Project 1 Find Road Lanes

September 12, 2017

1 FUNDAMENTAL PIPELINE

The project 1 and corresponding course talked about how to find road lanes using conventional computer vision methods. More precisely, it included the following techniques:

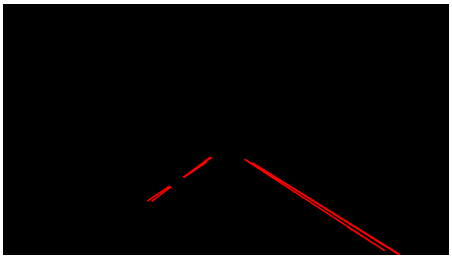
1. Color selection. First I using color selection to hopefully keep only yellow and white color which are lanes colors.
2. Using ROI (Region of Interest) selection to keep the heuristic regions and remove unrelated regions.
3. Generate gray image as input of Canny detector.
4. Canny edge detection to help determine the region of edges.
5. Hough transform to find lines in the image.

Using the above-mentioned steps and tuning the parameters with trial-and-error, I acquired the detected lane as follow:

2 HOW I MODIFY THE DRAW_LINE FUNCTION

From Fig 1.1 and compare with the figure show on P1, we would like to connect line segments to produce a clear line. And the ultimate goal is draw just one line for the left side of the lane, and one for the right. Since I have multiple segments. Ideally, I would like to merge the segments to a two lines. In other words, I would like to have 2 slope values which denotes left lane and right lane respectively.

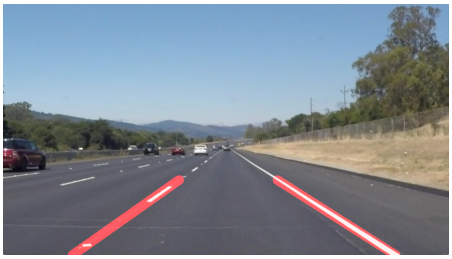
(a) Original image



(b) Detected hough lane lines

Figure 1.1: Results of line segments from fundamental pipelines

(a) Original image



(b) Detected averaged hough lane lines

Figure 2.1: Results of modified pipelines

1. Find 2 groups of lines (scope and intercept). The left lane and right lane will be determined by the slope of line. More precisely, if $slope < 0$, it will be considered as right lane S_r, I_r, otherwise left lane S_l, I_l.

2. Calculate the mean value from two set of scopes and intercepts. Draw 2 lines using the mean value scopes and intercepts.

3 Potential shortcomings of my current pipeline

In my opinion, the above mentioned pipeline has the following shortages:

1. There are a number of thresholds and color parameters need to be manually pre-defined as a constant value. In other words, the method may easily failed under various conditions, such as weather and the position of camera.

2. Color feature is useful but very sensitive to the illumination changes.

3. The fundamental ideas is the left and right lines are straight lines, which is not true with curve on the road. In this case, only a small part of lanes are straight.

4 POSSIBLE IMPROVEMENTS

The rule-based method need set a number of rules to make sure we find the correct location and right color space. It will suffer from the practical problems which has a large number of various conditions. In addition to using adaptive threshold selection, I would try to using learning-based method to find lanes. The advantage is I can learn difference parameters from large number of practical training data.