Finding Lane Lines on the Road

Udacity - Self-Driving Car Nanodegree

nandakishor.koka@gmail.com

Reflection

1. Describe your pipeline. As part of the description, explain how you modified the draw_lines() function.

The pipelines consists of

1. Read color image
2. Convert image to grayscale
3. Blur image using a kernel size of 3
4. Apply Canny operator for edge detection. Thresholds = (2,200)
5. Mask image using a triangular area. The coordinates of the triangle were chosen using a few heuristics. Essentially the triangles apex is in the center of the image and the other two coordinates are the bottom left and bottom right corners of the image
6. Identify line segments using Hough transforms (houghlines)
7. Extrapolate line segments using draw_lines() function
8. Merge the original the line drawings using the weighted_img() function

The draw_lines() function:

1. Calculate slope for each line and group the lines into left or right. Left side lines have a positive slope and Right side ones have a negative slope
2. Identify the far left and far right point on the road
    a. Iterate through all the lines to identify the endpoint with the lowest y co-ordinate.
3. Calculate the slope for the left and right lane.
    a. Rounded off the slopes to 2 decimal points and took the most common one
4. Calculate the x coordinates for the starting points (near left and near right) using the endpoint and the slope. We already know the y coordinate for this point i.e. must lie at the last row of the image
5. Draw the line from the start point to the end point

Identify potential shortcomings with your current pipeline

1. The pipeline assumes that lanes are always centered in the image i.e. the car is always aligned along the lane lines. If the road curves too much or if the car moves considerably away from the center of the lane, then the pipeline will fail to identify the lane lines.

2. If a truck or a large vehicle is directly in front of the car. The lanes will be occluded and therefore very difficult to identify

3. The parameters are finely tuned using one of the images. The parameters will not work with different lighting conditions, different weather conditions (rain, snow)

Suggest possible improvements to your pipeline

1. The pipeline does not have any memory. It is identifying lanes in each frame individually. Therefore, it is not always correct. Retaining recent results and using them in identifying lanes will produce much better results.

2. Any methods to automatically determine optimal parameters values will be great for applying to different scenarios.

3. Masking of the image can be more intelligent / dynamic than being static. Analyze how the road is changing and optimize the mask accordingly