LICENSE PLATE
DETECTION & RECOGNITION

Deniz Pelen

23 September 2020

Contents

1 INTRODUCTION

2 STEPS OF LICENSE PLATE DETECTION

2.1 Eliminating the unsuitable contours

To consider a contour as a number or character, there is some restriction. Its height and width must be proportional. The proper scale for height/width is between 1 and 5. The minimum area of a contour is defined, it can be changed according to images that is processing.
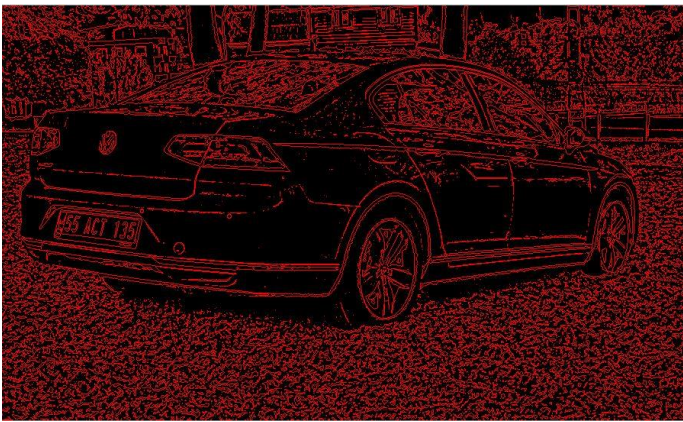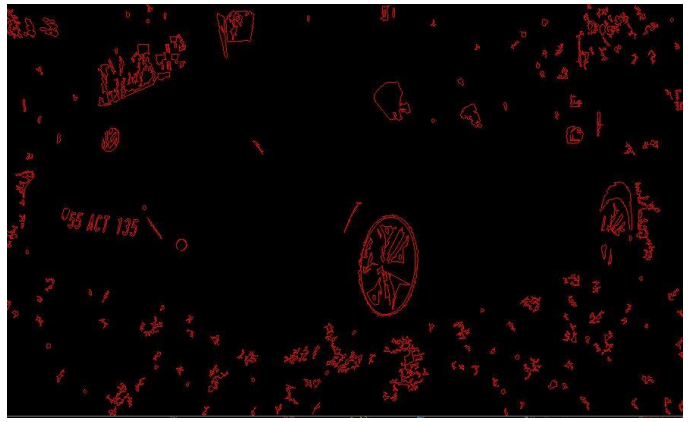
Figure 1 Original image

Figure 2 All contours

Figure 3 Suitable contours for a character

2.2 Looking for similar contours

After eliminating the improper contours, this step tries to observe for each contour that whether a contour is matching to another contour in the image. To approve the match between two contours, their dimensions must be similar and the distance between them must not exceed the three times of their heights. The function returns the list of contours that each contour in it has at least one similar contour.

