Finding Lane Lines on the Road

Reflection:

1. Pipeline:

My pipeline consists of the following steps. First, I converted the images to grayscale. Then, I applied the Gaussian blur on the greyscale image with a kernel size of 3.

Fig: Grayscale with Gaussian blur

Then I applied Canny Edge detection technique of the OpenCV library. The lower and upper threshold for the canny edge detector function is found using the computed median.

Fig: Canny Edge Detection

After that, I took a quadrilateral region of interest in order to mask the canny edge output image to get a masked image for the required region.

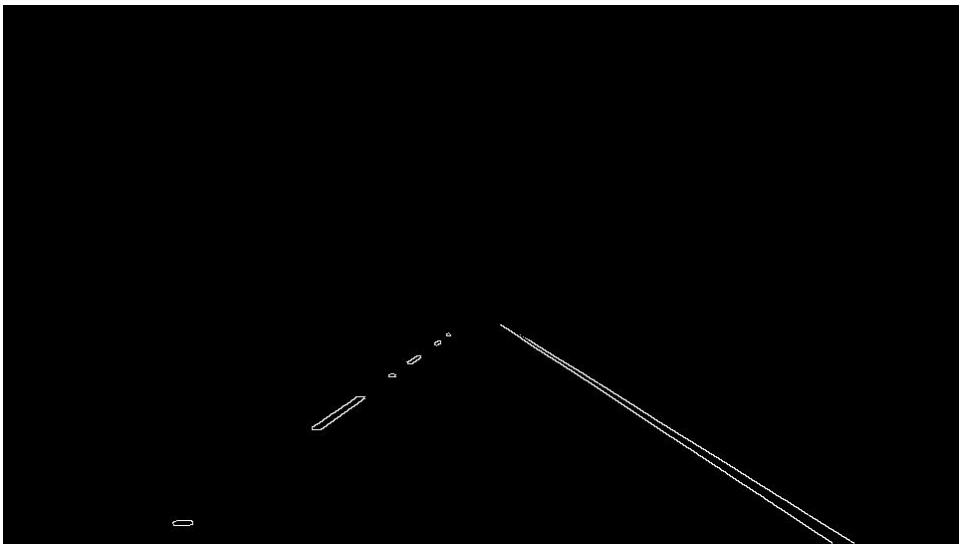

Fig: Masked Image with quadrilateral Region of Interest

Setting the appropriate values for parameters of the Hough transform, detect lines in the masked image.

