Finding Lane Lines on the Road

The goals of this project are the following:
Make a pipeline that finds lane lines on the road. The pipeline will find the lane lines in the video captured by a camera mounted at the front of a car.

1. The process of finding lane lines

My pipeline consisted of 5 steps. First, I converted the images to grayscale. Then I used Gaussian smoothing to average colors. After that, I use the Canny algorithm to detect the large changes in gradient of the color of images. Those large changes indicate the position of lane lines. Since lane lines' color is very different from the color of road. Then I applied a mask to select a region of a image where the lane lines typically are. Finally, I used the Hough transform to connected the pixels of lane lines found in the Canny algorithm. The connected lines are lane lines.

In order to draw a single line on the left and right lanes, I modified the draw_lines() function by applying an extrapolation method. First I distinguish the left lane line segments and right lane line segments by comparing the slope of each line segments. The slopes of left segments are very different from the slopes of right segments. Then, I fitted a least square line to the output of Hough transform which are the starting and ending points of line segments. Then I found the top and bottom coordinates of the fitted line. The y of the top coordinate will be the top of the mask. The y of the bottom coordinate will be the height of the image. Using this two values, I found the corresponding x values. Finally I draw a straight line through the two coordinates. This will be the fully stretched lane line. Apply the method for left segments to get the left lane line. Apply it for the right segments for the right lane line.

2. Identify potential shortcomings with your current pipeline

One potential shortcoming is that fully stretched lane lines bounce a lot. This may caused by the uncommon slopes of certain line segments.

Another shortcoming is that the parameters of algorithms are selected for a specific road under a specific weather condition. The method will not be robust for various conditions.

3. Suggest possible improvements to your pipeline

A possible improvement would be to smooth the slopes before fitting a least square line.

Another potential improvement could be to let the algorithm adjust the parameters by itself.