

Reflection

1. My pipeline consists of 6 steps.

- Firstly, to be able to correctly recognize yellow and white road lanes, I've applied mask which selected yellow and white color ranges in the image. To make this mask selection robust for both colors in different shadow, asphalt conditions, I chose to apply this mask to the image in HLS color scheme because it provided the best results in identification of those lanes.
- Second, converted masked image to grayscale.
- Third, smoothed image using Gaussian blur filter with kernel size 5
- Forth, identified edges on the image using Canny edge detector with lower threshold of 150 and higher threshold of 200
- Fifth, selected the region of interest on the image where the algorithm will check existence of the lane lines. It is trapeze with such vertices:

`bottom_left = (int(imshape[1]*0.1),int(imshape[0]*0.95))`

`top_left = (int(imshape[1]*0.4),int(imshape[0]*0.6))`

`top_right = (int(imshape[1]*0.6),int(imshape[0]*0.6))`

`bottom_right = (int(imshape[1]*0.9),int(imshape[0]*0.95))`

- Then I used Hough transform to find the lines in that specific region of my preprocessed image. Here are my parameters for opencv Hough transform function:

`rho = 1 # distance resolution in pixels of the Hough grid`

`theta = np.pi/180 # angular resolution in radians of the Hough grid`

`threshold = 25 # minimum number of votes (intersections in Hough grid cell)`

`min_line_len = 25 #minimum number of pixels making up a line`

`max_line_gap = 100 # maximum gap in pixels between connectable line segments`

In order to draw a single line, I modified `draw_lines()` function by weighted averaging of the lines found by Hough transform. As the weight I used the length of the line. Also I excluded all lines which had slope less than 0.2 and bigger than 10 from computation of average line, which means almost horizontal or vertical lines will not affect the score, because lane lines usually have slope in between of those values.

2. Potential shortcoming could be absence of lane lines or, in case of dashed line, too big intervals between lanes parts.
Another shortcomings could be different light conditions, shadows, other cars, different types of the lane lines, etc.
3. Possible improvements would be using several such detectors with different parameters for different conditions or using machine learning to identify those parameters.