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COMPUTER SCIENCE & ENGINEERING DEPARTMENT

A PFSD Project Document

On

"Road Lane-Line Detection"

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UNDER THE ESTEEMED GUIDANCE OF

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ABSTRACT

Driver support system is one of the most important features of modern vehicles to ensure driver safety and decrease vehicle accident on roads. Apparently, road lane detection or road boundaries detection is a complex and challenging task. It includes the localization of the road and the determination of the relative position between vehicle and road. A vision system using an onboard camera looking outwards from the windshield is presented in this paper. The system acquires the front view using a camera mounted on the vehicle and detects the lanes by applying a few processes. The lanes are extracted using Hough transform through a pair of hyperbolas which are fitted to the edges of the lanes. The proposed lane detection system can be applied on both painted and unpainted roads as well as curved and straight roads in different weather conditions. The proposed system does not require any extra information such as lane width, time to lane crossing, and offset between the center of the lanes. In addition, camera calibration and coordinate transformation are also not required. The system was investigated under various situations of changing illumination, and shadows effects in various road types without speed limits. The system has demonstrated a robust performance for detecting the road lanes under different conditions.

INTRODUCTION

Autonomous Driving Car is one of the most disruptive innovations in AI. Advanced Driving Assistance Systems (ADAS) require the ability to model the shape of road lanes and localize the vehicle with respect to the road. Although, the main reason to build intelligent vehicles is to improve the safety conditions by the entire or partial automation of driving tasks. Among these tasks, road detection took an important role in driving assistance systems that provides information such as lane structure and vehicle position relative to the lane Fueled by Deep Learning algorithms, they are continuously driving our society forward and creating new opportunities in the mobility sector. An autonomous car can go anywhere a traditional car can go and does everything that an experienced human driver does. But it’s very essential to train it properly. One of the many steps involved during the training of an autonomous driving car is lane detection, which is the preliminary step. So, this presents a vision-based approach that is capable of reaching a real-time performance in detecting and tracking structured road boundaries (painted or unpainted lane markings) with a slight curvature and shadow conditions.

LITERATURE SURVEY

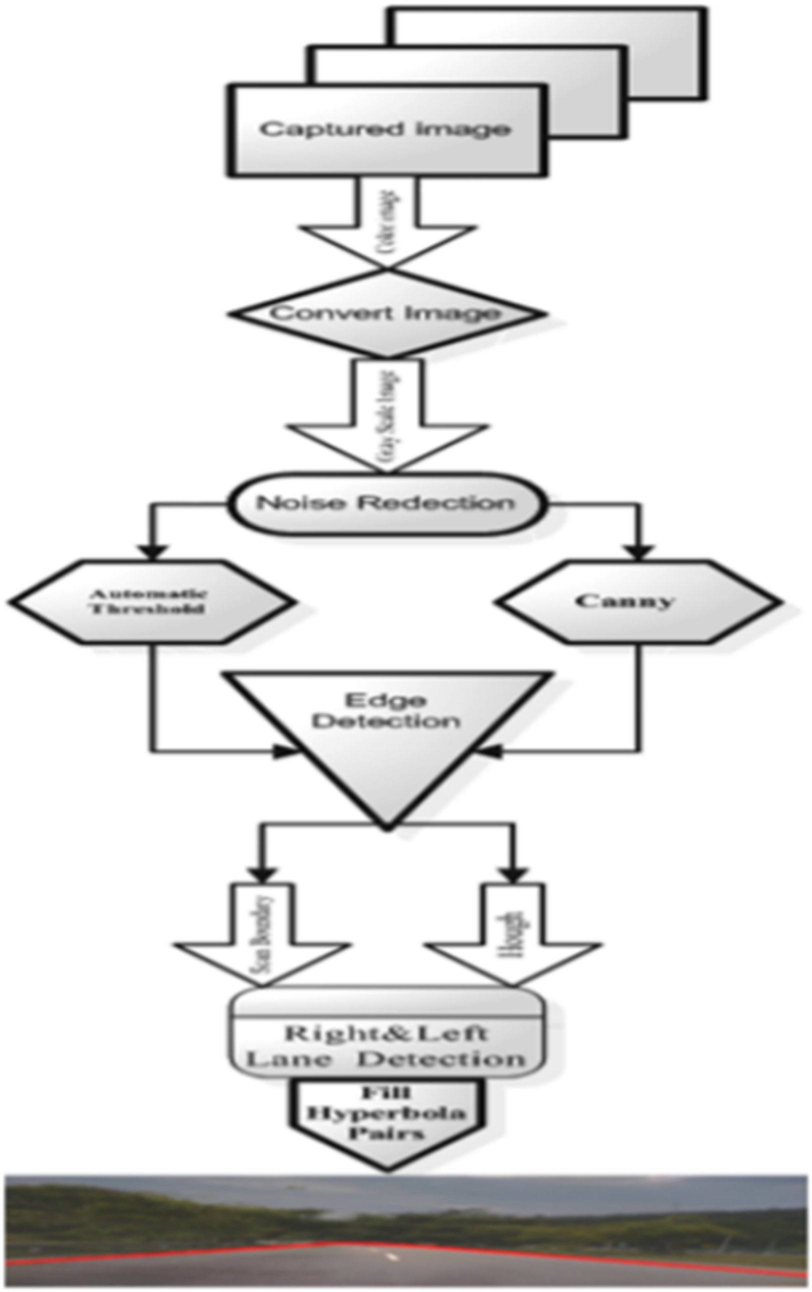
TITLE OF GATHERED ARTICLES	PROCEDURE /EQUIPMENT	CONCLUSION
https://www.researchgate.net/publication/242292667_A_Driver_Warning_System_Based_on_the_LOIS_Lane_Detection_Algorithm **A Driver Warning System Based on the LOIS** **Lane Detection Algorithm**	This system uses LOIS Algorithm. The LOIS algorithm is used to track lanes from frame-to-frame.	The LOIS-based lane tracker provides a very reliable algorithm for the development of a lane departure warning system.
OpenCV Real Time Road Lane Detection	This system includes methods like Canny edge detector, Grayscale conversion of image, capturing and decoding video file.	solution was purely based on certain image pre-processing operations.
https://data-flair.training/blogs/road-lane-line-detection/ **Road Lane line detection – Computer Vision Project in Python**	This system using the concepts of computer vision use OpenCV library. To detect the lane we have to detect the white markings on both sides on the lane.	This lane line detection project, we use OpenCV. Before detecting lane lines, we masked remaining objects and then identified the line with Hough transformation.

