Digital Image Processing
CS390S

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METROPOLITAN STATE UNIVERSITY℠
OF DENVER

Help doc “GLCM”

Define offsets of varying direction and distance. Because the image contains objects of a variety of shapes and sizes that are arranged in horizontal and vertical directions, the example specifies a set of horizontal offsets that only vary in distance.

```
offsets0 = [zeros(40,1) (1:40)'];
```

Create the GLCMs. Call the `graycomatrix` function specifying the offsets.

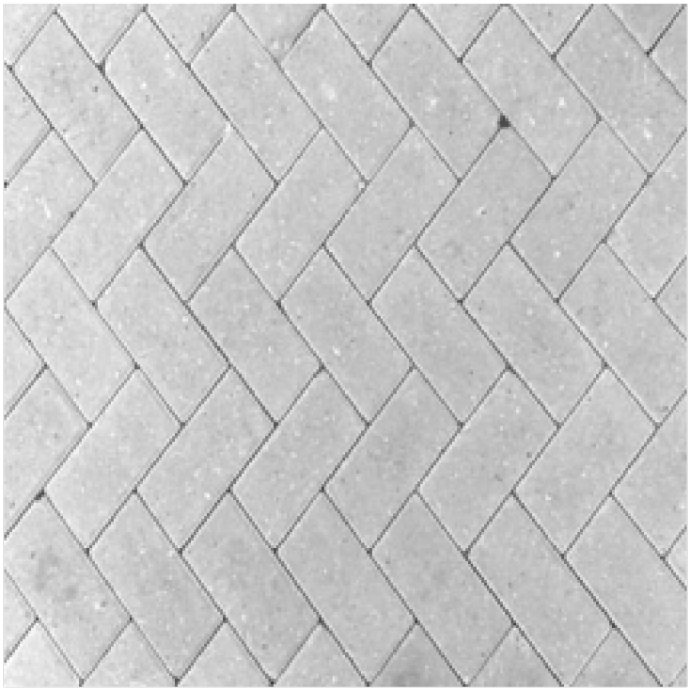
```
glcms = graycomatrix(circuitBoard,'Offset',offsets0)
```

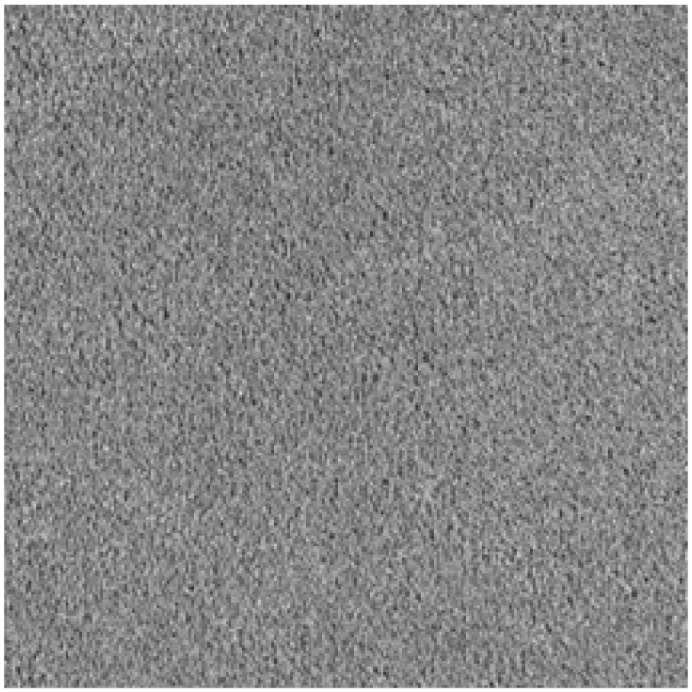
Derive statistics from the GLCMs using the `graycoprops` function. The example calculates the contrast and correlation.

```
stats = graycoprops(glcms,'Contrast Correlation');
```

