CA2

Alireza Karimi : 810101492

Mehdi Vajhi : 810101558

Part1

Row Picture

Resize to 300 * 500

Gray

Binary

Clean

Review

p1.m

```
clc;
clear all;

[file, path] = uigetfile('*.jpg; *.png ;*.bmp; *.tif', 'Input Ma

s=[path,file];
picture = imread(s);
figure

subplot(2,2,1);
imshow(picture);

rowPixels = 300;
```

```
colPixels = 500;
resized_picture = imresize(picture, [rowPixels, colPixels]);

subplot(2,2,2);
imshow(resized_picture);

gray_picture = mygrayfun(resized_picture); % Replaced with my fu

subplot(2,2,3);
imshow(gray_picture);

% threshold = graythresh(gray_picture);
threshold = 128;
binarized_picture = mybinaryfun(gray_picture, threshold); % Repl

subplot(2,2,4);
imshow(binarized_picture);

binarized_picture = ~binarized_picture;
lower_threshold = 1000;
cleaned_picture = myremovecom(binarized_picture, lower_threshold
upper_threshold = 2500;
cleaned_picture = cleaned_picture - myremovecom(binarized_pictur
figure
imshow(cleaned_picture);

labeled_picture = mysegmentation(cleaned_picture);

[L,Nseg]=mysegmentation(cleaned_picture);


load TRAININGSET;
totalLetters=size(TRAIN,2);

figure
final_output=[];
```

```
t=[];
for n=1:Nseg

    [r,c]=find(L==n);
    Y=labeled_picture(min(r):max(r),min(c):max(c));
    imshow(Y)
    Y=imresize(Y,[42,24]);
    imshow(Y)
    pause(0.2)

    ro=zeros(1,totalLetters);
    for k=1:totalLetters
        ro(k)=corr2(TRAIN{1,k},Y);
    end

    [MAXRO,pos]=max(ro);
    if MAXRO>.25
        out=TRAIN{2,pos};
        final_output=[final_output out];
    end
end


% Printing the plate
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
file = fopen('number_Plate.txt', 'wt');
fprintf(file,'%s\n',final_output);
fclose(file);
open('number_Plate.txt')
% winopen('number_Plate.txt')
```

Function my_segmentation

```
function [X , FINALOBJECT_LEN] = my_segmentation(picture)

FINALOBJECT = createobject(picture)
FINALOBJECT_LEN = size(FINALOBJECT, 2)
% Initialize the output matrix
X = zeros(size(picture));

% Loop through all found objects and only keep the ones larger t
for j = 1:size(FINALOBJECT, 2)
    for i = 1:size(FINALOBJECT{j}, 2)
        X(FINALOBJECT{j}(1, i), FINALOBJECT{j}(2, i)) = j;
    end
end

end
```

Function myremovecom

```
function X = myremovecom(picture, threshold)

FINALOBJECT =createobject(picture)
% Initialize the output matrix
X = zeros(size(picture));

% Loop through all found objects and only keep the ones larger t
for j = 1:size(FINALOBJECT, 2)
    if size(FINALOBJECT{j}, 2) >= threshold
        for i = 1:size(FINALOBJECT{j}, 2)
            X(FINALOBJECT{j}(1, i), FINALOBJECT{j}(2, i)) = 1;
```

```
        end
    end
end

end
```

Function mygrayfun

```
function gray_picture = mygrayfun(picture)

    redChannel = picture(:, :, 1);
    greenChannel = picture(:, :, 2);
    blueChannel = picture(:, :, 3);

    gray_picture = 0.299 * redChannel + 0.587 * greenChannel + (
end
```

Function mybinaryfun

```
function binarized_picture = mybinaryfun(gray_picture, threshol(

    [rowNum, colNum] = size(gray_picture);

    binarized_picture = zeros(rowNum, colNum);

    for i = 1:rowNum
        for j = 1:colNum
            if gray_picture(i, j) >= threshold
                binarized_picture(i, j) = 1;
```

```
            else
                binarized_picture(i, j) = 0;
            end
        end
    end
end
```

