Computer Vision

Report - Lab 4

Edge detection and Hough transform

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A.Y. 2018/2019

1 Segmentation of street lanes

The first assignment of the homework was to segment and extract street lanes using the Hough transform and to color the rightmost lane in red.
First I used the "Canny()" function, which implements the Canny algorithm, to run the Canny edge detection. The goal was to set the right parameters in order to keep useful edges and reject not necessary ones. I transformed the image in greyscale and then set the first threshold to 250 and the second to 750. In this way the edges corresponding to the street lanes were detected correctly. The result is shown in Figure 1.

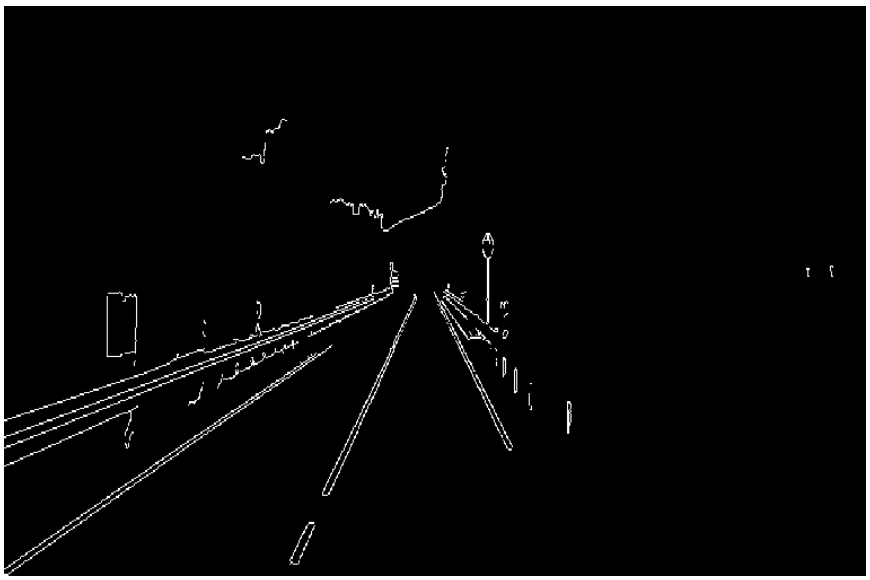

Figure 1: *Edges extraction with Canny algorithm*

The second step was the detection of the rightmost lane using the Hough transform, implemented with the function "HoughLines()".
In order to find the optimal parameters I used a trackbar that allowed to change the values of rho, theta and the threshold. The following optimal values were found (Table 1):

Parameter	Value
Rho	$\frac{\pi}{3}$
Theta	$\frac{\pi}{4}$
Threshold	75

Table 1: *Optimal parameters values for the function "HoughLines()"*

The extracted lines are shown in Figure 2.
The next task was to color the space corresponding to the street in red. To do so I computed the intersection point of the two lines and I used the function "fillConvexPoly()" to fill the pixels of the resulting area.
The result is shown in Figure 3.

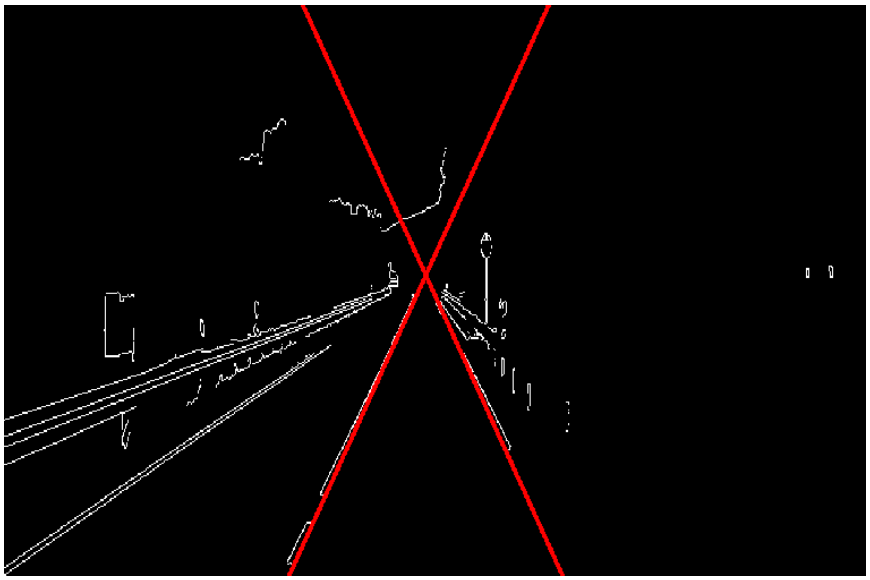

Figure 2: *Lines extraction with Hough transform*

Figure 3: *Result of the extraction of the street lane*

2 Segmentation of round street signs

The adopted procedure to extract the area of the street sign was similar to the one adopted to extract the street lane.
Now, instead of extracting lines, the objective was to extract circles. For this reason I used the function "HoughCircles()", which implements the Hough transform for the detection of circles and automatically computes the edges, so that it was not necessary to run the Canny algorithm manually.
As I had done before, I used a trackbar to set the optimal parameters for the function, which are shown in Table 2.

Parameter	Value
minDist	$\frac{image\ rows}{101}$
param1	2
param2	22
minRadius	6
maxRadius	13

Table 2: *Optimal parameters values for the function "HoughCircles()"*

To show the detected street sign I used the function "circle()" which draws circles given the center and the radius, setting the parameters such that the drawn circle was filled in green. Figure 4 shows the obtained result.

Figure 4: *Result of the extraction of the round street sign*

3 Final result

Merging the two obtained results we have the final image (Figure 5), in which we can see the segmentation of the street lanes and of the round street sign.

Figure 5: *Final image obtained after the whole process*