Computer Vision 2021 Lab 4

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Note: this homework was done before the homework for Lab 3.

1 Goal

Segment the street lane and the round street sign from a given image.

2 Implementation

The implementation closely follows the provided guide for the homework.

Canny edges and and Hough lines are calculated at once to more efficiently fine tune the parameters. For this purpose, `vconcat()` was used to concatenate the image results.

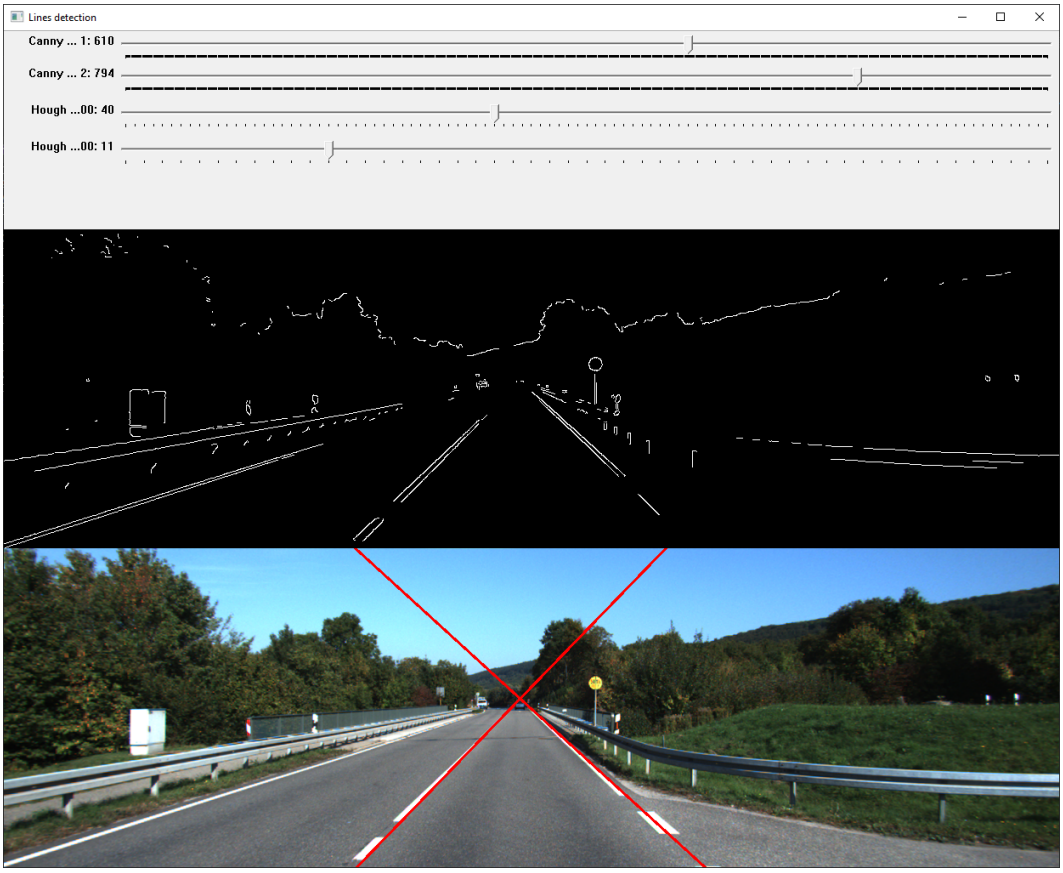
For the Hough circles I preferred using an externally provided Canny edge detection step instead of using the one included in `HoughCircles()` . Being able to see the edges middle result made it easier to identify the correct circle.

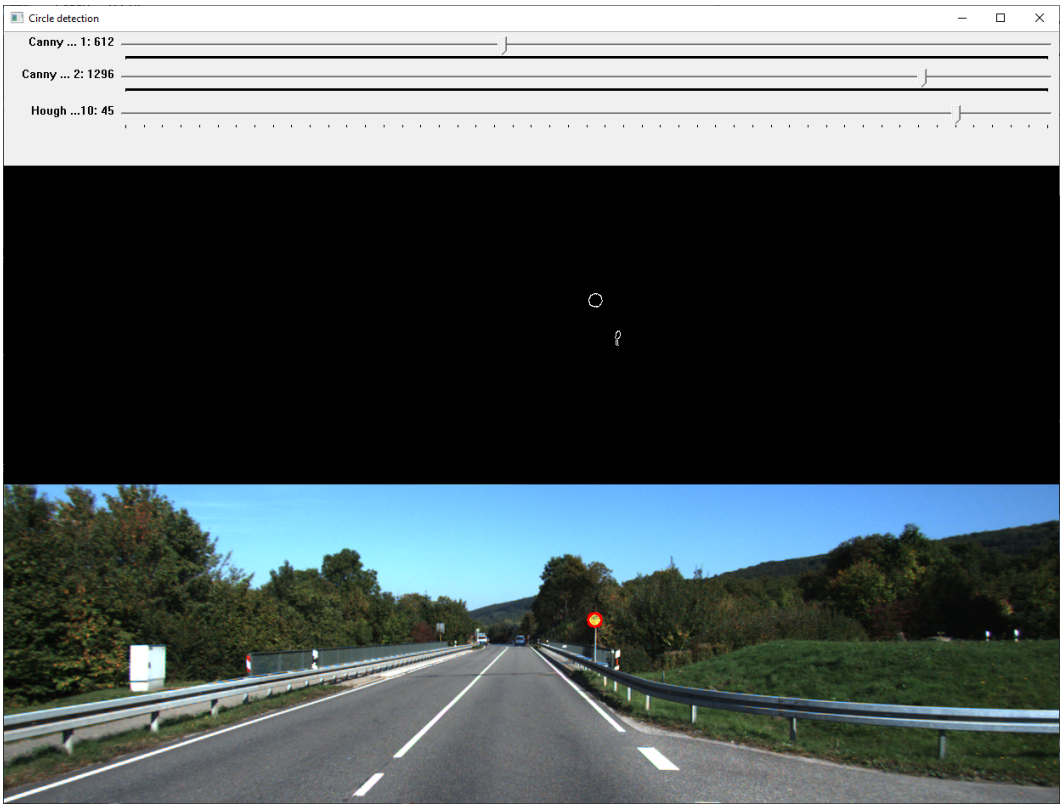
I encountered some problems with the trackbars and parameter tuning. OpenCV trackbars only support integers, so a scaling factor was needed for some parameters, making the code more bloated. The Hough parameters were very noisy (small variations made big changes in the identified lines); this might be caused by me using the wrong scale for the parameters.

3 Results

```
========== Strongest 2 lines ==========
Canny threshold 1: 610
Canny threshold 2: 794
Hough accumulator rho resolution: 0.4
Hough accumulator theta resolution: 0.11

========== Strongest circle ==========
Canny threshold 1: 612
Canny threshold 2: 1296
Hough inverse accumulator resolution: 4.5
```


Lines detection
Canny ... 1: 610
Canny ... 2: 794
Hough ...00: 40
Hough ...00: 11


Circle detection
Canny ... 1: 612
Canny ... 2: 1296
Hough ...10: 45


Result

4 Conclusion

While the requested exercise have been delivered successfully, a more general approach should be used to perform this kind of segmentation. The recognition of the street lane greatly suffered from noise in the parameters space. A more robust approach would be to identify multiple lines and then filter them with some heuristics (identifying the horizon line, taking into account an estimation of the expected angles of the lines).