transform is used. It is detect boundary in the current video frame and finally localize the road boundary using the colour red and green . The current goal is to find the edges of road in which human driver have to drive. By using the Hough transform, the proposed approach finds the edges of road. The detected road boundary are used to verify which ones are needed to be tracked and which ones are not. The approach can still find the accurate drivable road boundary robustly from the figure .

Fig. 1. Road boundary detection.

B) MULTI-OBJECT RECOGNITION :

As mentioned previously, the intelligent vehicles have to share the road environment with all road users, such as pedestrians, motorbikes, bicycles, and other vehicles. The system development of different types of detection systems in order to improve traffic safety with respect to the road users .In the proposed system, particular objects of interest, including vehicles, pedestrians, motorcycles and bicycles, are recognized with the context information . Object identification is challenging in that objects present dramatic appearance changes according to camera viewpoints and environment conditions. The detection of object an kalman filter is used. The Kalman filter object is designed for tracking. It is use to predict a physical object's future location, to reduce noise in the detected location, or to help associate multiple physical objects with their corresponding tracks. A Kalman filter object can be configured for each physical object for multiple object tracking.

The flowchart of this object detection system is shown in fig 2. and its main steps are discussed in the following section. The first step is to collect database of video file. There is masking of all the image and foreground detection. Then block is analysis .After the analysis of all the block it read all the frames of image. All the previous frames is delete and create a new frame. It detect the object track and predict frames.

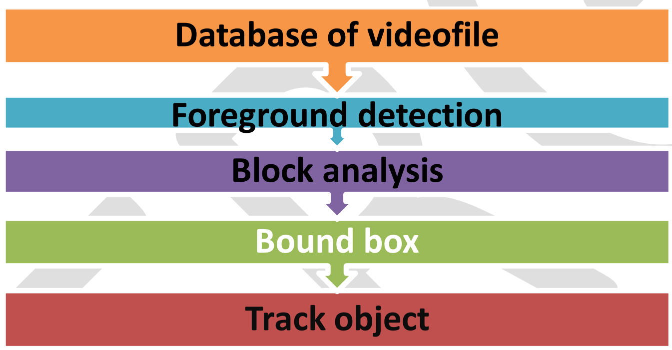


Fig 2. Flow chart of object detector

Object tracking is often performed to avoid false detections over time and predict future target positions. However, it is unnecessary to keep tracking the targets which are out of the collision range Particular objects of interest, including vehicles, pedestrians, motorcycles, and bicycles, are recognized, which will be provided to the behavioural and motion planning systems of the intelligent vehicles for high-level functions. Some example results in various scenarios for different on-road objects are shown in Figure which substantiated that the proposed system can successfully detect the objects of interest with various sizes, types, colours.

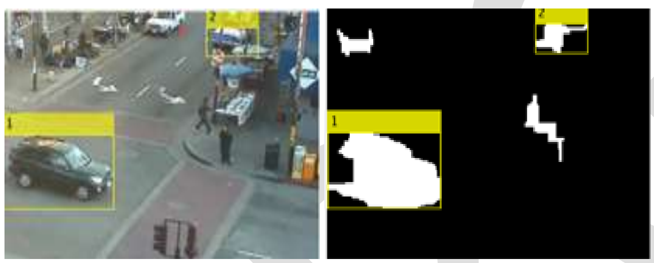
1) Vehicle detection:-

Original video Segmented video

2) Pedestrians detection :-

Original video Segmented video

3) Vehicle and pedestrian detection:-



Original video Segmented video

CONCLUSION :

We present a vision-based approach for estimating the road boundary and recognizing a number of road users. Our first contribution is road detection using Hough transform. It allows the used to verify which ones are needed to be tracked and which ones are not. it will help the human driver to go on a particular road boundary .Our second contribution is the use of road contextual correlation for enhancing the object recognition performance. The Kalman filter object is designed for tracking. It is use to predict object's future location. The system development in order to improve traffic safety with respect to the road users All of these contributions improve the accuracy as well as robustness of the road environment recognition.

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