METHODS

Image Capturing: The input data was color image sequences taken from a moving vehicle. A color camera was mounted inside the vehicle at the front-view mirror along the central line. It took images of the environment in front of the vehicle, including the road, vehicles on the road, roadside, and sometimes incident objects on the road. The onboard computer with an image capturing card captured the images in real-time (up to 30 frames/second), and saved them in the computer memory. The lane detection system read the image sequences from the memory and started processing. A typical scene of the road ahead is depicted.

Edge Detection: Lane boundaries are defined by the sharp contrast between the road surface and painted lines or some types of non-pavement surfaces. These sharp contrasts are edges in the images. Therefore edge detectors are very important in determining the location of lane boundaries. It also reduces the amount of learning data required by simplifying the image considerably, if the outline of a road can be extracted from the image. The edge detector was implemented for this algorithm. The one that produced the best edge images from all the evaluated edge detectors was the ‘canny’ edge detector.

ALGORITHM



Captured image
Color image
Convert Image
Gray Scale Image
Noise Redection
Automatic Threshold
Canny
Edge Detection
Scan Boundary
Hough
Right&Left Lane Detection
Fill Hyperbola Pairs

RESULTS

DISCUSSION

By observing we can say that it evaluates the overall performance of the system, after solving most of the problems discovered in earlier developed stages of the scheme. The performance of the algorithm is evaluated qualitatively in terms of accuracy in the localization of the lane boundaries for 150 frames in each case. This tier performance metric per input frame is strictly a pass/fail vote based on the likelihood that a vehicle could conceivably navigate with the output hyperbola pairs. It has been developed from the algorithm where accurate lane detection is marked by a red line at 2 and once it drops down to 1 it indicates the fault lane detection at that frame sequence. However, the evaluation ranged from straight highways to curved normal country roads, during day and night. A few frames had been shown as traffic in road types, Railway Bridge, and critical weather conditions such as heavy rain and cloudy sky. The final summary of the best results obtained in different road conditions in this project is shown where the detection rate per frame achieved 96.6% during daytime and 92.6% at night time as presented. The results are considered to be satisfactory after avoiding most of the light reflection problems that caused to have very disappointing results at the preliminary stage.

CONCLUSION

A real-time vision-based lane detection method was proposed. Image segmentation and removal of the shadow of the road were processed. The Canny operator was used to detect edges that represent road lanes or road boundaries. A hyperbola-pair road model is used to deal with occlusion and imperfect road conditions. A series of experiments showed that the lanes were detected using Hough transformation with a restricted search area and the projection of their intersection will form the last scan point called the horizon. Furthermore, In order to search out the left and right vector points that represent the road lanes, the lane scan boundary phase uses the edge image and the left and right Hough lines and the horizon line as inputs, to effectively allocate the lane points. The experimental results showed that the system is able to achieve a standard requirement to provide valuable information to the driver to ensure safety.