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Udacity- Self Driving Car Course
Term 1

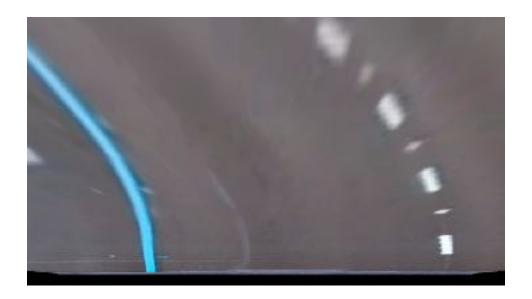7 November 2017

Advanced Lane Line Finding

In this project we aim to detect lane lines on the road using more advanced techniques than the one used for the first lane line finding project. We introduce color selection using different color spaces and sober gradient to reduce light and noise influence. In a second part we average our lane line calculation over the video stream frames to give a smoother detection.

Lane Line Detection Pipeline

Camera Calibration and perspective transforming

We start by preprocessing the lane line images. We calibrate the camera and do a perspective transform to facilitate the line detection:

Color selection

Once we applied the perspective transform we start our line selection process using a color section. We transform our image to the HLS color space. This helps us mask the yellow lines using the saturation value and the white lines using the light value. We finish by calculating the Sobel on the image's light channel over the vertical direction. We combine the three resulting images to get our final preprocessed image.

[Saturation Channel Masked]

[Light Channel Masked]

[Sobel X on the light channel]

[Combined Channels]

Window Search

We use the window technique to detect the line. To do so we start by taking the pick values of the image's histogram to identify the left and right lane starting points. We slide the window to detect all the lane points we use linear regression to construct a line from the detected points. We average the lane points over 10 frames to get a better estimation. To do so we use linear regression one more time.

Curvature Calculation

We print in the terminal the current lane line curvature for both left and right lines. To calculate the curvature we first transform the image points to the world space and then we use the fitting equation to calculate the curvature.

Sanity Check

We check whether or not our detected lines are correct or not by checking the difference in curvature between the left and right lines. We check as well whether or not the left and right lines are parallel.

Conclusion

In this project we've been able to use new techniques for lane line detection as color selection using HLS and HSV color spaces. We learnt as well to detect lines by direction and the window searching techniques. We can improve our detection by tweaking more our color thresholds the window parameters.