**Accurate Detection and Recognition of Vehicle Plate Numbers**

**Title 1:** SYSTEM FOR COLLISION PREDICTION AND TRAFFIC VIOLATION DETECTION

**Abstract:** The invention refers to a system for monitoring, analyzing and reporting incidences of traffic violations at a predetermined area in real -time, prospectively or retrospectively. Specifically, the invention refers to a system and method of monitoring, analyzing, predicting and reporting or Warning the incidence of a past or imminent traffic violation by acquiring a moving object Within a predetermined boundary, assigning a path to the moving object and based on a plurality of thresh olds, determining the likelihood of a traffic violation type and occurrence.

**Title 2:** A hybrid License Plate Extraction Method Based On Edge Statistics and Morphology

**Abstract:** A hybrid license plate extraction algorithm based on the edge statistics and morphology for monitoring the highway ticketing systems. The method can improve the location rate only by the edge statistics. The proposed approach can be divided into four sections, which are, vertical edge detection, edge statistical analysis, hierarchical-based license plate location, and morphology-based license plate extraction. The algorithm can quickly and correctly detect the region of vehicle license plates. Under the experiment databases, which were taken from real scene, 9786 from 9825 images are successfully detected. The average accuracy of locating vehicle license plate is 99.6﹪.

**Title 3:** An Improved Sobel Edge Detection

**Abstract:** A method which combines Sobel edge detection operator and soft-threshold wavelet de-noising to do edge detection on images which include White Gaussian noises. In recent years, a lot of edge detection methods are proposed. The commonly used methods which combine mean de-noising and Sobel operator or median filtering and Sobel operator can not remove salt and pepper noise very well. In this paper, we firstly use soft-threshold wavelet to remove noise, then use Sobel edge detection operator to do edge detection on the image. This method is mainly used on the images which includes White Gaussian noises. Through the pictures obtained by the experiment, we can see very clearly that, compared to the traditional edge detection methods, the method proposed in this paper has a more obvious effect on edge detection.

**Title 4:** Combining Hough Transform and Contour Algorithm for detecting Vehiclesí License-Plates

**Abstract:** Vehicle license plate (VLP) recognition is an interesting problem that has attracted many computer vision research groups. One of the most important and difficult task of this problem is VLP detecting. It is not only used in VLP recognition systems but also useful to many traffic management systems. Our method is used for the VLP recognition system that deals with Vietnamese VLPs and it can also be applied to other types of VLPs with minor changes. There are various approaches to this problem, such as texture-based, morphology-based and boundary linebased. In this paper, we present the boundary line-based method that optimizes speed and accuracy by combining the Hough transform and Contour algorithm. The enhancement of applying the Hough transform to contour images is that the much improved speed of the algorithm. In addition, the algorithm can be used on VLP images that have been taken from various distances and have inclined angles between ±300 from the camera. Especially, it can detect plates in images has more than one VLP. The algorithm was evaluated in two image sets with accuracy of about 99% (see 3.3).

**Title 5:** An Efficient Method for Correcting Vehicle License Plate Tilt

**Abstract:** Tilt correction is a very crucial and inevitable task in the automatic recognition of the vehicle license plate (VLP). In this paper, according to the least square fitting with perpendicular offsets (LSFPO) the VLP region is fitted to a straight line. After the line slope is obtained, rotation angle of the VLP is estimated. Then the whole image is rotated for tilt correction in horizontal direction by this angle. Tilt correction in vertical direction by inverse affine transformation is proposed for removing shear from the LP candidates. Despite the success of VLP detection approaches in the past decades, a few of them can effectively locate license plate (LP), even when vehicle bodies and LPs have similar color. A common drawback of color-based VLP detection is the failure to detect the boundaries or border of LPs. In this paper, we propose a modified recursive labeling algorithm for solving this problem and detecting candidate regions. According to different colored LP, these candidate regions may include LP regions. Geometrical properties of the LP such as area, bounding box and aspect ratio are then used for classification. Various LP images were used with a variety of conditions to test the proposed method and results are presented to prove its effectiveness.