Figure 3 Contours that has at least one matched contour

2.3 Hough Transform

Since, characters on a license plate are aligned straight. We can take one more step to extract license plate by finding contours which create a straight line. This function performs the hough algorithm and returns the groups of contours that creates a straight line . I focused on license plates which all characters in it have the same size approximately.
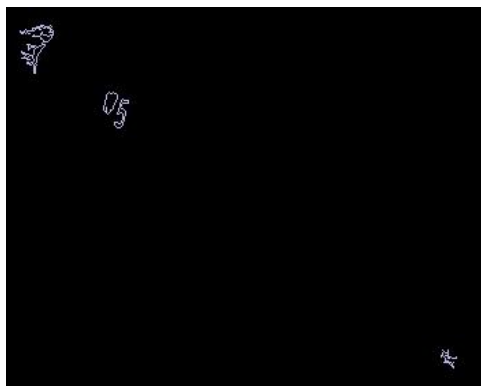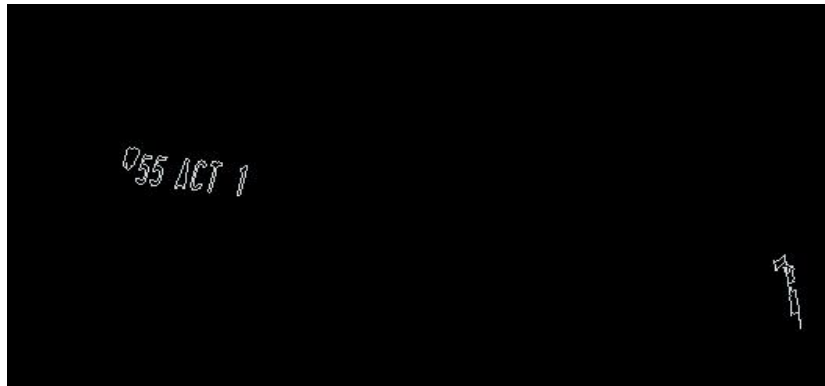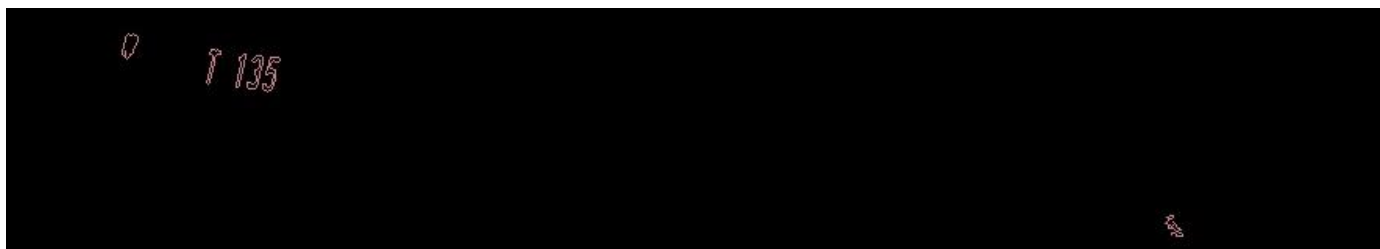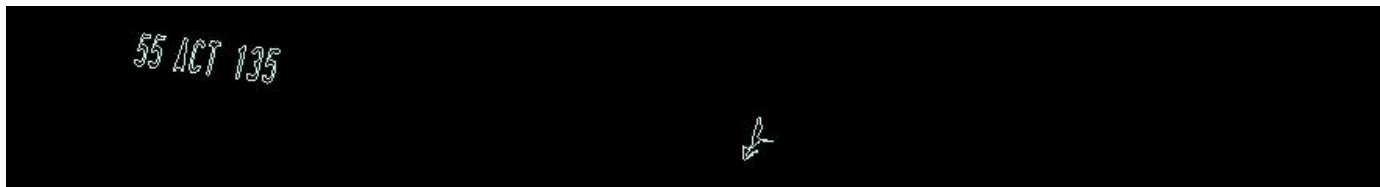

Figure 5.1

Figure 4.2

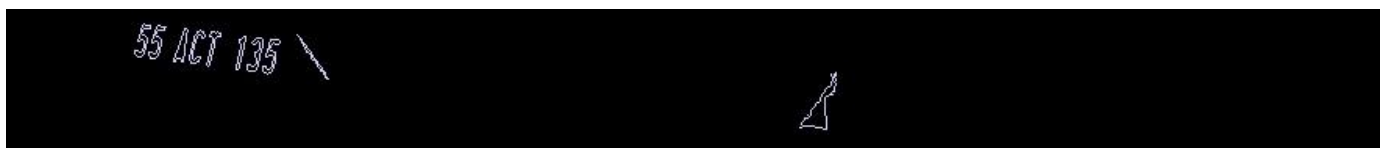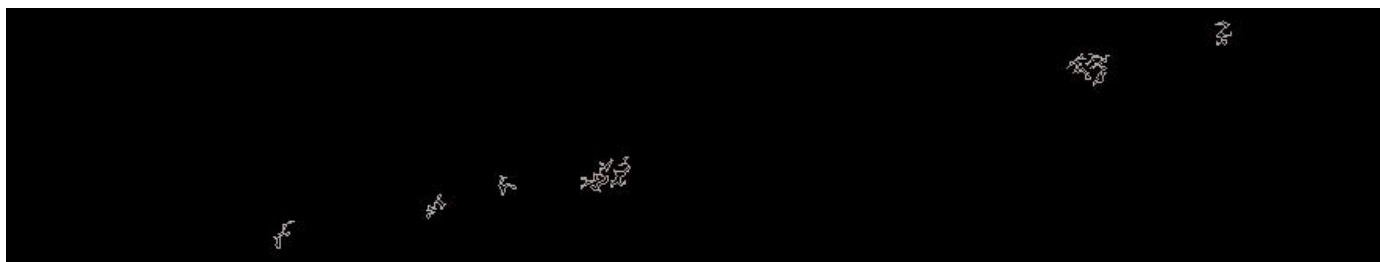*Figure 4.3*

