

Number_plate Function :

```
function np=number_plate(img)
%image correlation method
%matches 2 matrix
load('imgfildata.mat');
[~,cc]=size(img);
picture=imresize(img,[300 500]);

if size(picture,3)==3
    picture=rgb2gray(picture);
%grey values are btwn 0 to 1 or 0 to 255
end
```

```
threshold = graythresh(picture); %greythresh gives the threshold value of greyscale image
picture = ~im2bw(picture,threshold); %black nd white values are 0 or 1 and values greater thn
threshold=1,rest=0 and invert white and black ie 1 to 0 and 0 to 1
picture = bwareaopen(picture,30); % those things that have less than 30 pixels are removed
```

```
if cc>2000
    picture1=bwareaopen(picture,3500); %those things that have less than 3500 pixels are removed ie
excluding nmbr plate
else
    picture1=bwareaopen(picture,3000); %those things that have less than 3000 pixels are removed ie
excluding nmbr plate
end
```

```
picture2=picture-picture1; %only number plate is left
```

```
picture2=bwareaopen(picture2,200); %only text is there in the nmbr plate
```

```
[L,Ne]=bwlabel(picture2);
%l gives matrix which has info of
nmbr plate and
Ne gives number of digits or characters
```

```
final_output=[];
t=[];
for n=1:Ne
    [r,c] = find(L==n);
    n1=picture(min(r):max(r),min(c):max(c));
%picture command crops nth object from L
    n1=imresize(n1,[42,24]);
%in database size is 42,24 so it is
resized so that
we can match it with the database
```

```
x=[ ];
```

```
totalLetters=size(imgfile,2);
```

```
for k=1:totalLetters
```

```
    y=corr2(imgfile{1,k},n1);
    x=[x y];
```

```
end
```

```
% t=[t max(x)];
if max(x)>.35
    z=find(x==max(x));
    out=cell2mat(imgfile(2,z));
```

```
final_output=[final_output out];
end
```

FUNCTION NAME : WHAT IT DOES

size: Returns the dimensions of an array or matrix.

- ⇒ It can be used to determine the number of rows and columns in a matrix or the size along a specific dimension.

imresize: Resizes an image to a specified dimension or scale.

- ⇒ It can be used to enlarge or reduce the dimensions of an image. The function takes the image and the desired dimensions or scale factor as inputs.

imread: Reads an image from a file into MATLAB.

- ⇒ It reads image data from various file formats (e.g., JPG, PNG, BMP) and returns the image as a matrix. The function requires the path to the image file as an input.

FUNCTION NAME : WHAT IT DOES

rgb2gray: Converts a color image (RGB) to grayscale, reducing it to a single channel representing intensity.

graythresh: Computes a threshold value using Otsu's method, aiming to separate the foreground from the background in a grayscale image.

im2bw: Converts a grayscale or color image to a binary image by thresholding.

bwareaopen: Removes small objects (or noise) from a binary image based on their area.

bwlabel: Labels connected components in a binary image, assigning a unique label to each connected region.

find: Returns the linear indices of nonzero elements in an array. Useful for locating specific values or regions in an image.

corr2: Computes the 2-D correlation coefficient between two matrices. In this context, it's likely used to measure similarity between template images and portions of the main image.

cell2mat: Converts a cell array to an ordinary array. This function is not directly related to image processing but is useful for reshaping or converting data structures.

picture: In the provided code, picture is a variable holding the image data after various processing steps. It's not a function but a variable name.

The Main Code:

```
clc
close all;
clear;
load imgfildata;

[file,path]=uigetfile({'*.jpg;*.bmp;*.png;*.tif'},'Choose an image');
s=[path,file];
picture=imread(s);
[~,cc]=size(picture);
picture=imresize(picture,[300 500]);

if size(picture,3)==3
    picture=rgb2gray(picture);
end
se=strel('rectangle',[5,5]);
a=imerode(picture,se);
figure,imshow(a);
b=imdilate(a,se);
threshold = graythresh(picture);
picture =~im2bw(picture,threshold);
picture = bwareaopen(picture,30);
imshow(picture)
if cc>2000
    picture1=bwareaopen(picture,3500);
else
    picture1=bwareaopen(picture,3000);
end
figure,imshow(picture1)
picture2=picture-picture1;
figure,imshow(picture2)
picture2=bwareaopen(picture2,200);
figure,imshow(picture2)

[L,Ne]=bwlabel(picture2);
propied=regionprops(L,'BoundingBox');
hold on
pause(1)
for n=1:size(propied,1)
    rectangle('Position',propied(n).BoundingBox,'EdgeColor','g','LineWidth',2)
end
hold off

figure
final_output=[];
t=[];
for n=1:Ne
    [r,c] = find(L==n);
    n1=picture(min(r):max(r),min(c):max(c));
    n1=imresize(n1,[42,24]);
    imshow(n1)
    pause(0.2)
    x=[ ];

totalLetters=size(imgfile,2);

for k=1:totalLetters

    y=corr2(imgfile{1,k},n1);
    x=[x y];

end
t=[t max(x)];
if max(x)>.45
    z=find(x==max(x));
    out=cell2mat(imgfile(2,z));

final_output=[final_output out];
end
end
```

FUNCTION NAME : WHAT IT DOES

uigetfile: Opens a dialog box to select files interactively in MATLAB, making it easier to work with specific data files or images during the execution of a script or function.

rgb2gray: Converts an RGB image to grayscale.

strel: Creates a structuring element for morphological operations.

imerode: Erodes an image using a structuring element.

imshow: Displays an image.

imdilate: Dilates an image using a structuring element.

graythresh: Computes a global image threshold using Otsu's method.

im2bw: Converts an image to binary.

bwareaopen: Removes small objects from a binary image.

bwlabel: Labels connected components in a binary image.

regionprops: Measures properties of image regions.

rectangle: Draws a rectangle on a figure.

find: Finds indices of non-zero elements.

corr2: Computes the 2-D correlation coefficient.

cell2mat: Converts a cell array to an ordinary array.