License plate recognition.

I dissected the problem into 2 parts first find the license plate . After that read the problem from it.

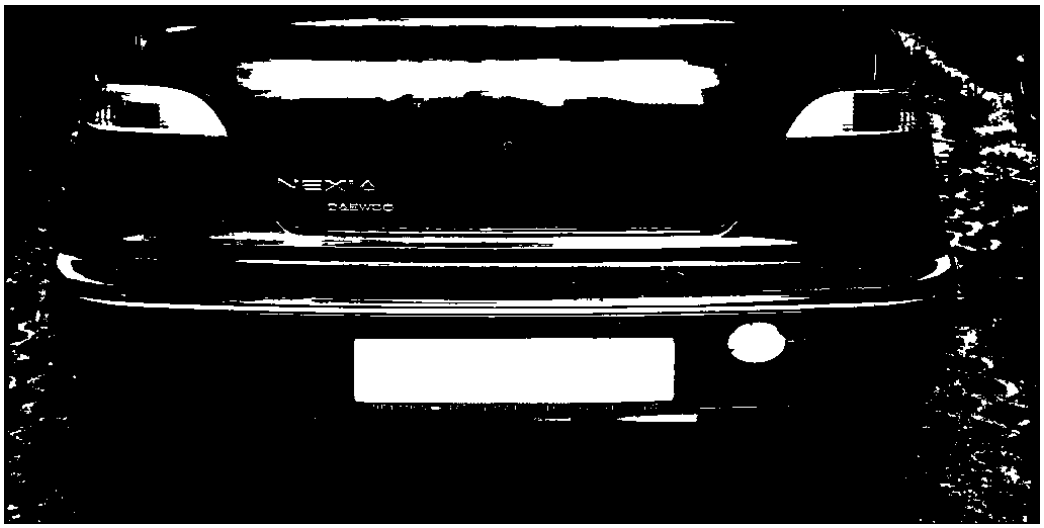
Finding the plate.

At first I tried simply just converting the image into grayscale than applying a threshold to it to find the white parts . But if there are more than separate white parts in the image I would than have to do shape recognition. Which didn't feel like the point of this exercise nor did I find any kind of built in ransac method for matlab. After this I started using all the channel information which gave back a better result for finding the truly white areas more accurately. With the help of the threshold I simply create a mask for the image . After which I apply three methods first imclearborder so the image won't have any kind of problem with proper borders . I use the default value here changing it didn't have any benefit since it's rare that the main problem is distinguishing between the car and the license plate .After this I apply BWlabbel in earlier stages this was also used to find out if the image didn't oversepareate white areas making them too small. Finaly imfill to completely clear away the letters and any kind of symbols from the plate.

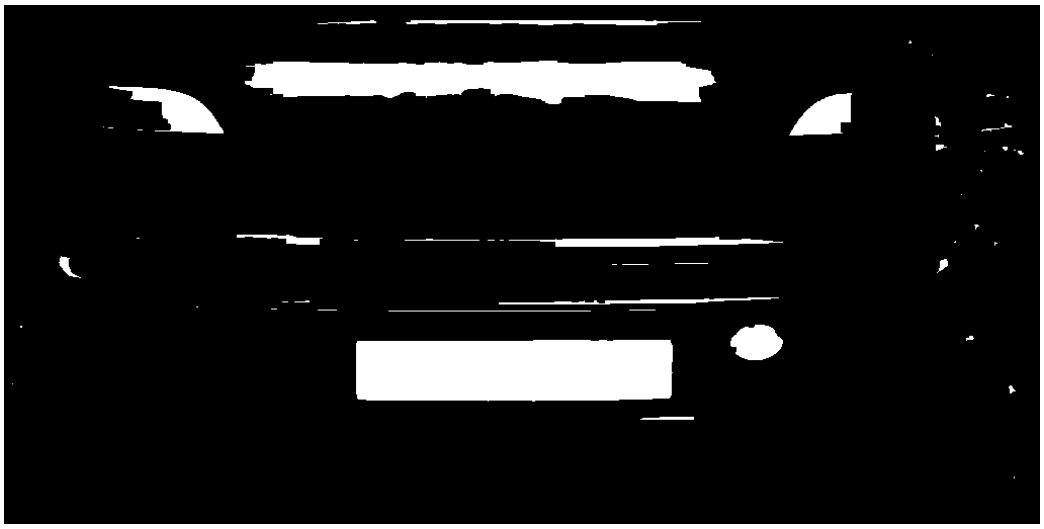
Also I cheat here a bit and only concentrate on parts of the image where I know the license plate will be so I cut of the top third of every image .