Figure 4.4

Figure 4.5

Figure 4.6

Figure 4 Some results of Hough Transform

2.4 Processing the result of Hough Transform

In this step we will work on the results of hough transform. This step figures out which contours in a group does not satisfy the dimension and distance conditions. Again, if a contour's height is not similar to contours which is around it and if it is far away from others, this contour will be removed. Additionally, a function compares sum of widths of contours in a group and the distance between the most left contour and the most right contour. Sum of the widths should be close to total width of group.
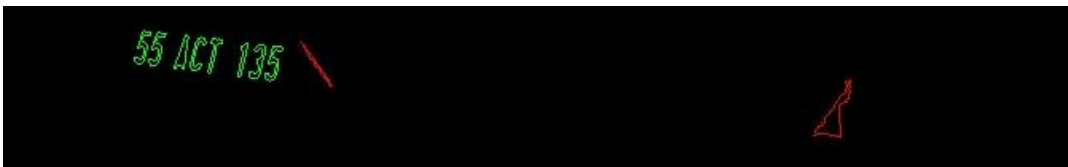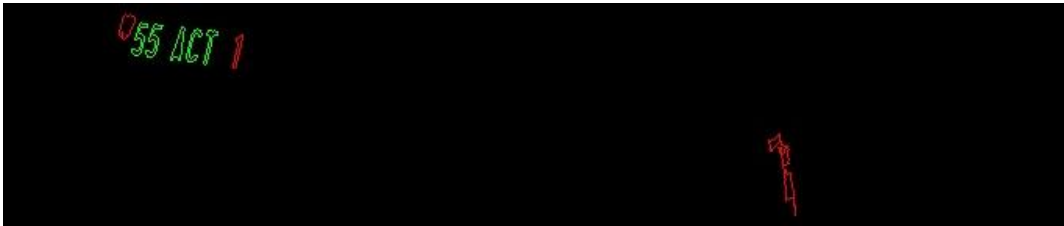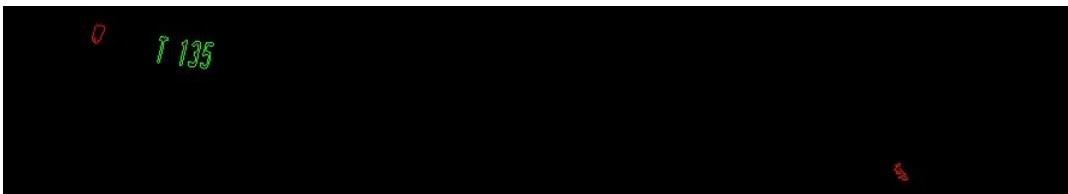

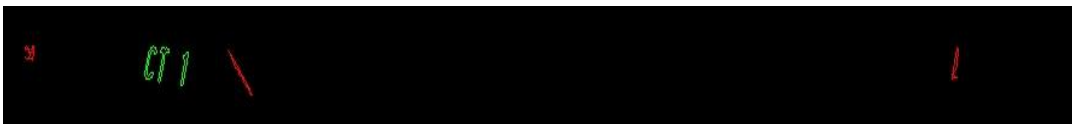
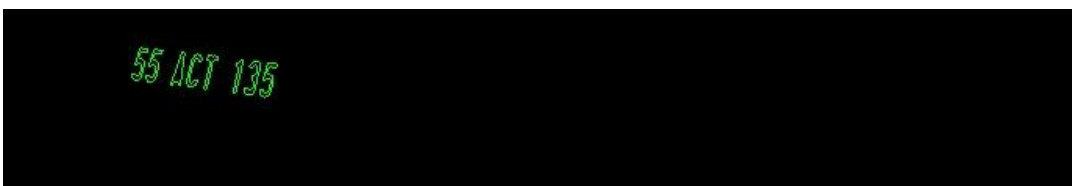Figure 5.1

Figure 5.2

Figure 5.3

Figure 5.4

Figure 5.5

Figure 5

In the figures above, red contours do not satisfy the conditions. They will be removed. Sometimes the whole license plate may not detected like in the figure 5.5 and 5.1. To solve this issue, these groups are combined. For example, program combines the figure 5.3 and 5.4 and also the figure 5.2 because they have mutual contours.

2.5 Extracting the license plate

Last step for the detection is changing the perspective of license plate and extracting either each character alone or whole plate. Since aim of this program is to process images found on the internet like content of used car websites. License plates in these images do not always face towards camera and they are in perspective. Using the angle of license plate, we transform the image geometrically.

Figure 6 original license plate

Figure 7 geometrical transformation applied

If the vertical slope of license plate is too much. After the geometrical transformation, characters do not stand upright. This makes recognition of characters difficult.

2.6 Recognizing the characters

Tesseract is used to recognize characters and KNN can be used. KNN is not ready to use.