Image Processing Project Blog
Week 1
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Introduction

The project chosen by our group is Classifying images into different types of vehicle. The group consists of 3 members including myself, Dylan Delaney and Evan Morgan. The aim of the project is to identify a type of vehicle based purely from an image. The project will be completed on Matlab. There are 7 images each displaying a vehicle that needs to be sorted into its correct vehicle type.

How to Identify Vehicles

It's important to understand how can we identify the different types of vehicles. In the Images we have [1]:

- Vehicle1.png = Compact 4x4 [2]
- Vehicle2.png = Hatchback car
- Vehicle3.png = Sedan car
- Vehicle4.png = Painted Bus
- Vehicle5.png = Dublin Bus
- Vehicle6.png = Eddie Stobart Delivery Truck
- Vehicle7.png = Tesco Delivery Truck

The differences between the trucks, buses and cars should be easier to identify by simply looking at the number of windows and wheels. However, identifying the types of cars would require looking at the shape of the car and could be more complex.

Adaptive Thresholding

Firstly, I tried to isolate the car in the foreground and remove the background by using the adaptive thresholding technique. It is a Form of segmentation that sets pixels to either a foreground or background value based on an intensity value threshold. Adaptive differs from global thresholding by setting unique thresholds for different sections of an image.

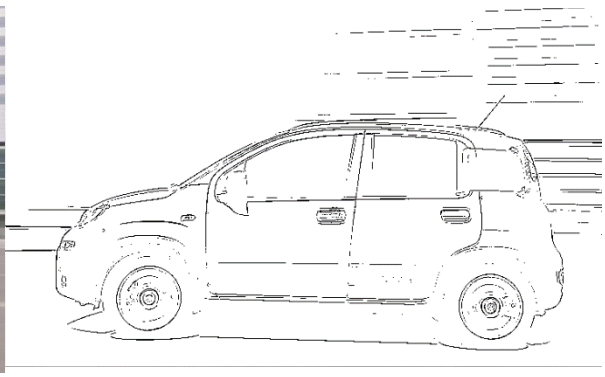
In the example below, a square(cookie) of 3x3 pixels is thresholded for every pixel. the height and width of the filtered image are used so as not to go over the edge of the image. If the pixel is above the mean intensity value of the cookie - C (in this case 10/225) then it is set to 1(White). If not, it is set to 0 (Black). This method relies on magic numbers and would need to be altered to be more automated.

```
[H, W] = size(G);
Gthr = G;
n = 3;
half = floor(n / 2);

for i = half + 1:H - half
    for j = half + 1:W - half
        Cookie = G(i - half:i + half, j - half:j + half);
        Gthr(i, j) = G(i, j) > mean(Cookie(:)) - 10 / 255;
    end
end

imshow(Gthr)
```

Adaptive Thresholding Code

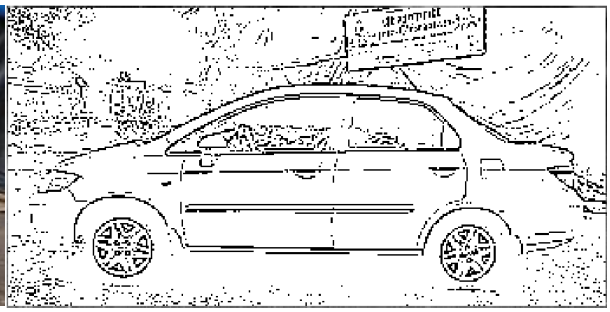
Testing this on the first two vehicles the background was removed mostly, however, we did lose some detail from the car itself. The method works very poorly on the third vehicle image. The thresholding will need to be altered to deal with all the images.

Vehicle 1



Vehicle 1 Thresholded

Vehicle 3



Vehicle 3 Thresholded

Challenges

There have been particular challenges with the vehicle3.png image so far as the background is quite detailed and varied in colour. Identifying the painted bus in vehicle4.png could prove challenging as the paintwork covers some of the windows making it hard to identify them. Also identifying vehicle7.png could be difficult as it is partially cropped on the right hand side of the image.

References

[1] cars!, ABC. "Drive.SG - ABC Guide To Differentiate Different Types Of Cars!". *Drive.SG*. N.p., 2017. Web. 10 Mar. 2017.

[2] "Fiat Panda 4X4: The Compact 4X4 | Fiat". *Fiat*. N.p., 2017. Web. 10 Mar. 2017.