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Lane Detection Method Based on Recursive Binary Fitting ⋆

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Abstract

This paper introduces a method of lane detection based on recursive binary fitting method of the lane detection: First use canny edge detection algorithm to detect the edges on the basis of gray images, and then scan the edge image from the left to the right and from the bottom to the top, we can extract the inner side of the lane edge of the interested region and dilate the lane by connecting some breakup, and on this basis and through the connected domain filtering, to remove the one that does not conform to the characteristics of binary image of lane. At last, we can get the lane by the recursive binary fitting method. The results show that the algorithm has good robustness and real-time performance.

Keywords: Lane Detection; Canny Edges Detection; Recursive Binary Line Fitting

1 Introduction

The lane is one of the most basic road traffic signs, and is also the basic constraint of driving a car. The lane detection and tracking is a basic and necessary function for intelligent vehicle navigation and vehicle collision warning system which is based on computer vision. It does not only provide a reference to navigation, but also be applied to the moving target detection, auto accident early warning and so on. Many countries make that in the list of high-tech development plan and spend a lot of money for it, and has developed some different characteristics of lane departure warning systems [1], through which drivers get warn information in advance and take the correct operating measures to prevent such accidents or reduce the damage degree as the purpose of this kind of accident.

The lane detection and testing is paid great attention to. A lot of foreign references focus on the field of smart car. Wang et al. [2] present a kind of B - Snake model based on the lane detection and tracking algorithm and a robust algorithm called CHEVP provides a good initial

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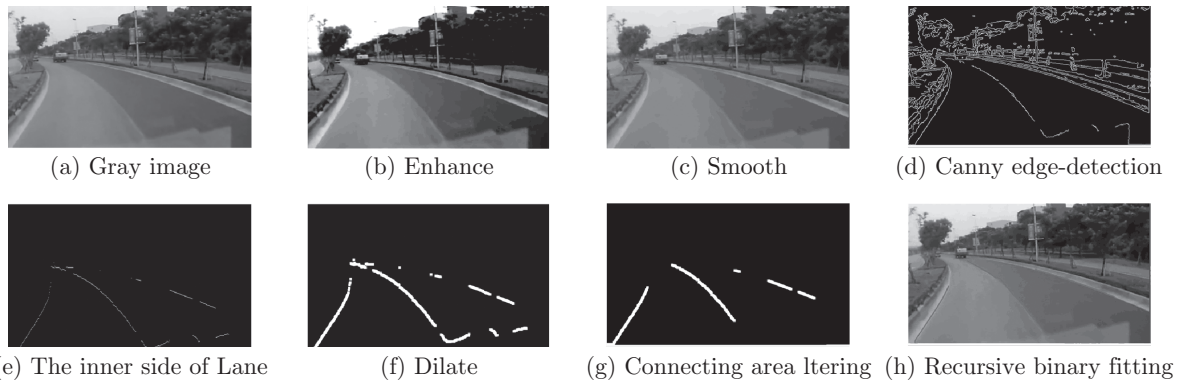
position for B - Snake model, which can effectively detect the lane. Lee et al. [3] propose a kind of algorithm based on LBPE, Hough transform and linear regression; Wang et al. [4] present SCA and fuzzy C-means clustering to deal with spatial information, and the edge gets from the Canny algorithm to effectively detect the lane. Yan et al. [5] show an image preprocessing method based on Edge Distribution Function (EDF) through the direction of the lane. Hu et al. [6] show gradient edge detection technique based on gray-level threshold segmentation, when image edge detection of pavement cooperate with gray information of the road, it can accurately separate the edge. According to this definition of lane tracking - ROI in the region and EDF which is defined by the lane edge information and the analysis based on the regional lane gradient in the direction of tracking, we can obtain the positions of the two lanes on road image.

Our country has made many of the most prominent results in this research aspect. Shen et al. [7] mainly analyse the characteristic in the HSV color model under the constraint condition, and research on and analysis image, and expect to meet the characteristics of color edge constraint conditions. Through the characteristics of the color in the HSV model shown in [8], the value of each point is represented by calculation and characteristic color represents the value of the similarity to determine the area to be detected, and the last the corresponding processing is preceding in the candidate region. Hu et al. [9] present a kind of color edge detection algorithm, in view of the features of color RGB component values, by setting the transfer function of labeling features color area, the candidate region is to be edge detection. Wang et al. [10] put forward an adaptive modeling lane detection algorithm by obtaining information on the lane and set up the appropriate lane model to complete the lane line detection.

2 General Steps for Lane Detection

Complete automatic lane detection is currently limited because of unpredictable environment. Lane and background areas are distinguished by their respective contrast ratio values. Thus, in this paper, an algorithm for complete lane detection is achieved, as shown in Fig. 1. The steps of our algorithm are shown as follows:

The first step is to design to improve the speed of image processing, we convert color image into gray image, and then enhance gray image and smooth. These works are shown in Fig. 1 (a)-(c). Image enhancement is used to emphasize the purpose of the whole or local feature of image, and to emphasize some characteristics of interest, to expand the difference between different objects



(a) Gray image (b) Enhance (c) Smooth (d) Canny edge-detection

(e) The inner side of Lane (f) Dilate (g) Connecting area ltering (h) Recursive binary fitting

Fig. 1: General steps for lane detection