

# Homework 2 OpenCV

Computer Vision 2021/22

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This homework report purpose is to provide the experimental results of some application of OpenCV library. In this case we're going to see some application of line detection algorithms. Comments on problems encountered and conclusions are also provided at the end of the document.

This is the original image we're using for our purpose.



Image 1: Original Image

## Task 1

Task 1 simply requires to compute a binary edge image using canny algorithm. To obtain sharper edges and less noise for the next steps the image is previously equalized ( function "equalizeImage" in "Lab4.cpp" ) focusing in the range  $[200,255]$ , in this way we take advantage of the fact that the lines are white ( high brightness level ) to better distinguish them from the rest of the image. (Image 1)

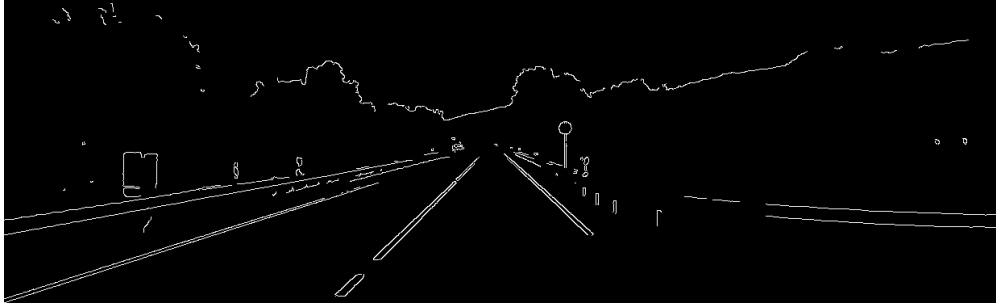


Image 1: Canny

## Task 2

Task 2 requires to elaborate a new algorithm from scratch that detects the white lines in the center of the image. The algorithm provided in the source code "lineDetect()" takes the input image and resizes it to avoid excessive computational load. Then for every pair of points it calculates the number of points with brightness level higher than a given threshold along the line connecting the pair. The algorithm also provides length and accuracy of the line just calculated. The list of pairs is then sorted by these parameters and the most accurate lines are displayed (Image 2).

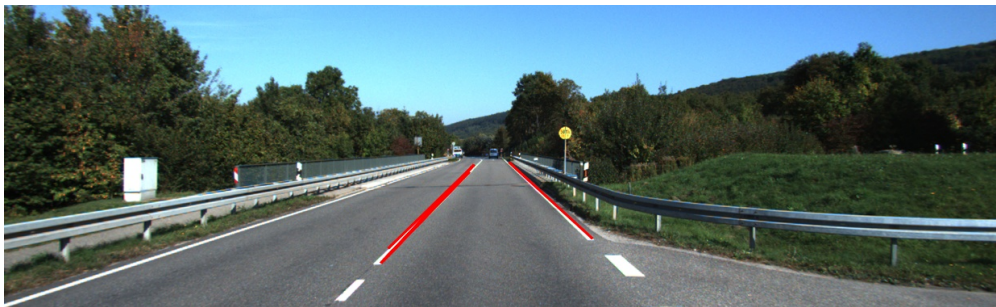


Image 2: lineDetect

## Task 3

In this task we need to detect the white lines like in the previous one but using Hough transform. In particular we're using "HoughLines" function to obtain a list of possible lines, which are then filtered by desired angle. Parameters are tuned to correctly recognize only the 2 lines we require, using the data obtained from the Hough algorithm we then plot the 2 lines and also the convex poly between these representing the street lane.

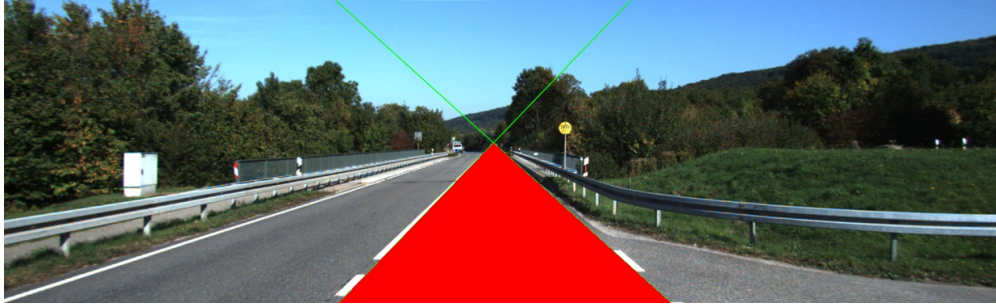


Image 3: HoughLines

## Task 4

The last task consists in using HoughCircles function to detect the yellow sign on the side of the road. Due to noise problem and the size of the sign, before using the function we pass our image through a bilateral filter to obtain better results. A red circle is plotted on top of the road sign (Image 4)



Image 4: HoughCircles

## Conclusions

The main problems encountered in this homework mainly concerned the elaboration of a detection algorithm from scratch. Despite the overall simplicity of the algorithm provided, making it function with an acceptable performance in very small computing time was not very easy. It was also tricky to tune all parameters of the functions to make everything to properly.