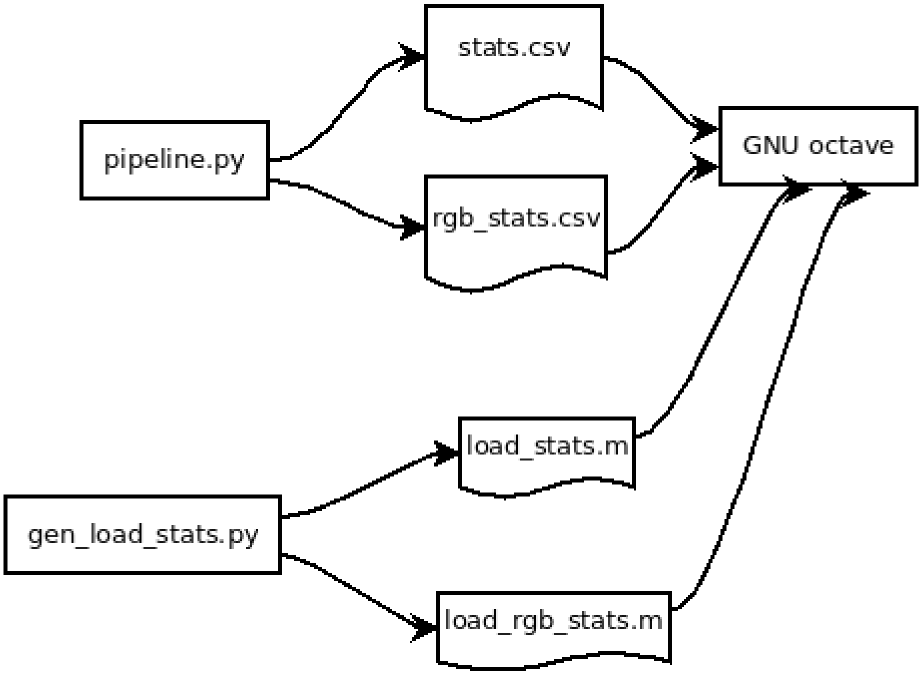
Lane Lines Detection Writeup

The greatest challenge was the choice of metrics. In order to collect some useful data I wrote `pipeline.py` and several GNU octave scripts:



`pipeline.py` generates CSV files that contain a lot of numbers =) Several numbers turned out to be useful.

As I found out, the most useful metrics are

- line count – reflects the quality of colors selection (it seems so) and shows whether Canny parameters are chosen well
- left/right lane slope/intercept – shows whether Hough parameters are chosen well

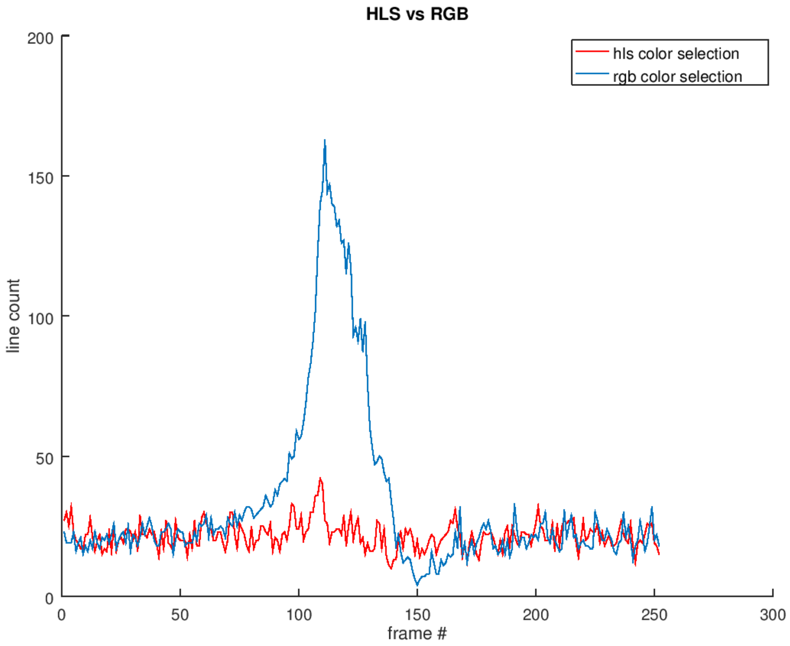
Here are some pictures that illustrate my findings.