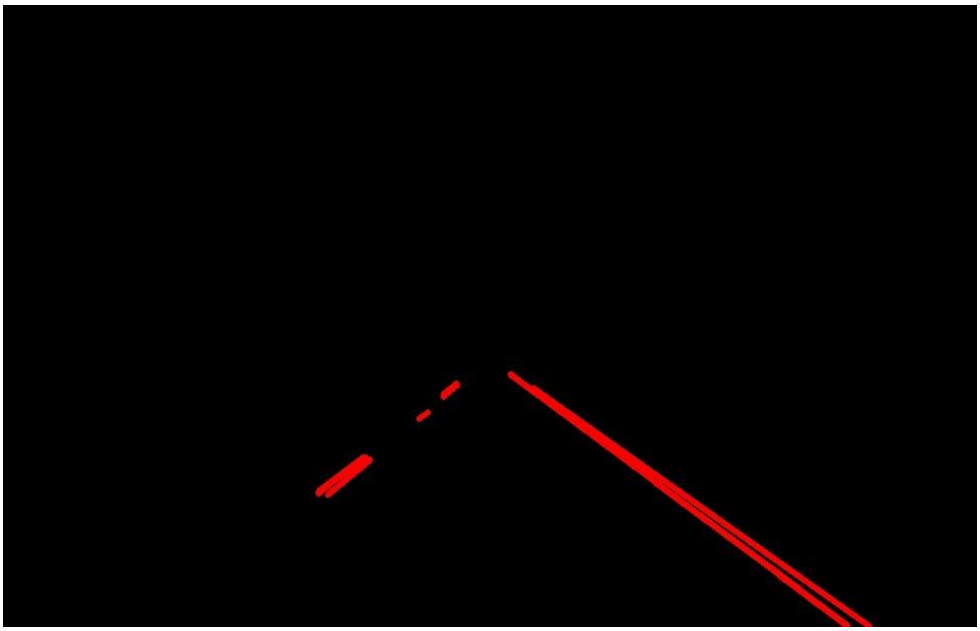

Fig: Hough Transform to detect lanes

In order to draw a single line on the left and right lanes, I modified the draw_lines() function. My base for categorizing the lines into left and right is to calculate the slopes of the lines detected from Hough transform. The right lane will be having negative slope and left lane positive slope.

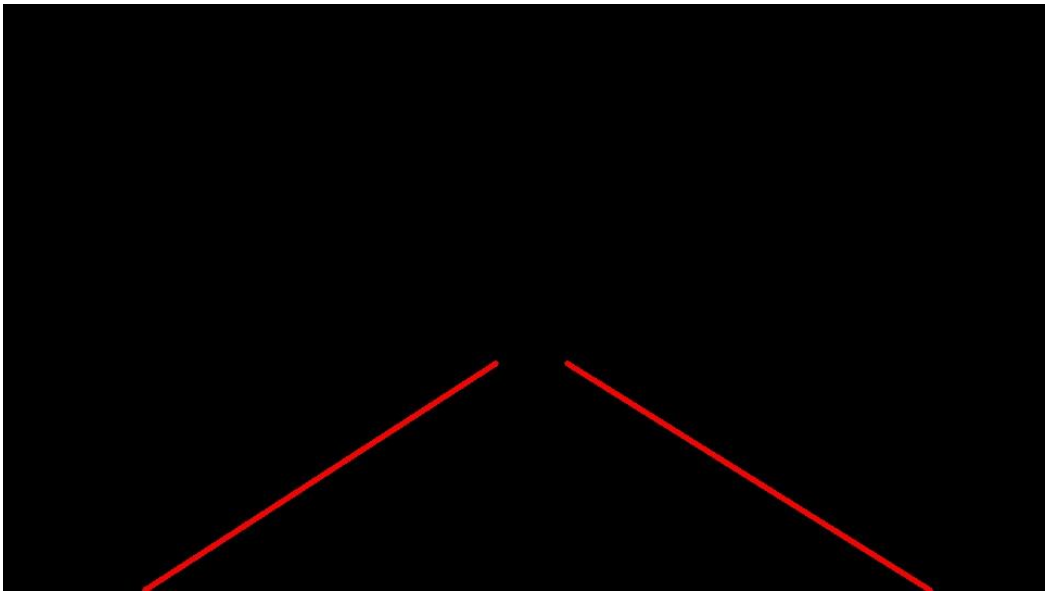

Fig: Extrapolated Left and Right lanes

Out of these detected lines, I took the line segment with the maximum length and chose its slope to draw the final lines on the image for both left and right lanes. I extrapolated these lines from the base of the image up to the region of interest.

Fig: Final Image with detected lanes

2. Potential shortcomings with current pipeline

One potential shortcoming would be that, since I have used the criteria of drawing the line using maximum length of the detected line segment, as a result it gives a noisy result for the drawn extrapolated lines. The extrapolated line segments are prone to vibration depending on the detected line segments.

Another shortcoming could be that, since the algorithm for the detection of lanes, is based on line segments. As a result, it is not able to detect and extrapolate curved lines on the road.

Also, the algorithm fails to detect road when clear lanes are missing in the video frames.

3. Possible improvements pipeline

A possible improvement would be to take the average of slopes of the detected lines and then draw extrapolated new line using this average slope.

Another potential improvement could be to use some technique for curve detection on the road.

We do need some higher advanced techniques in order to detect roads when distinct clear lanes are not visible.