Plot correlation as a function of offset.

```
figure, plot([stats.Correlation]);
title('Texture Correlation as a function of offset');
xlabel('Horizontal Offset')
ylabel('Correlation')
```





```
Cmatrix=graycomatrix(im1);
stats = graycoprops(Cmatrix);
sta
sta
sta

Cma
```

```
stats:
        Contrast: 0.5279
     Correlation: 0.3391
          Energy: 0.3948
     Homogeneity: 0.8495
```

```
Cmatrix2=graycomatrix(im2);
stats2 = graycoprops(Cmatrix2);
sta
sta
sta

i=i
```

```
stats2:
        Contrast: 1.0037
     Correlation: 0.0765
          Energy: 0.1505
     Homogeneity: 0.6768
```

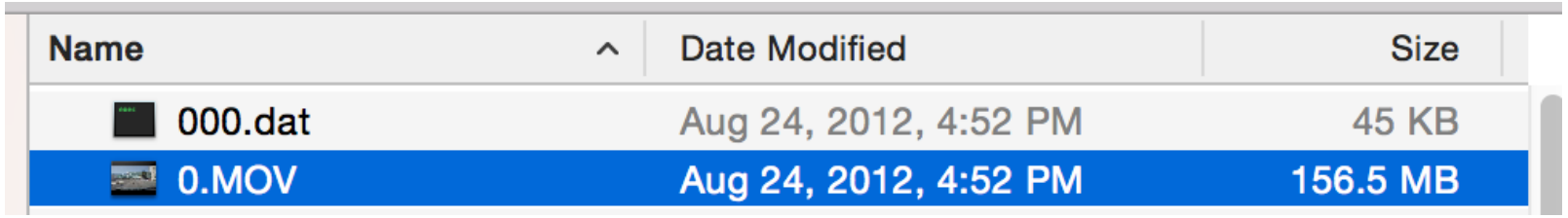
Project 3 Realistic Driving Video Analysis

- Image analysis
- Real driving data processing
- http://www.vision.caltech.edu/Image_Datasets/CaltechPedestrians/ (pedestrian detection)

Realistic driving data

DOD GS600 DVR in each vehicle to collect the naturalistic driving data that consists of the driving scene video, GPS information, and vehicle acceleration in X, Y, and Z directions. The DOD GS600 DVR can collect data continuously and save the data into a micro SD card. We used 32GB micro SD cards which can hold up to 10 hours of driving data.

Sensor	5 Mega pixels CMOS
Wide Angle Lens	120°
Focus	10cm - infinity
GPS	Internal antenna
Video output	MINI HDMI： Support 1080i/720p output mode Composite：NTSC/PAL
Recording format	mov
Recording resolution	1920 x 1080(30fps) 1280 x 720(30fps) 848 x 480(60fps)
Video Code	H.264
Recording media	Micro Card(Upto 64G SDHC Card)




```
1626   [S] -133    166 717
1627   [G] 2012-08-24 15:51:36 N39.823020  W86.159155  52  0
1628   [S] -118    151 699
1629   [S] -184    184 733
1630   [S] -184    184 733
1631   [S] -118    133 717
1632   [S] -151    200 717
1633   [S] -85 200 733
1634   [S] -151    200 717
1635   [S] -118    251 684
1636   [S] -166    233 733
1637   [S] -118    200 699
1638   [G] 2012-08-24 15:51:37 N39.823151  W86.159160  52  359
1639   [S] -118    233 766
1640   [S] -151    251 784
1641   [S] -151    200 717
1642   [S] -118    200 751
1643   [S] -151    184 699
1644   [S] -151    184 666
1645   [S] -166    218 684
1646   [S] -200    133 784
1647   [S] -151    267 800
1648   [S] -166    184 717
1649   [G] 2012-08-24 15:51:38 N39.823286  W86.159165  53  359
1650   [S] -133    166 699
1651   [S] -133    166 684
1652   [S] -133    166 733
1653   [S] -151    166 766
1654   [S] -151    166 766
1655   [S] -151    184 733
1656   [S] -151    133 717
```

