Computer Vision Assignment_3 Report

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1. Dataset:

Positive:

I use the point form contour in the xml file from sunny dataset to segment the image to be my dataset. I change half of image size to 40 x40 from my positive dataset. **(Figure 1.1)** Others are image with different size. **(Figure 1.2)**
At the first time, I only use image with different size, but the result is not good and the training speed is slow.

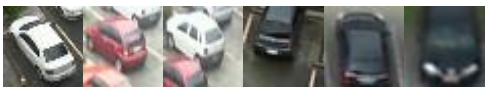


Figure 1.1

Figure 1.2

Negative:

I use the empty parking lot at the first time **(Figure 1.3)** but the result is not good. Therefore, I use the negative dataset from the internet which are all without the tree and the part of the body of the car. **(Figure 1.4)**

(Figure1.3)

(Figure 1.4)

2.Training Data

I write two .bat file (cascade_sampe and training_sample) to training. (Figure 2.1 and 2.2)
The number of stage I use in **LBP** and **HAAR** are 20 and the **minHitRate** is 0.995 **maxFalseAlarmRate** is 0.5 **maxWeakCount** is 100
The number of **sample** is 6441 and **numPos** is 4000, **numNeg** is 1500 (Figure 2.3 and 2.4)

```
opencv_createsamples.exe -info Pos_Pic\Pos.txt -vec Pos_try.vec -bg Neg\Neg.txt -num 10000 -w 20 -h 20
```

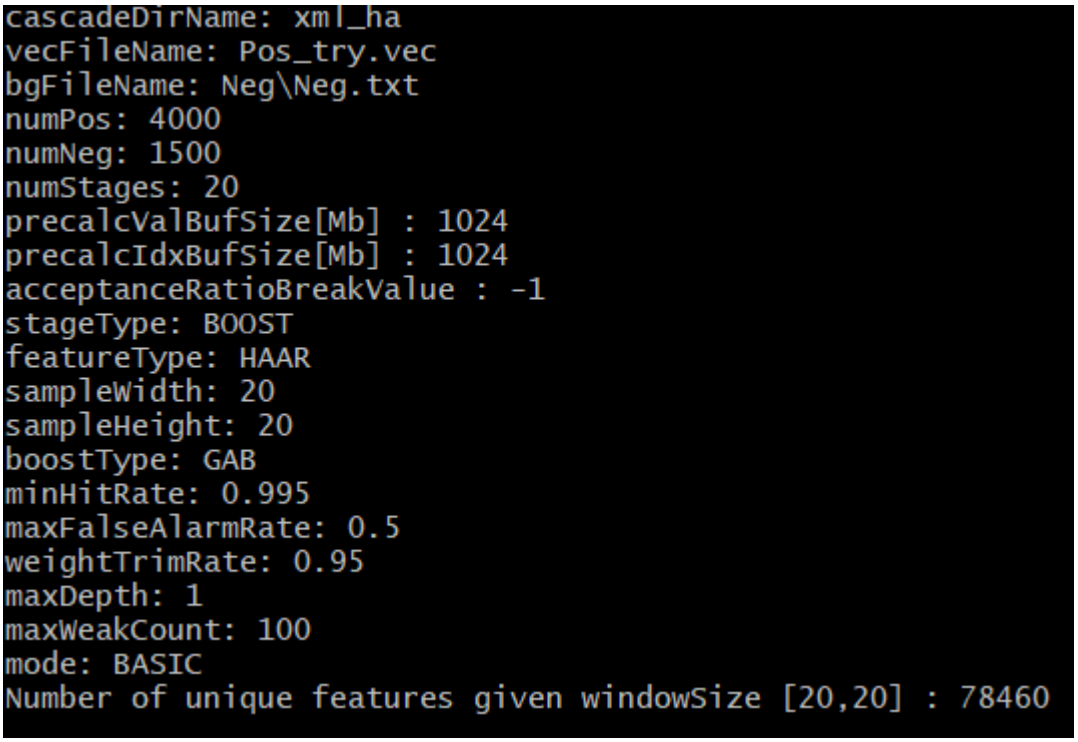
(Figure 2.1)

```
opencv_traincascade.exe -data xml_ha -vec Pos_try.vec -bg Neg\Neg.txt -numPos 4000 -numNeg 1500 -numStages 20
~
~
```

