

## Writeup

The pipeline consisted of 7 key steps. First the images were converted to HSV to make it easier to threshold filter yellow and white lane line colours. The thresholding values were obtained by using an online color picker and experimenting with different values until mostly the lane lines remained. Second, they were converted to grayscale. Third, the gaussian filter was applied with a kernel size of 5 as this removed most of the high frequency details while keeping the original shape of the lanes. Fourth, the canny edge detector was applied. A ratio of 1:2 was applied as it delivered the best performance for edge detection. Fifth, each image was filtered based on a general region of interest which isolated the edges for only the ego lane lines. Sixth, the hough line detector was used to determine the lines in the images. A small line length and a large line gap were used to connect the dotted white lines to form a singular line. Seventh, regression was performed on the line segments. This involved classifying the left and right lane lines based on a slope threshold value and fitting the line segments to a RANSAC regression algorithm to remove outliers. Lastly, these lines were overlayed over the original image.

The main shortcoming with this pipeline is that it can only identify lines for straight or slightly curved roads. This is not useful as there are always curves in any road. Another shortcoming is the manual tuning of many parameters. The region of interest may not work for other cameras or at different inclinations. Also, the colour thresholding would change based on the lighting conditions of the road. The last shortcoming is that this can only detect the ego lane with the correct lane markings. It cannot detect multiple lanes or lane boundaries. Additionally, it cannot detect a lane when one of the features is missing (if there is construction).

To improve the line fitting a spline could be used instead of a line. This would help with curved roads and improve the accuracy of the lane detection. Another improvement could be to fine tune the region of interest based on the specific camera being used as well as inclination. For example, an IMU could detect the pitch of the vehicle and the region of interest could be adjusted accordingly.