Load Map Set

```
clc;
clear;
close all;
files=dir('./p1/Map Set/');
len=length(files)-2;
TRAIN=cell(2,len);

for i=1:len
   TRAIN{1,i}=imread([files(i+2).folder,'/',files(i+2).name]);
   % for window: TRAIN{1,i}=imread([files(i+2).folder,'\',files(
   TRAIN{2,i}=files(i+2).name(1);
end

save('TRAININGSET', 'TRAIN');
```

Function createobject

```
function FINALOBJECT =createobject(picture)
% Find the row and column indices of the foreground pixels
```

```
[row, col] = find(picture == 1);
POINTS = [row'; col'];
POINTS_NUM = size(POINTS, 2);

% Initialize the first point
initpoint = POINTS(:, 1);
POINTS(:, 1) = [];
POINTS_NUM = POINTS_NUM - 1;
CurrectObject = [initpoint];
t = 1;

% Loop through until all points are processed
while POINTS_NUM > 0
    [POINTS, newPoints] = close_points(initpoint, POINTS);
    newPoints_len = size(newPoints, 2);
    CurrectObject = [CurrectObject, newPoints];

    % Check for additional connected points
    while newPoints_len > 0
        initpoint = newPoints(:, 1);
        newPoints(:, 1) = [];
        [POINTS, newPoints2] = close_points(initpoint, POINTS);
        CurrectObject = [CurrectObject, newPoints2];
        newPoints = [newPoints, newPoints2];
        newPoints_len = size(newPoints, 2);
    end

    % Store the current object in the final list of objects
    FINALOBJECT{t} = CurrectObject;
    t = t + 1;
    POINTS_NUM = size(POINTS, 2);
    if POINTS_NUM > 0
        initpoint = POINTS(:, 1);
        CurrectObject = initpoint;
    end
end
```

```
end
```

Function close_points

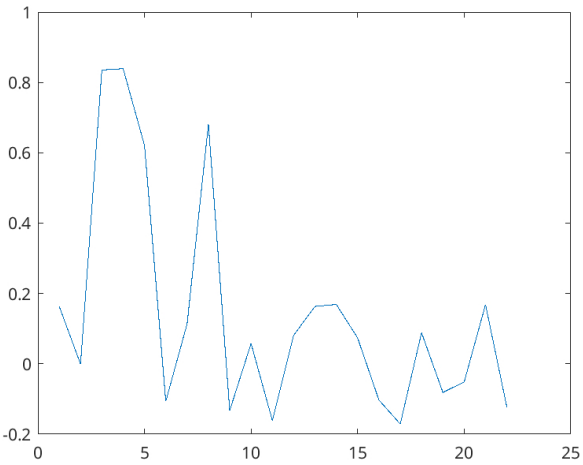
```
function [POINTS,newPoints]=close_points(initpoint,POINTS)

POINTS_NUM=size(POINTS,2);
DIF=repmat(initpoint,1,POINTS_NUM)-POINTS;
DIF=abs(DIF);
ind=find(DIF(1,:)<=1 & DIF(2,:)<=1);
newPoints=POINTS(:,ind);

POINTS(:,ind)=[];
end
```