(Figure 2.2)

```
cascadeDirName: xml_new
vecFileName: Pos_try.vec
bgFileName: Neg\Neg.txt
numPos: 4000
numNeg: 1500
numStages: 20
precalcValBufSize[Mb] : 1024
precalcIdxBufSize[Mb] : 1024
acceptanceRatioBreakValue : -1
stageType: BOOST
featureType: LBP
sampleWidth: 20
sampleHeight: 20
boostType: GAB
minHitRate: 0.995
maxFalseAlarmRate: 0.5
weightTrimRate: 0.95
maxDepth: 1
maxWeakCount: 100
Number of unique features given windowSize [20,20] : 3969
```

(Figure 2.3)


cascadeDirName: xml_ha
vecFileName: Pos_try.vec
bgFileName: Neg\Neg.txt
numPos: 4000
numNeg: 1500
numStages: 20
precalcValBufSize[Mb] : 1024
precalcIdxBufSize[Mb] : 1024
acceptanceRatioBreakValue : -1
stageType: BOOST
featureType: HAAR
sampleWidth: 20
sampleHeight: 20
boostType: GAB
minHitRate: 0.995
maxFalseAlarmRate: 0.5
weightTrimRate: 0.95
maxDepth: 1
maxWeakCount: 100
mode: BASIC
Number of unique features given windowSize [20,20] : 78460

(Figure 2.4)

3.Parking Lot Analysis

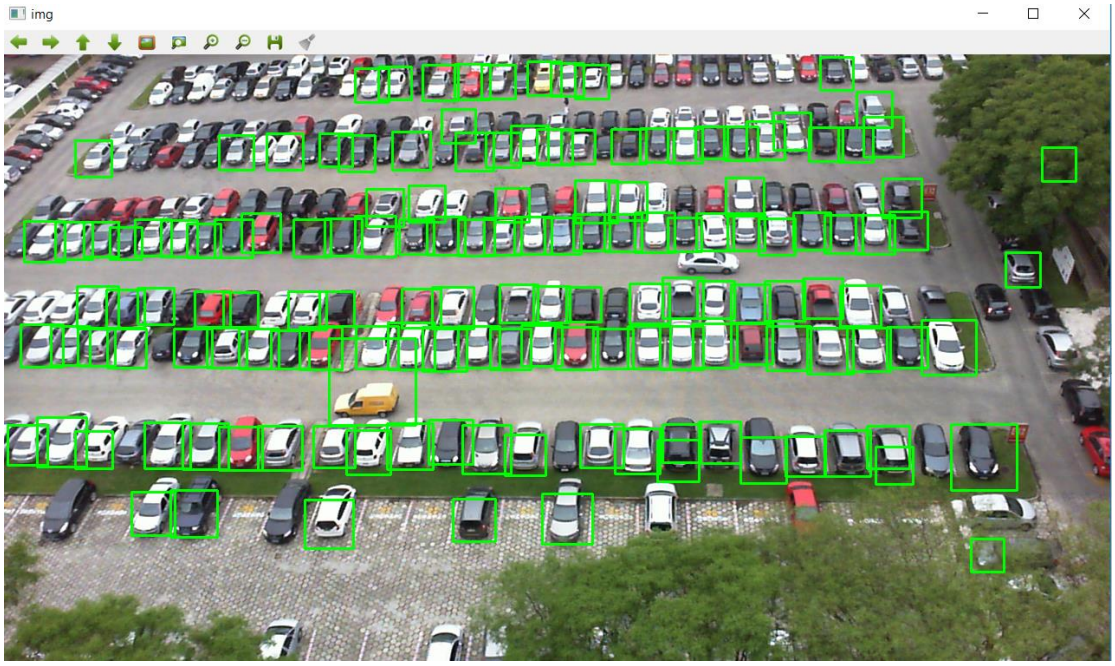
Test Image	Classifier Feature	Stages	No. of Positives	No. of Negatives	TP	FP	Accuracy
Parking_2							
parking2\rainy\2012-10-26\ 2012-10-26_06_19_24	**HAAR**	**20**	**4000**	**1500**	**3**	**0**	**75%**
parking2\rainy\2012-10-26\ 2012-10-26_06_19_24	**LBP**	**20**	**4000**	**1500**	**3**	**0**	**75%**
parking2\rainy\2012-10-26\ 2012-10-26_07_24_27	**HAAR**	**20**	**4000**	**1500**	**18**	**0**	**94.37%**
parking2\rainy\2012-10-26\ 2012-10-26_07_24_27	**LBP**	**20**	**4000**	**1500**	**18**	**1**	**94.37%**
parking2\cloudy\2012-10-31\2012-10-31_11_28_13	**HAAR**	**20**	**4000**	**1500**	**58**	**2**	**82.85%**
parking2\cloudy\2012-10-31\ 2012-10-31_11_28_13	**LBP**	**20**	**4000**	**1500**	**158**	**1**	**82.85%**
parking2\cloudy\2012-10-31\ 2012-10-31_14_48_21	**HAAR**	**20**	**4000**	**1500**	**39**	**2**	**62.9%**
parking2\cloudy\2012-10-31\ 2012-10-31_14_48_21	**LBP**	**20**	**4000**	**1500**	**39**	**1**	**62.9%**
parking2\cloudy\2012-10-31\ 2012-10-31_08_13_04	**HAAR**	**20**	**4000**	**1500**	**47**	**0**	**51.08%**
parking2\cloudy\2012-10-31\ 2012-10-31_08_13_04	**LBP**	**20**	**4000**	**1500**	**47**	**0**	**51.08%**
parking2\cloudy\2012-10-31\ 2012-10-31_16_33_26	**HAAR**	**20**	**4000**	**1500**	**52**	**0**	**82.53%**
parking2\cloudy\2012-10-31\ 2012-10-31_16_33_26	**LBP**	**20**	**4000**	**1500**	**52**	**0**	**82.53%**
parking2\rainy\2012 - 09 - 16\2012-09-16_06_22_55	**HAAR**	**20**	**4000**	**1500**	**0**	**0**	**100%**
parking2\rainy\2012 - 09 - 16\2012-09-16_06_22_55	**LBP**	**20**	**4000**	**1500**	**0**	**1**	**100%**
parking2\cloudy\2012-11-08\2012-11-08_07_20_27	**HAAR**	**20**	**4000**	**1500**	**11**	**3**	**91.66%**

parking2\cloudy\2012-11-08\2012-11-08_07_20_27	**LBP**	**20**	**4000**	**1500**	**10**	**0**	**83.33%**
parking2\cloudy\2012-11-08\2012-11-08_12_00_40	**HAAR**	**20**	**4000**	**1500**	**60**	**1**	**90.90%**
parking2\cloudy\2012-11-08\2012-11-08_12_00_40	**LBP**	**20**	**4000**	**1500**	**51**	**1**	**77.27%**
Parking_a							
parking1a\cloudy\2013-01-16\2013-01-16_07_40_03	LBP	20	4000	1500	0	1	100%
parking1a\cloudy\2013-01-16\2013-01-16_07_40_03	**HAAR**	**20**	**4000**	**1500**	**0**	**5**	**100%**
parking1a\cloudy\2013-01-16\2013-01-16_17_45_14	LBP	20	4000	1500	8	3	47.05%
parking1a\cloudy\2013-01-16\2013-01-16_17_45_14	**HAAR**	**20**	**4000**	**1500**	**8**	**2**	**47.05%**
parking1a\cloudy\2012-12-12\2012-12-12_10_00_05	LBP	20	4000	1500	12	0	42.58%
parking1a\cloudy\2012-12-12\2012-12-12_10_00_05	**HAAR**	**20**	**4000**	**1500**	**13**	**0**	**46.42%**
parking1a\cloudy\2012-12-12\2012-12-12_11_10_06	LBP	20	4000	1500	11	0	39.28%
parking1a\cloudy\2012-12-12\2012-12-12_11_10_06	**HAAR**	**20**	**4000**	**1500**	**14**	**1**	**50%**
parking1a\rainy\2013-01-21\2013-01-21_07_40_02	LBP	20	4000	1500	0	3	100%
parking1a\rainy\2013-01-21\2013-01-21_07_40_02	**HAAR**	**20**	**4000**	**1500**	**0**	**4**	**100%**
parking1a\rainy\2013-01-21\2013-01-21_09_25_04	LBP	20	4000	1500	11	0	39.28%
parking1a\rainy\2013-01-21\2013-01-21_09_25_04	**HAAR**	**20**	**4000**	**1500**	**12**	**2**	**42.85%**
parking1a\rainy\2013-01-21\2013-01-21_08_15_03	LBP	20	4000	1500	3	1	37.85%
parking1a\rainy\2013-01-21\2013-01-21_08_15_03	**HAAR**	**20**	**4000**	**1500**	**3**	**1**	**37.5%**
parking1a\rainy\2013-01-21\2013-01-21_10_30_05	**LBP**	**20**	**4000**	**1500**	**11**	**2**	**39.28%**