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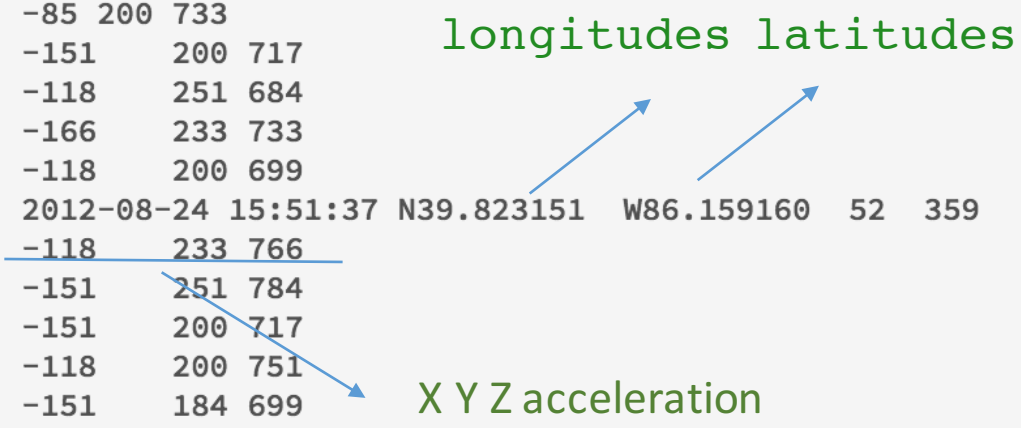
1654   [S] -151    166 766
1655   [S] -151    184 733
1656   [S] -151    133 717
```



Crash?

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```
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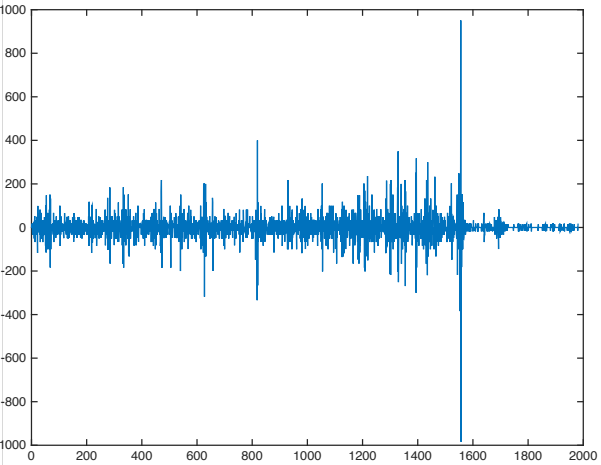
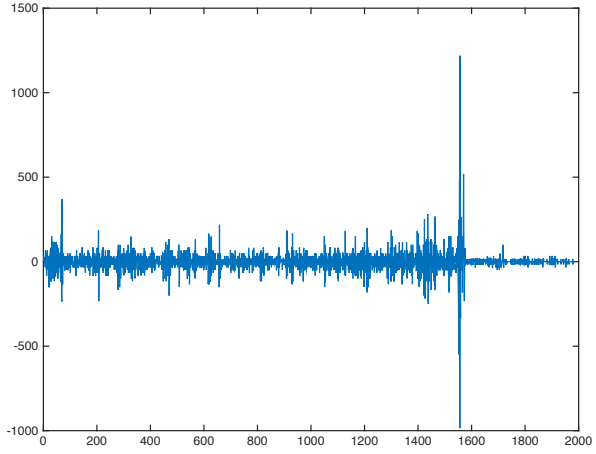
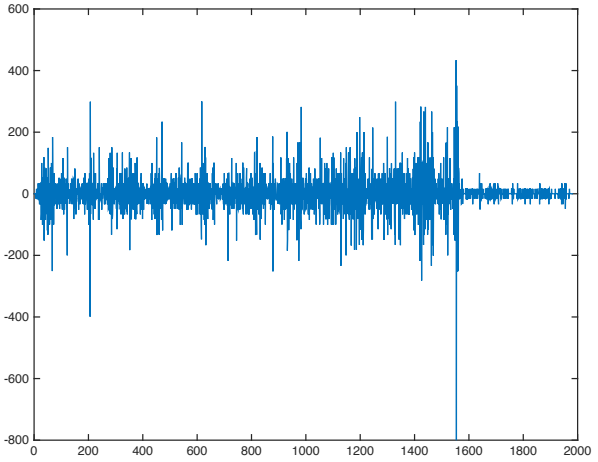
1654   [S] -151    166 766
1655   [S] -151    184 733
1656   [S] -151    133 717
```

1. Test potential crash time
2. Sample interesting frames
3. Pedestrian detection
4. Image analysis of cut out region

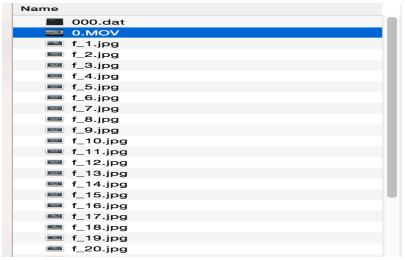
Checking X Y Z acceleration







Test potential crash time



0.MOV

Frames after crash (sample each second)

f_22.jpg
1,280 × 720

f_23.jpg
1,280 × 720

f_24.jpg
1,280 × 720

f_18.jpg
1,280 × 720

f_19.jpg
1,280 × 720

f_20.jpg
1,280 × 720

f_14.jpg
1,280 × 720

f_15.jpg
1,280 × 720

f_16.jpg
1,280 × 720

f_17.jpg
1,280 × 720

f_11.jpg
1,280 × 720

f_12.jpg
1,280 × 720

f_13.jpg

f_8.jpg

f_9.jpg

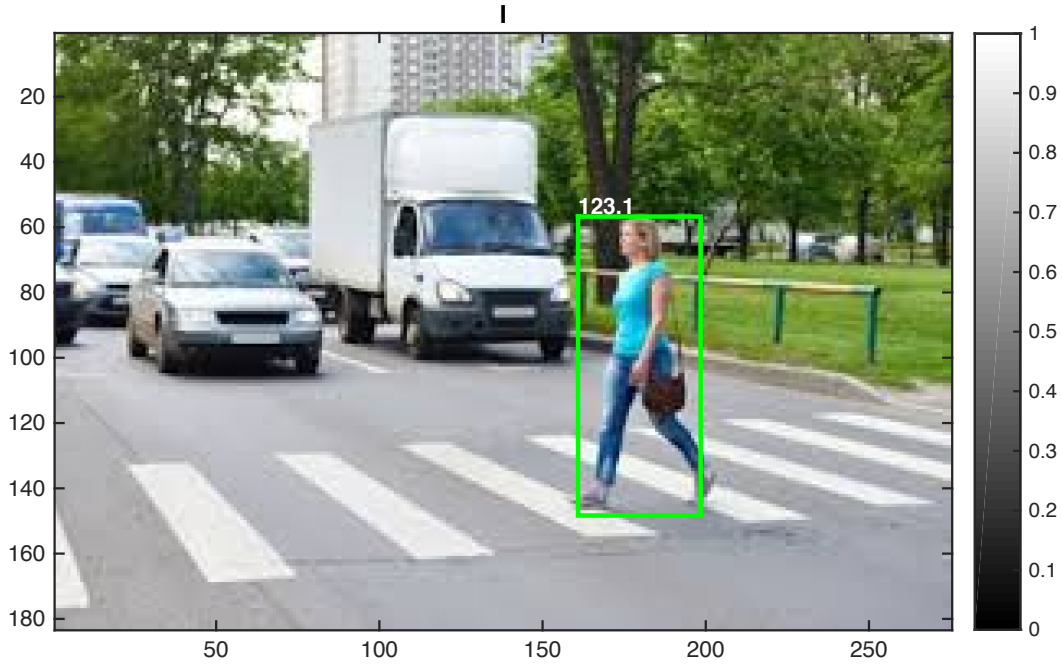
f_10.jpg

f_4.jpg

f_5.jpg

HOG + SVM pedestrian detection

http://www.vision.caltech.edu/Image_Datasets/CaltechPedestrians/



Example

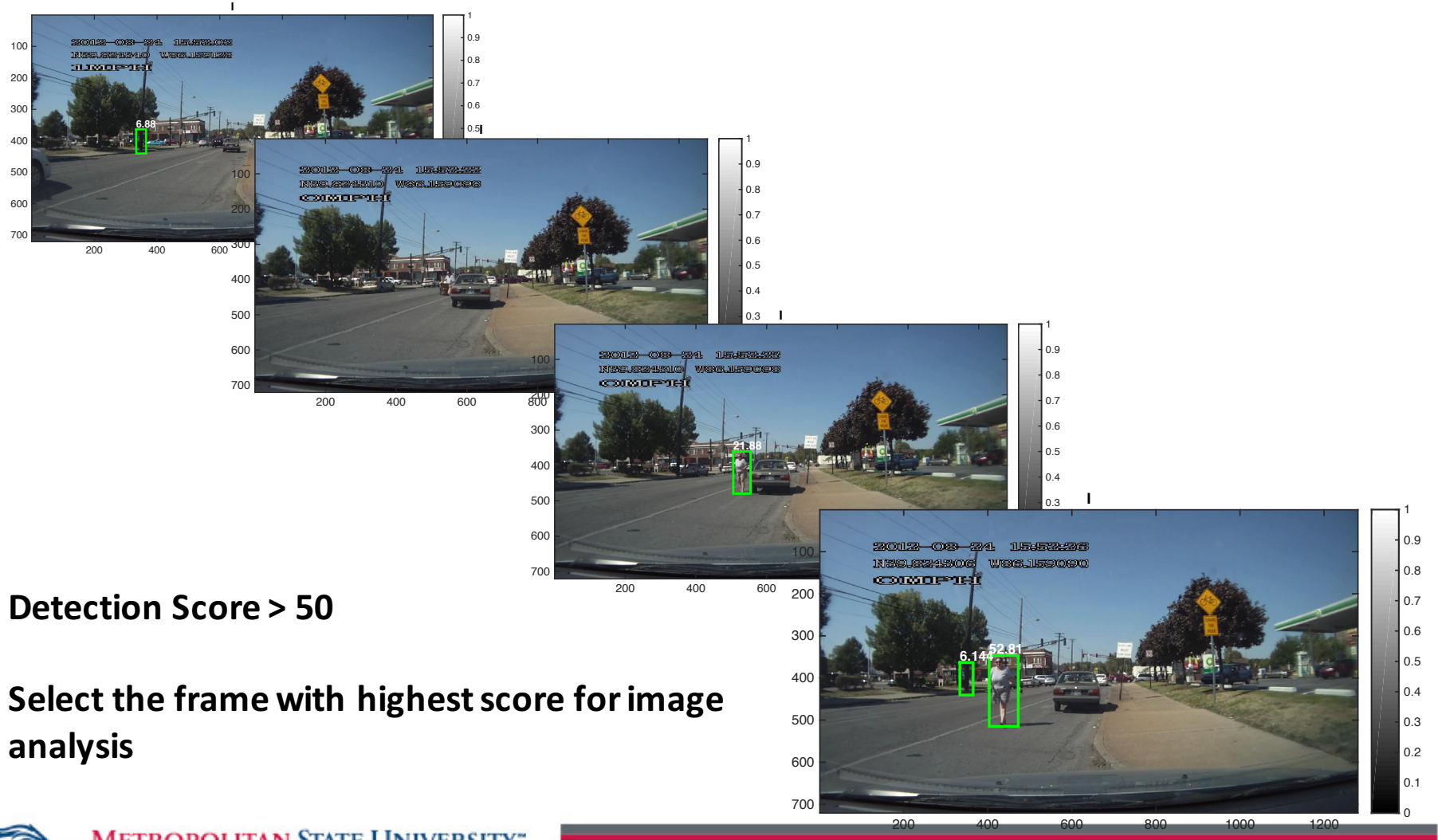
```
clc
close all
clear all
addpath(genpath('./Ped_detectio
savepath

I=imread('tt.jpg');
t=load('AcfCaltech+Detector.mat
detector=t.detector;
tic;
bbs=acfDetect(I,detector);
t
f
i=i;
```

```
bbs: 1x5 double =

   160.8750   56.7300   37.5563   91.6008  123.0840
```

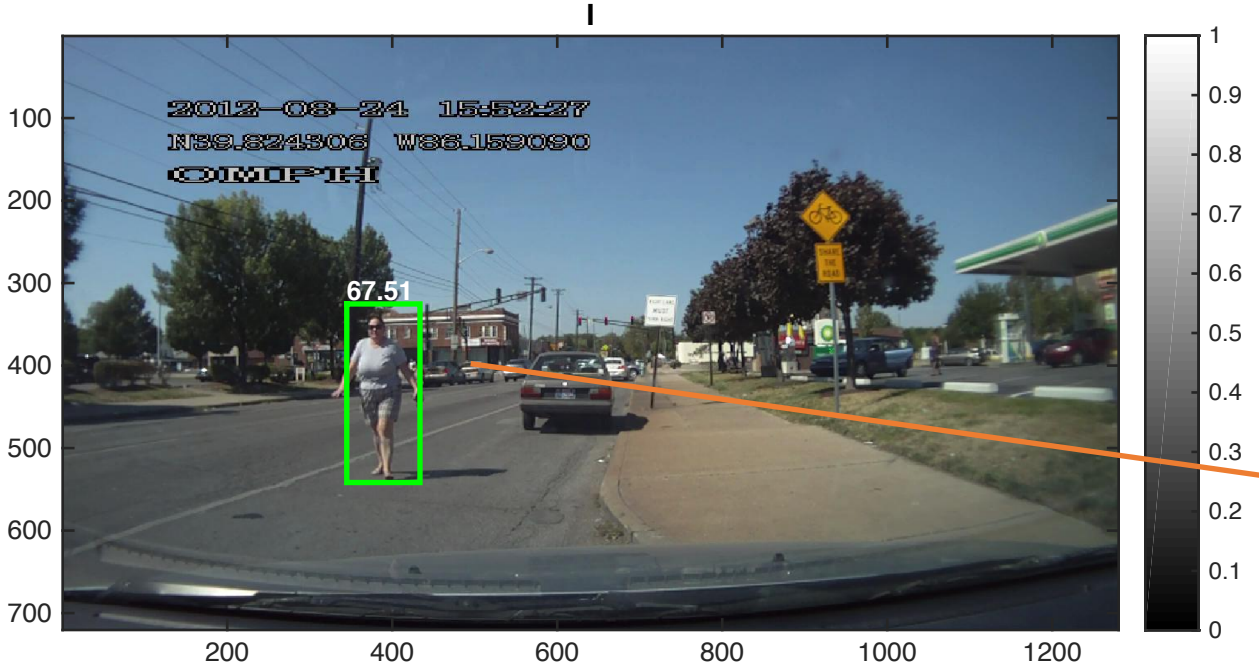
Frames after crash (sample each second)

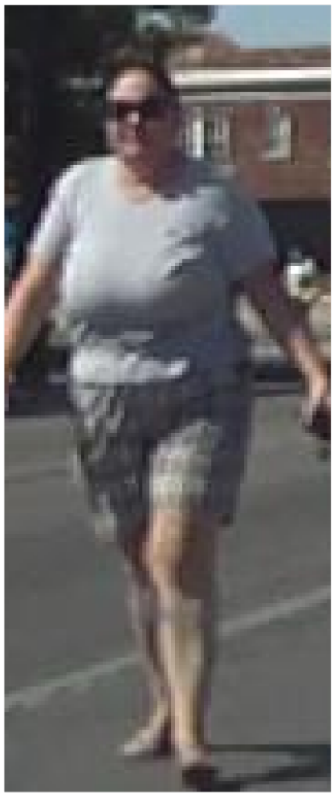


Detection Score > 50

Select the frame with highest score for image analysis

Frames after crash (sample each second)