After applying threshold to the image:

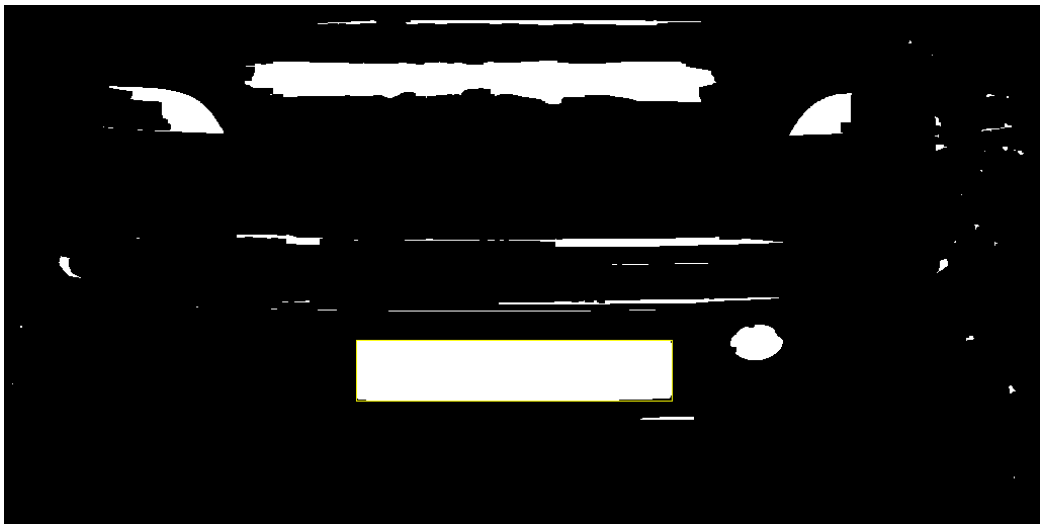
After applying infill to get rid of the letters:



I apply erosion to the image with a 5 pixel wide square . This will erode any thing that's too small. Thus clearing up the image for us.



After this I used regionprops to find all possible areas within the image which remains both getting a bounding for them and the area after this I search for the area with largest number of white pixel since the bounding box is a box I kinda do a shape search . Before this I also apply a minimum area requirement so any area which might entire fill the bounding box is filtered out .



Reading the plate

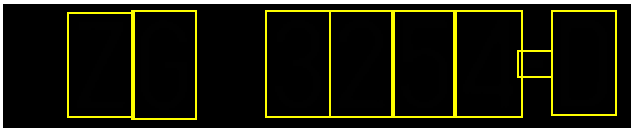
After this I cut out the lincese plate from the image and use the grayscaled image created previously and only use the coordinates from the entire previous part.

Using the imclearborder and imfill again but for the reverse porpuse to make the letters into one piece fully connected parts for the regionprops again.

From the region prop I get both bounding box and area again to filter out anything that's too small to be a letter mostly the symbol in the middle of the plate. Since I know because of the cut how large the plate is .

I add a few extra pixels to the size of the bounding box because It seems to improve the chances of the OCR to find what I'm looking for and checking with a horrible loop if the new bounding boxes are too large and reducing their size. After that again because OCR seems to work better with it I reverse

the black and white so the letters are the black part and send it trough OCR I tried limiting the character set for it but it doesn't seems to improve it's chances.



Finally since I only check one character at a time I join the letter together and write it out to file.

Built in functions I used

(I'm uncertain what to write as to the mathematical aspect here most of the functions as far as I can tell are simply just going over 2d matrices in some specialized way?):

Imclearborder: Supresses structures in the image . It check for both connectivity if there are pixels that are not connected to the larger structure next to it but rather stand by themselves those get suprresed or if connectivity is specified if in the matrix the pixel which does not have the required connectivity also get eliminated. Based on the references it is a specialised form of erosion.

Imfill: If it's find a region which is surrounded by a different kind of value entirely than it fill the entire region with the surrounding value.

Imerod: Using the structuring element it uses it as a window and applies it to the image everywhere if it find a matching parts than it insert it there.If neede it will also pad the image.

Regionprops: Tries to find any connected areas and give back certain values from it such as area bounding box or centroid.