江苏大学海外教育学院
Overseas Education College of Jiangsu University

School of Computer Science & Communication Engineering

DEGREE PROJECT PROPOSAL

PROJECT TITLE: LANE LINE DETECTION SYSTEM WITH LINE RECOGNITION

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Degree Project Proposal

Part 1:

1. **Background:** Computer vision is an interdisciplinary scientific field that deals with how computers can be made to gain high-level understanding from digital images or videos. From the perspective of engineering, it seeks to automate tasks that the human visual system can do. The process uses images from cameras and videos and deep learning models. Machines can accurately identify and classify objects —and then react to what they see. In this project, the main focus is computer vision in smart cars, particularly lane detection. Lane Detection is an essential component for smart vehicles as it is a key part

of ensuring road traffic interpretation and safety. In modern society, road traffic accident has become a problem, the risk of highway accidents is becoming a rising trend.

In order to improve the driving safety and operation simplicity, countries all over the world are active in researching and developing automotive assistant driving systems. Lane detection and tracking based on machine vision are one of key techniques of intelligent vehicle assistant driving systems and are basis of realizing active safety functions such as lane departure warning, lane keeping and so on.

2. **Industry Background** Early experiments in computer vision took place in the 1950s, using some of the first neural networks to detect the edges of an object and to sort simple objects into categories like circles and squares. In the 1970s, the first commercial use of computer vision interpreted typed or handwritten text using optical character recognition. This advancement was used to interpret written text for the blind. As the internet matured in the 1990s, making large sets of images available online for analysis, facial recognition programs flourished.

3. **Current Development Status**

In current systems, there are several sensing modalities used for road and lane understanding, including vision (i.e. one video camera), stereo, LIDAR, vehicle dynamics information obtained from car odometers or Inertial Measurement Unit (IMU) with global positioning information that is obtained using Global Positioning System (GPS) and digital maps. In the area of vision, being the most prominent research area in lane and road detection due to the fact that markings are made for human vision, LIDAR and global positioning are important complements that are commonly used in current systems.

4. **General Goals of the Project**

The goal of this project is to design a lane lines detection system that will be able to detect lane lines from a live video feed.

The system should be able to detect lane line and output the results.

5. **References:**

- Jason Brownlee on May 31, 2019 in Deep Learning for Computer Vision.
- Johnson, R.A., and Wichern, D.W. (1992) Applied Multivariate Statistical Analysis. Prentice Hall. p356-395

- Feature Extraction and Image Processing for Computer Vision, Third Edition
- Algorithms for Image Processing and Computer Vision by James R

Part 2: Project Contents and Main Technologies

1. **Functionality of Target System**

To detect road lane lines in real time. Process the input data which is the video feed and indicate the lane lines that must be followed.

2. **Implementation Skills:**

In order to implement this technology, the basis is Edge Detection and this can be achieved through the following points:

Gray scale: In this project, we use canny edge detection to identify the sharp changes in intensity in adjacent pixels. A sharp change in color. The achieve this, we first change the input image/video to *gray scale* for faster processing (a single channel compared to a three channel color image).

Gaussian blur: In order to accurately capture the edges in the image, image noise must be filtered out hence smoothen the image using a Gaussian filter.

Apply Canny: This function is used to identify high gradient pixels in the image. The canny function computes gradients in all directions of the blurred image and traces the strongest gradients as white pixels. Pixels are compared to preset low and high thresholds. The gradients larger than the high threshold is accepted as an edge pixel. If it is below, it is rejected.

Find Region of interest: A mask (blacked out version) of the original image is created thus having the same dimensions, with a polygon marking the region of interest.

Bitwise_and: This is computation is carried out on the canny image and the mask to only show the region of interest traced by the polygonal contour of the mask.

Hough Transform: This algorithm is applied into the result image from the bitwise AND operation to determine straight lines in the image and hence detect the lane lines.

Part 3: Key Problems of the Project

The main problems of lane lines detection are often the most obvious ones, even to the human eye, some of which are; poor lane line markings. With time, lane line markings get rubbed off roads. Presence of foreign matter such as liquids and dust that corrupt the markings. In some cases, absence of markings all together!

In general, as long as it is difficult for the human eye to identify lane lines due to such situations, technology can only do as much. In the years

to come, with the growing development of image and video technology, a few of these problems will be tackled.

Part 4: Expected Results of the Project

To open the minds of people to image processing and its capabilities, how simple it actually is because all the complicated work has been done, we just need to apply it to make our day to day lives in order to make it easier and safer in the case of lane lines detection.

This technology should be welcomed by auto manufacturers more and more as to make road using safer and easier for motorists.

Project Schedule

Start/End	**Missions**
2020/02/20-2020/03/01	Gather information on Image processing and lane line detection
2020/02/25-2019/02/25	Select Processing and Detection tools
2020/03/01-2020/06/01	Make word document of Thesis
2020/03/01-2020/03/02	Testing system with different sample data

Supervisor Comments

Signature：

Date:

Approver Comments：

Signature：

Date: