Final Project: Detecting Cars in a Noisy Video

Project Overview

Introduction to the final project:

Scenario: A company hired you to check the traffic volume infront of theri office:

Specifics. Count number of cars in each frame:

Steps:

1. **Preprocess the video by removing the noise and grayscaling it.**
2. **Isolate the cars in the eeach frame by a binary mask the segments from the background.**
3. **Calculate region properties, and analyse the results for the entire video.**

```
1158*518
```

```
ans =
599844
```

Section 1: Preprocessing the video

```
vIn = VideoReader("RoadTraffic.mp4");
```

```
image = read(vIn,152);
imshow(image)
```

```
imshow(removeNoiseAndGray(image))
```

Section 2: Isolating the cars

Get background representative frame:

Frames with no cars are: 1-5,28-60, 86-93, 118-143

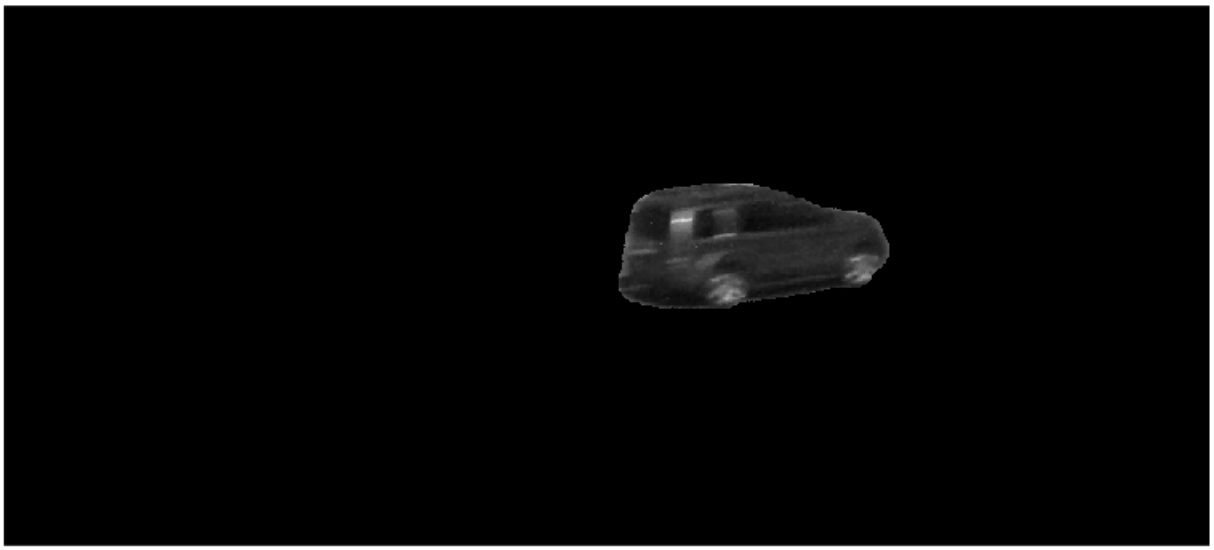
```
a = [1:5];
b = [28:60];
c = [86:93];
d = [118:143];
back_idx = cat(2,a,b,c,d);
background = im2double(removeNoiseAndGray(read(vIn,back_idx(1))));
for i = 2:length(back_idx)
    background = background + im2double(removeNoiseAndGray(read(vIn,back_idx(i))));

end
background = background/length(back_idx);

imshow(background)
```


```
frame = read(vIn,22);
frame = removeNoiseAndGray(frame);
frame = im2double(frame);
frameDiff = abs(frame - background);
%montage({frameDiff,segmentCar(frameDiff)})
iii = segmentCar(frameDiff);
%imshow(frame)
%imshow(frameDiff)
max(max(frameDiff))
```

```
ans =
0.7279
```

```
edgeimg = frame;
edgeimg(~iii) = 0;
montage({iii, edgeimg, edge(imgaussfilt(edgeimg,3),"canny")})
```

```
imshow(edgeimg)
```



```
nnz(iii)
```

```
ans =
24564
```

```

```

Testing video

```
vOut = VideoWriter("trafficSegment.mp4", "MPEG-4");
```

```
vOut.FrameRate=10;
vIn = VideoReader("RoadTraffic.mp4");

nFrames = vIn.NumFrames;
open(vOut)

for i =1:nFrames
    img = readFrame(vIn);

    frame = removeNoiseAndGray(img);
    frame = im2double(frame);
    frameDiff = abs(frame - background);
    %montage({frameDiff,segmentCar(frameDiff)})
    bw = segmentCar(frameDiff);

    %frame = imfuse(im2uint8(img),im2uint8(bw),"montage");
    bw = im2uint8(bw);
    writeVideo(vOut,bw);


    time = vIn.CurrentTime;
end

close(vOut)
vIn.CurrentTime = 0;
```

```
```

Section 3: Calculating region properties

```
NumberRegions = [];
MeanRegionSize = [];
TotalRegionSize = [];



vIn = VideoReader("RoadTraffic.mp4");

nFrames = vIn.NumFrames;


for i =1:nFrames
    img = readFrame(vIn);

    frame = removeNoiseAndGray(img);
    frame = im2double(frame);
    frameDiff = abs(frame - background);
    %montage({frameDiff,segmentCar(frameDiff)})
    bw = segmentCar(frameDiff);
```

```
    %frame = imfuse(im2uint8(img),im2uint8(bw),"montage");

    props = regionprops(bw, {'Area'});
    props = struct2table(props);


        NumberRegions = [NumberRegions; size(props,1)];
        MeanRegionSize = [MeanRegionSize; mean(props.Area)];
        TotalRegionSize = [TotalRegionSize; sum(props.Area)];


    time = vIn.CurrentTime;

end

vIn.CurrentTime = 0;
```

```
regionData = table(NumberRegions,MeanRegionSize,TotalRegionSize)
```

```
sum(regionData.NumberRegions>0)
```

```
ans =
151
```

```
regionData(152,"TotalRegionSize")
```

ans = 1×1 table

	TotalRegionSize
1	62245

```
mode(regionData.NumberRegions)
```

```
ans =
1
```

```
sum(regionData.TotalRegionSize)/sum(regionData.NumberRegions)
```

```
ans =
1.6081e+04
```

```
function im = removeNoiseAndGray(RGB)


im = rgb2gray(RGB);
im = medfilt2(im);
```

```
end

function bw = segmentCar(diffIntensity)
bw = diffIntensity>0.2;

%% First, we will extract the region around the pole. If there are true pixels on
both sides of the pole, we will join them.

bw = imclose(bw, strel("disk",3,0));
bw_pole = bw(38:445,445:490);
bw_pole = imclose(bw_pole, strel("line",45,10));

%% second, we will extract the region around the tree. If there are true pixels
there, we will join them.
bw_tree = bw(97:231,999:1158);
bw_tree = imclose(bw_tree, strel("disk",45,0));




%% JOin all parts
bw(38:445,445:490) = bw_pole;
bw(97:231,999:1158) = bw_tree;
%bw = imopen(bw,strel("disk",3));


bw = imclose(bw, strel("disk",20,0));
bw = imopen(bw, strel("disk",20,0));
bw = imopen(bw, strel("disk",3,0));
end
```