Finding Lane Lines on the Road

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Report

Describing the pipeline

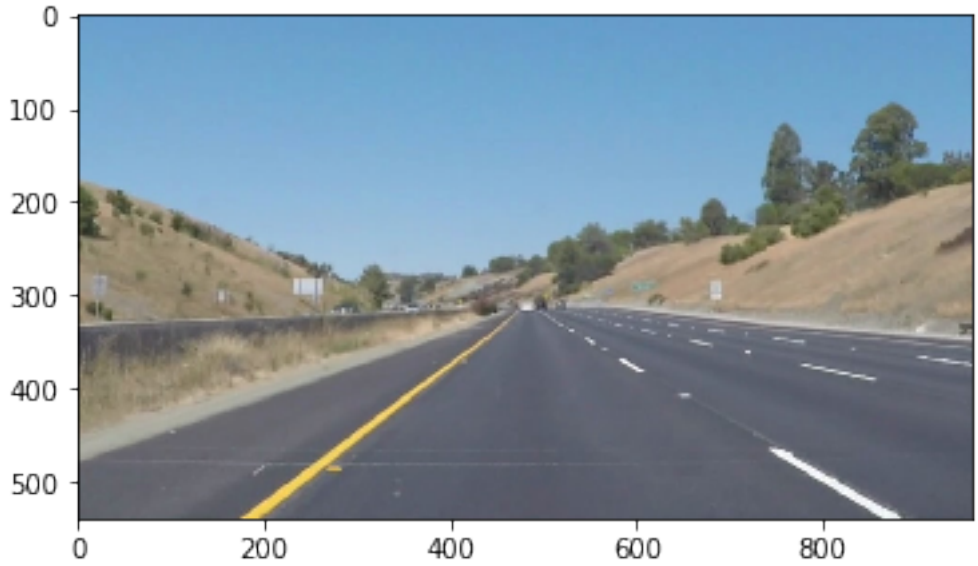

Figure 1: Initial Image

I will explain my pipeline using the image,“WhiteCarLaneSwitch.jpg”(Figure 1).

First using the cv2 functions I changed the color of the image to gray (Figure 2) and applied the Gaussian Blur with kernel_size = 7 (Figure 3)

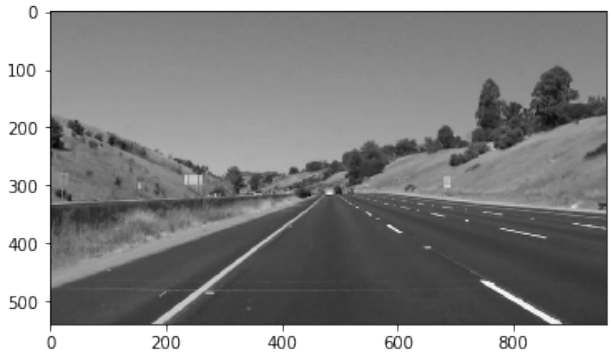

Figure 2: Gray Image

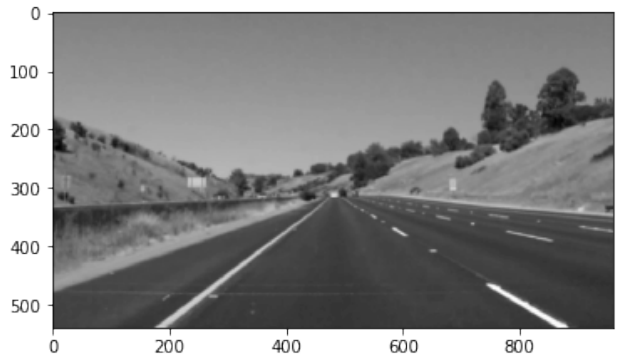

Figure3: Gaussian Blur

With the Figure 3, I applied the Canny Edge Detection to observe the gradient of the image and I had alternated the Low Threshold and High Threshold to find the better detection of the lines (Figure 4). As a result, the image only shows some shapes of the things. With the intention to filter only the lane lines I defined a region of interest, showing only the lines of the road (Figure 5).

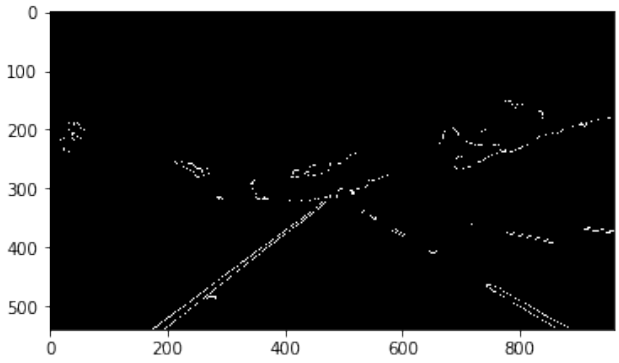

Figure 4: Canny Edge Detection

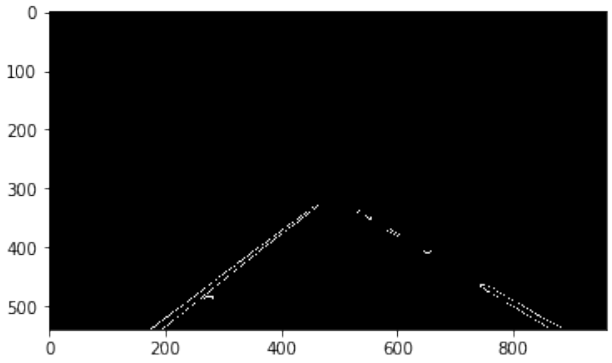

Figure 5: Region of Interest

Now with only an image with the lane lines I could detected then with a Hough Transform, defining the variables: rho = 1 ; theta = $\pi/180$; threshold = 15 ; min_line_len = 100 ; max_line_gap = 150. Consequently, I got the lines (HT_Lines) that represent the solid line and the segmented line of the image.