(I known it's better to use just one metric, but ... you know ... I will improve ... I promise)

Note: Only *Challenge* clip illustrations can be found here (because *Challenge* is the most challenging)

Color selection

I used the HLS color space, and the following picture shows why I did so:



`line count` plot for RGB is so crazy that it drives me mad. The blue peak is particulary irritating =) I don't think it is OK. And I don't think it's a coincidence because it appears right in the area with the shadow.

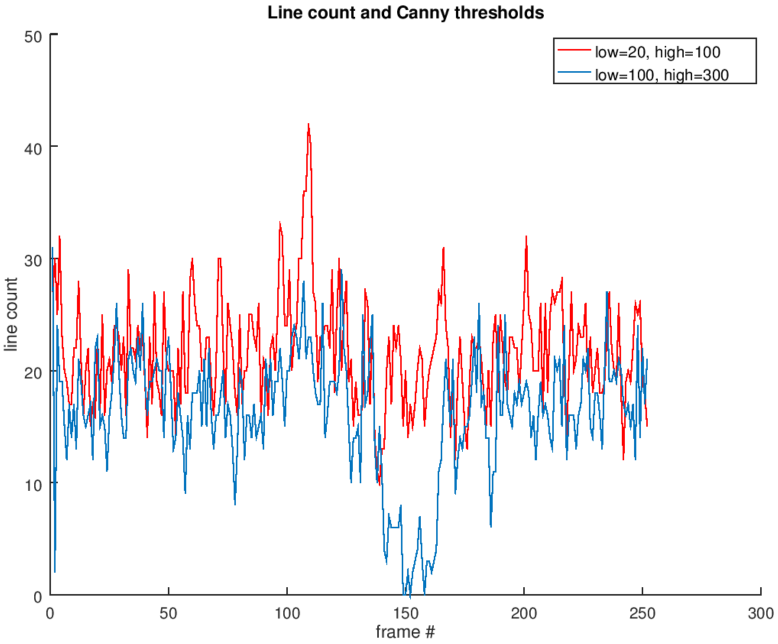
In addition, here're the moments for `line count`:

- HLS: mean 19.722, std 4.3960
- RGB: mean 27.484, std 25.703

Looks like HLS wins.

Canny thresholds

What I was trying to do is to minimize `line count` after the Canny step, but I realized that a too small `line count` is also no good. So, I chose a variant when Canny returns 20 lines in average.

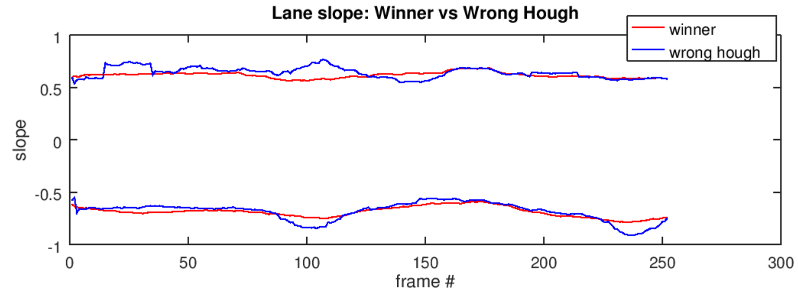


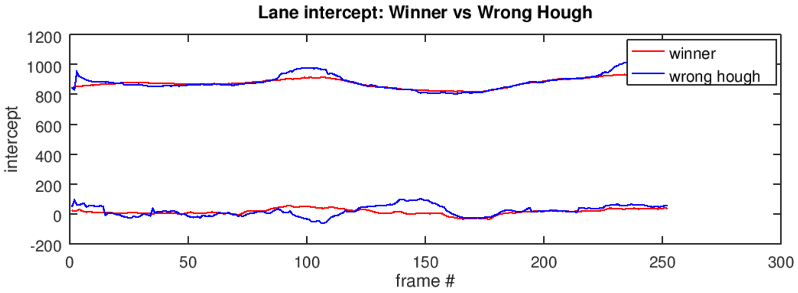
What's more, the moments turned out to be informative:

- Red series moments: mean 21.6786, std 4.86018
- Blue series moments: mean 16.2063, std 5.67137