Ped.jpg

Cut the pedestrian by program
Use "imwrite" to write out the pedestrian image

Additional analysis

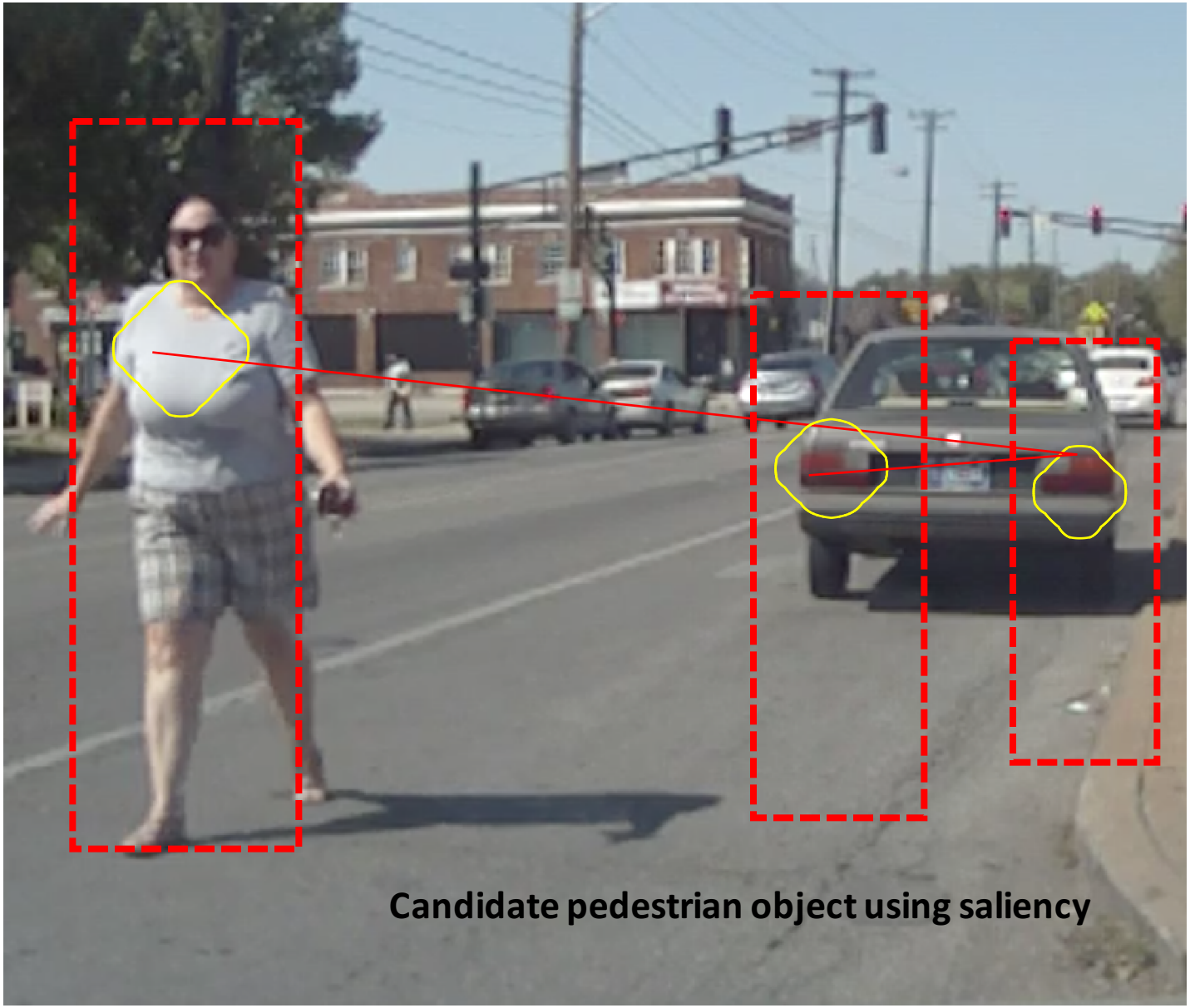
up to 5 points bonus

ROI (region of interest) if needed

Skin detection


Saliency calculation

shape from: Red/Green (9-5)



Basic image analysis

- Statistic features
- Histogram
- Segmentation foreground background
- Cloth color detection
- Skin detection
- Texture analysis
- …

Texture analysis

```
imwrite(imtest,'ped.jpg');
gim=rgb2gray(imtest);
im1=imresize(gim,[256,256]);


Cmatrix=graycomatrix(im1);
stats = graycoprops(Cmatrix);
stats.Energy
st
st
```

```
stats:
        Contrast: 0.0866
     Correlation: 0.9786
          Energy: 0.1922
     Homogeneity: 0.9568
```