Requirement Analysis

Capstone Design (SOC4150-002)

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1. Introduction:

Nowadays, the term self-driving is becoming popular and most engineers are interested in it. Capstone Design is subject treated as term final project for senior students for graduation. We have been given to develop a prototype of self-driving car using Raspberry Pi 3b and Software tools. For developing self-driving car which detects the lines on the road. For that were given video of moving car that captures the lines on the road. Our mission is to detect lines in the video using OpenCV library and Machine learning algorithm. For the successfulness of the assignment, we have to analyze all requirements including functional, user requirements.

2. Functional requirements:

a. Image Denoising – is required for deleting noises from the video, to be precise from the frame. Denoising the frame helps for correctly finding the lines on road.

b. Edge detection from binary image – it is another criteria which must be done on the frame in order to detect the lines using Hough algorithm. Before detecting the edge the frame must be in gray scale and then it must be converted to binary format which makes easier to process the image.

c. Mask the image – is requirement for creating mask for specific region in order improve computational cost. Moreover, for detecting lines ROI (region of interest) is mandatory because it will not detect other unnecessary lines that are not related to the road.

d. Hough lines detection – we have region of interest that has edges from that edges the lines should be detected using HoughLinesP OpenCV algorithm that returns lines with their coordinates.

e. Left and right lines separation – after getting the lines using Hough algorithm we have to separate the lines into left and right lines based on their coordinates or slopes. These lines must be separated for feeding linear regression model and getting corrected lines.

f. Drawing the complete line – after training on image the lines must be added to original frame or image using cv2.addWeighted OpenCV function.

g. Predict the turn – based on recorded video with regression lines it must predict the turn if there is a car moving from left side it should say the car on the left.

3. Process of brainstorming:

We know that we are creating a service that must fulfil the users needs for that reason we have to think divergently in order to meet all requirements that are put on our shoulders. First of all, we have to meet the main requirements for it we have to conduct team meetings, observation, survey, prototyping the model. We have to use flow-chart diagrams in order to see the general picture of our project.