Part2

Our code had some problems with numbers like <2,3>

<2,3>

```
Car tag is equal to :
3713322
```

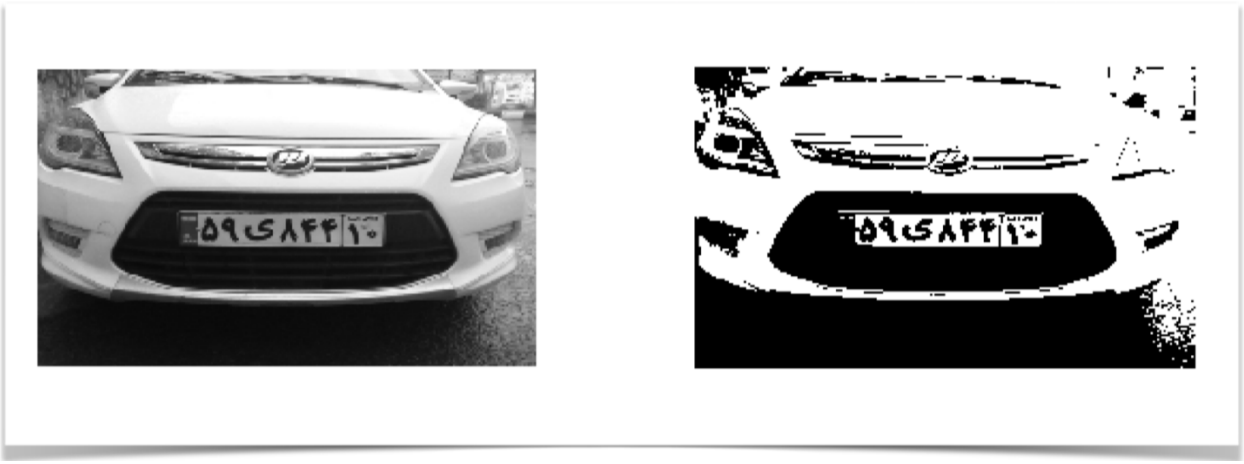


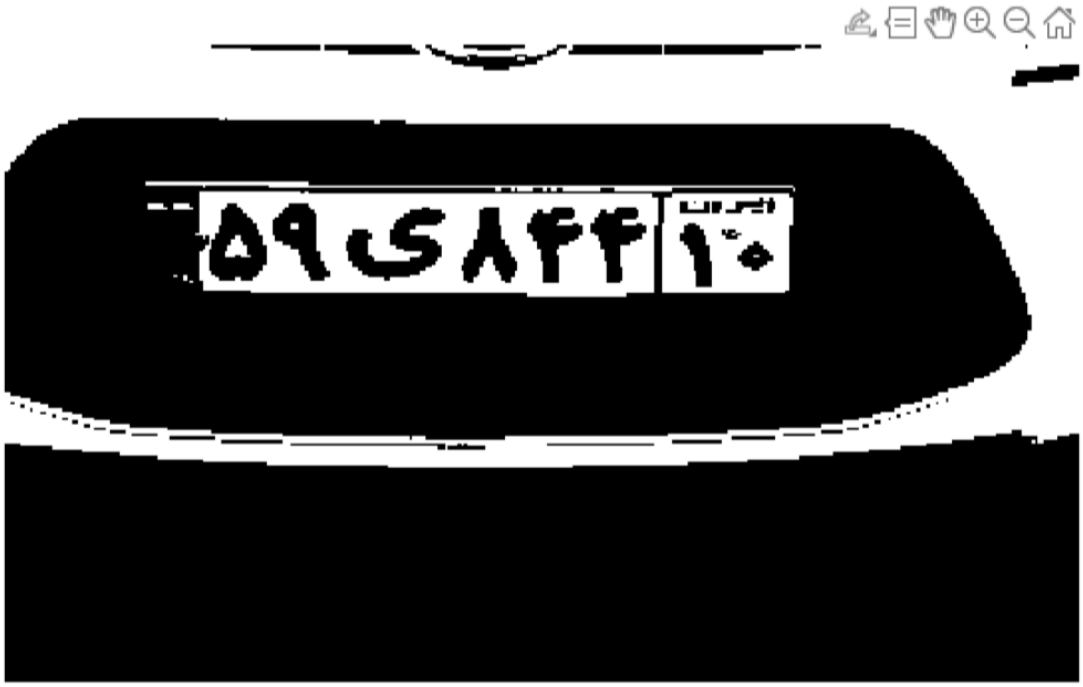
Part3

In this section, the following idea is used:

- **First, we make the image gray and then convert it to black and white.**
- **Then, we crop out the top 1/3 of the image.**
- **We also crop out 1/5 of the right side of the image.**
- **We also crop out 1/5 of the left side of the image.**
- **Now, we remove small parts and very large noise sections.**
- **Now, we number uniquely the remaining parts using `bwlabel`.**
- **Then, by checking the exact ratio of length to block width, which is 6, we delete it, considering the rectangular shapes that are between 4 to 6 in width, and save them in the folder `JelobandiOUT`.**

