CarND-LaneLines-P1 Report

The goal of this project is to detect the highway lane lanes from a video.

Description of the pipeline:

The pipeline developed for this project includes the following stages:

For each image in the video (each video frame):

1. The image is converted to grayscale
2. Gaussian blur filter is applied
3. Canny edge detection is applied
4. Hough transform is applied
5. Finally based on the line segments returned by Hough transform, semi-transparent lines are drawn on the images to mark the position of left and right lane line.

To more accurately categorize the line segments returned by Hough transform and detect the position of left and right lane, two additional steps is applied in stage 5:

1. Line segments detected in the either half of the images (left or right half) are assumed to belong to the corresponding lane line and are split into two categories
2. In each category only those line segments whose slopes mimics the slope of left or right lane are kept and the rest are discarded (in OpenCV coordinate system left lane has a negative slope while right lane has a positive slope)

Potential shortcomings and how to improve them:

As can be seen from the challenge video output, even the more robust version of the pipeline faces difficulties in detecting the lane lines in some specific situations for example when the intensity of the image frames changes due to shadows from trees located on the side of the street. Rather than setting a single high and low threshold for the whole video, a better implementation would take these intensity changes into consideration and would find an optimal high and low threshold for each video frame so that Canny edge detection would still be able to detect the lane lines obstructed by shadows.

Another possible improvement can be thought of by noting that the lane lines are not necessarily straight and that a curve might be able to fit them better than a single straight line. The current straight-line simplification might work very well in highways, but

in urban settings with more curvy roads, this assumption could lead to errors in detecting the proper shape of the lane.