Hough parameters

I decided that `slope` and `intercept` should not change abruptly. It is important to choose the right Hough parameters:





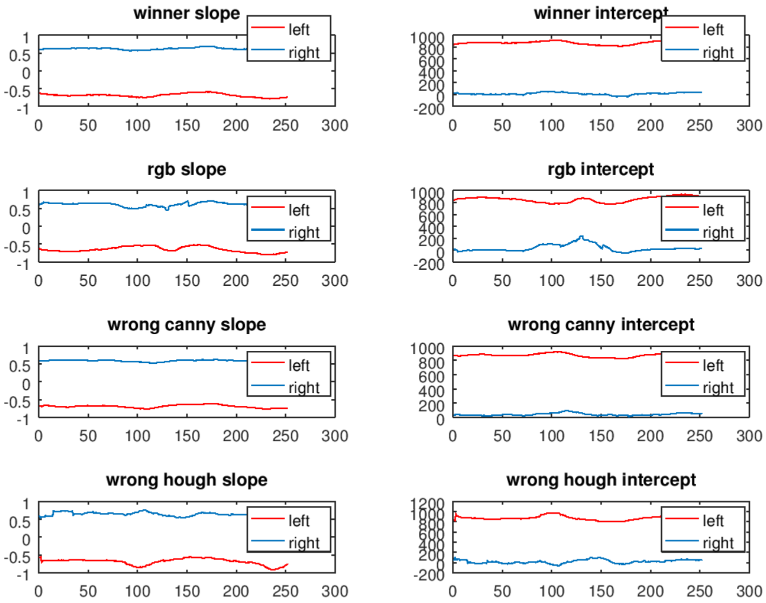
Winner Hough parameters:

- `rho`: 2
- `theta`: pi / 180
- `threshold`: 20
- `min_line_length`: 20
- `max_line_gap`: 400

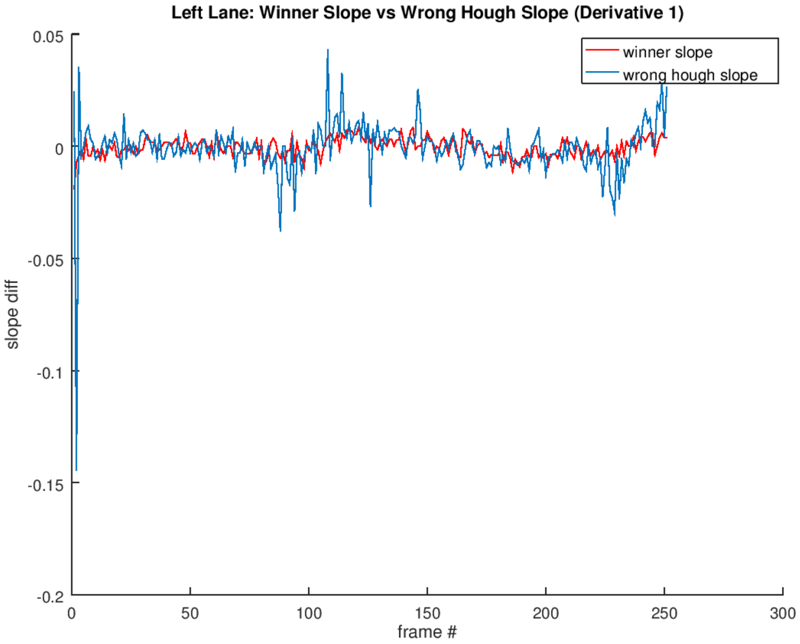
Wrong Hough parameters:

- `rho`: 2
- `theta`: pi / 180
- `threshold`: 10
- `min_line_length`: 10
- `max_line_gap`: 40

However, this is not enough. Color selection and Canny parameters are also influential:



The pictures above show values of `scope` and `intercept`, but, in fact, it is better to use derivatives (I realized it later):



Here's another irritating peak.

Conclusion

- I need more than one week to understant it ALL
- It's better to have a separate script for each Tested Pipeline
- It's better to have an external configuration file with Pipeline parameters
- I know that there're Illumination Invariant representations of images, and I think they should be better . . .
- I ommited the Noise analysing step, and this might be a path for imporvement
- I think my pipeline will go nuts on the curvy road in the mountains