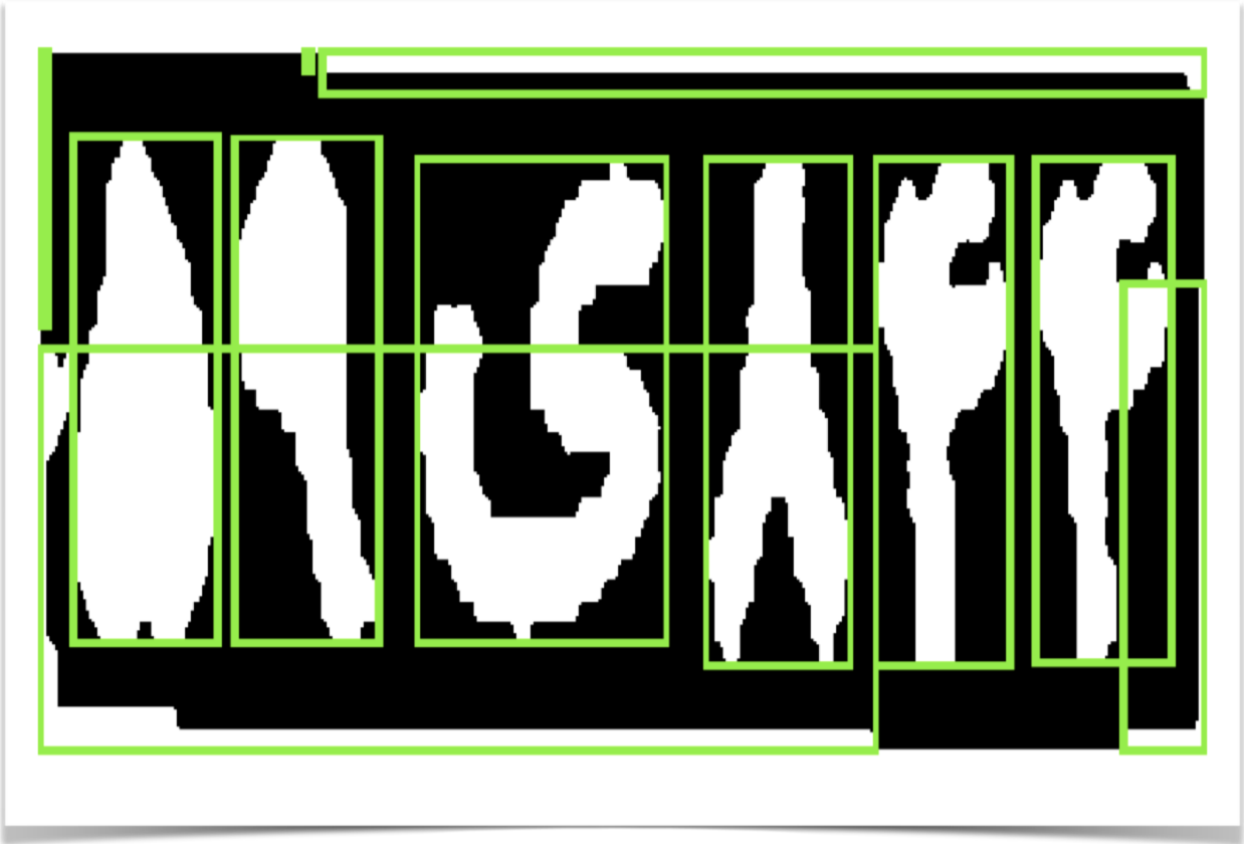
- **Now, we similarly delete the second section of the project output image and store it in the `JelobandiOUT` folder using the 'correlation' strategy.**




١٠
٥٩ ك ٨٤٤


۱۰
۵۹۸۴۴

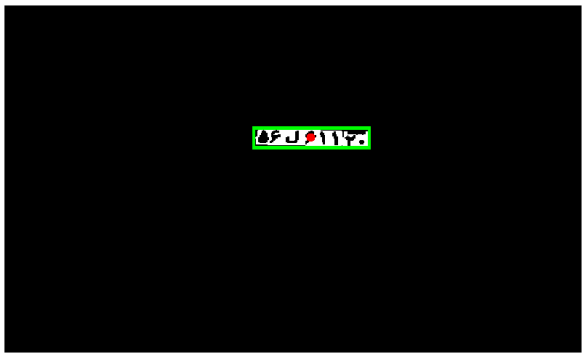

۵۹۸۴۴



```
final_output =

    '59844ی'

>>
```

Part4

First frame



Second frame


۵۶ ل ۶۱۱ ۲۰

The difference = 62.859 pixels (euclidean distance)

Speed = 99.251 pixels per second