**Visual Computing and Image Processing Report**

The chosen topic is **Vehicle Logo Detection.**

**Introduction:**

The identification of vehicles is very essential to create lots of applications that involve security, speed control,etc. systems that work automatically like vehicle logo detection help us enforce the law through license plates but there might be occasions when the plate might be covered or missing and in that case we use vehicle manufacture recognition to identify the vehicle by the brand logo whether it is on the front of the car or back of the car.

**Explanation of the program used in implementing vehicle logo detection system:**

The purpose of the vehicle logo detection system is that it detects the vehicle logo when given an image of the vehicle.

So, the first thing we did was making matlab read our testcases images by using the function imread as shown in the following:

image1=imread("Case1-Front1.bmp");

image2=imread("Case2-Front2.jpg");

image3=imread("Case2-Rear1.jpg");

image4=imread("Case2-Rear2.jpg");

the function target size is seen a lot in the program because it helps us specify the target window size (inside the square bracket is the width and height) and every image has its own target size that suits it.

Example:

targetSize1 = [200 150];

the function centerCropWindow2d is used alongside the target size function as it determines the window to crop from a 2D image and the size of the cropped image is of the target size function which was mentioned earlier.

Example:

r1 = centerCropWindow2d(size(image1), targetSize1);

The function imcrop is very essential in our program as it takes the parameters of the original image and a variable that tells us how we would like to crop the image.

Example:

J1 = imcrop(image1,r1);

The function images.spatialref.Rectangle(XLimits,YLimits) creates an a rectangle shaped object and puts the x limits and y limits

Example:

rec1 = images.spatialref.Rectangle([53 80],[103 130])

then we use the imcrop function again to crop the already cropped image according to the rectangle object’s x limits and y limits. Why did we crop the image again because some logos did not come out correctly for instance the kia logo.

We cropped every test case to show only the logo of the vehicle.

After that we made matlab read the images of three logos Opel, Kia, Hyundai and converted the logos and the cropped images to grayscale images using the function rgb2gray like the following:

g1=rgb2gray(Logo1);

g2=rgb2gray(Logo2);

g3=rgb2gray(Logo3);

g4=rgb2gray(Logo4);

f1=rgb2gray(l1);

f2=rgb2gray(l2);

f3=rgb2gray(l3);

f4=rgb2gray(l4);

after converting the images to grayscale images we used the function fft2(x) on them fft2 means (2-D fast fourier transform ) and what that function does is that it returns to us the two dimensional fourier transform of a matrix.

Example:

fftf1=fft2(double(f1));

imagefeatures1=abs(fftf1(:));

imagefeatures1=sort(imagefeatures1,'descend');

imagefeatures1=imagefeatures1(1:3);

then we do a for loop that loops four times to compare the logos with the images so that the program could detect the logo of the image and the for loop applies the fourier equation.

Example:

for i=1:4

nearesy(i)=sqrt((imagefeatures1(1)-features(1,i))^2+(imagefeatures1(2)-features(2,i))^2+(imagefeatures1(3)-features(3,i))^2);

end

then there is an if statement that basically tells us the logo of the vehicle depending on what is the index.

Example:

if Index==1

logo1='Opel';

elseif Index==2

logo1='Kia';

elseif Index==3 || Index==4

logo1='Hyundai';

end

then we use the function subplot to show the image of the vehicle and a title above it that contains the name of the logo that title is obtained from the if statement and we also show the image of the logo alongside the vehicle.

Example:

title(logo1);

subplot(2,2,2),imshow(l1);

**The Output:**

Graphical user interface

Description automatically generated