Finally, to draw a unique line in each lane line I had separated the right and left HT_Lines and obtained the average of each side. As well as that I expanded this average lines in all the scope of the region of the interest, resulting in the final image (Figure 6).

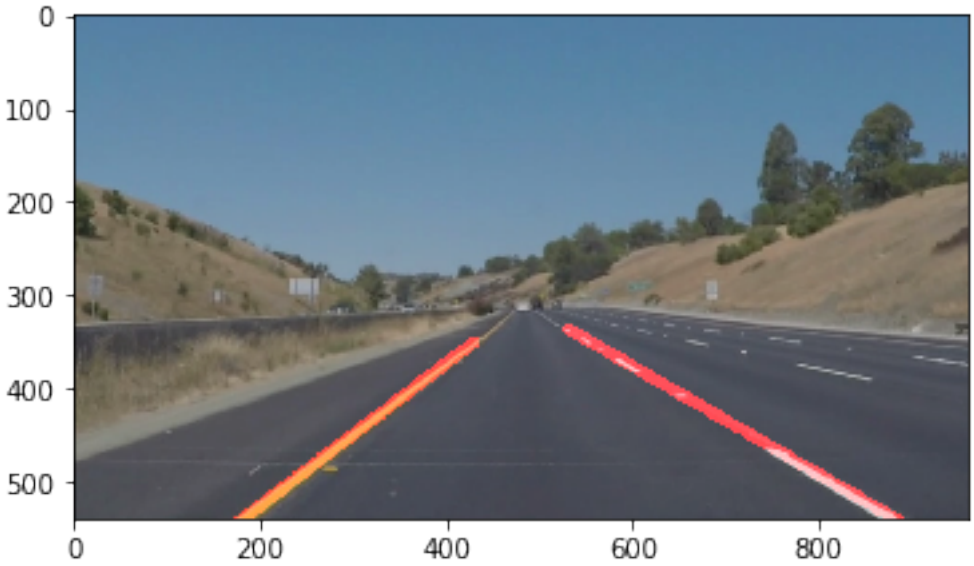

Figure 6: Final Image

Potential Shortcomings

One potential shortcoming occurs when exist some lines on the road different from the traffic lane. That appears when I ran the “SolidYellowLeft.mp4” video (10:12s) (Figure 7).

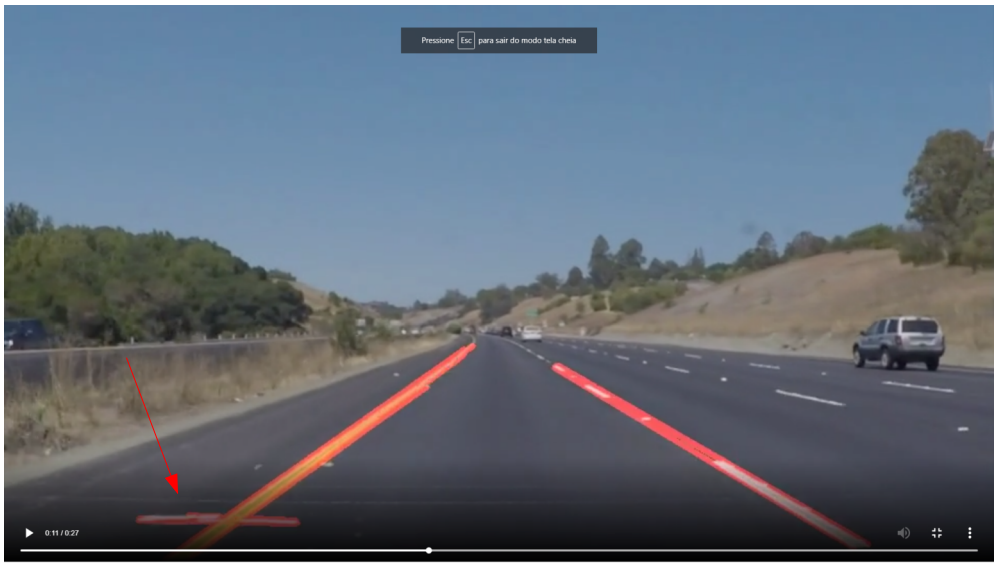

Figure 7: Shortcoming

As we can observe, in the left bottom of the image, the Hough Transform detected this line as a lane line, so this change makes the right HT_Line unstable. To filter this problem, I established a threshold of the lines to define the HT_Lines.

Possible Improvements

There are many improvements to do in my pipeline. For example, the shortcoming that I show, probably could be fixed with a better choice of the Hough Transform variables or the Canny Egde Detection thresholds.

Another improvement that may decrease the time of the processing image is to restrict the area of the interest before use the methods to find the lane lines.

Finally, my project results in 2 solid lines that represents the lane lines of the road. On the other hand the represents lines change very fast from one measurement to another, different from the video “P1_example.mp4” that the lines appears more stable. Maybe some filter help to fix this problem.