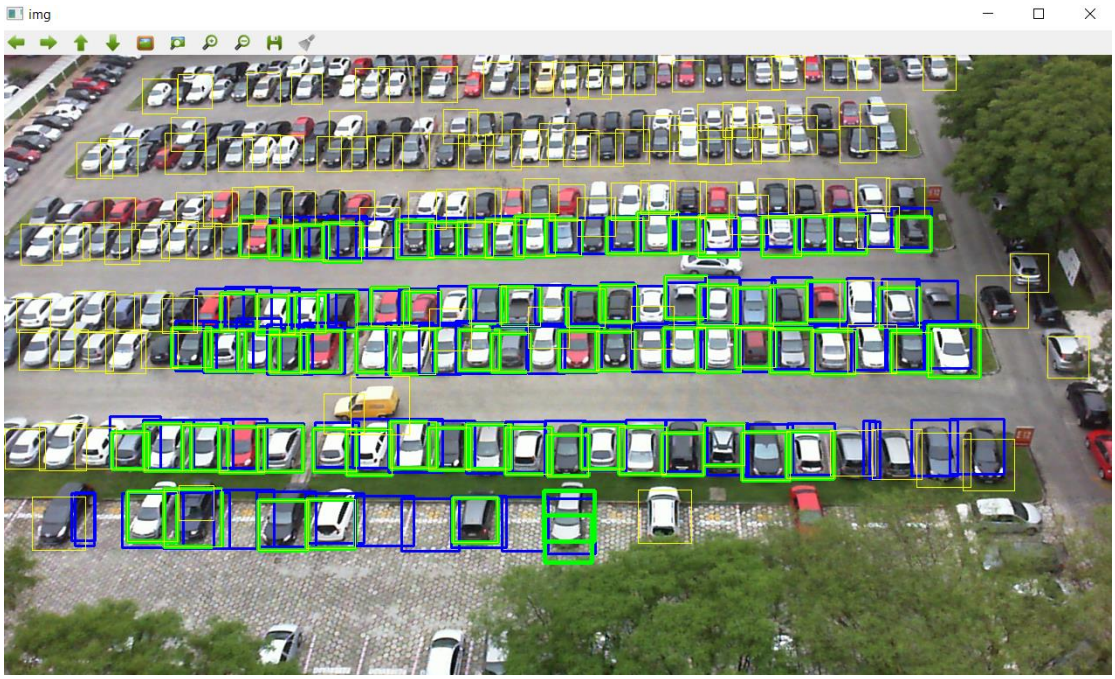
parking1a\rainy\2013-01-21\2013-01-21_10_30_05	**HAAR**	**20**	**4000**	**1500**	**11**	**2**	**39.28%**
Parking_b							
parking1b\cloudy\2013-03-15\2013-03-15_06_35_00	LBP	20	4000	1500	1	0	100%
parking1b\cloudy\2013-03-15\2013-03-15_06_35_00	**HAAR**	**20**	**4000**	**1500**	**1**	**0**	**100%**
parking1b\cloudy\2013-03-15\2013-03-15_07_15_01	LBP	20	4000	1500	1	2	14.28%
parking1b\cloudy\2013-03-15\2013-03-15_07_15_01	**HAAR**	**20**	**4000**	**1500**	**2**	**1**	**28.57%**
parking1b\cloudy\2013-03-15\2013-03-15_07_55_02	LBP	20	4000	1500	6	1	21.42%
parking1b\cloudy\2013-03-15\2013-03-15_07_55_02	**HAAR**	**20**	**4000**	**1500**	**6**	**0**	**21.42%**
parking1b\cloudy\2013-03-15\2013-03-15_15_45_11	LBP	20	4000	1500	7	0	17.75%
parking1b\cloudy\2013-03-15\2013-03-15_15_45_11	**HAAR**	**20**	**4000**	**1500**	**7**	**0**	**17.5%**
parking1b\rainy\2013-03-19\2013-03-19_06_30_00	LBP	20	4000	1500	0	3	100%
parking1b\rainy\2013-03-19\2013-03-19_06_30_00	**HAAR**	**20**	**4000**	**1500**	**0**	**1**	**100%**
parking1b\rainy\2013-03-19\2013-03-19_07_25_01	LBP	20	4000	1500	6	0	25%
parking1b\rainy\2013-03-19\2013-03-19_07_25_01	**HAAR**	**20**	**4000**	**1500**	**6**	**0**	**25%**
parking1b\rainy\2013-03-19\2013-03-19_12_50_07	LBP	20	4000	1500	7	1	17.5%
parking1b\rainy\2013-03-19\2013-03-19_12_50_07	**HAAR**	**20**	**4000**	**1500**	**6**	**0**	**15%**

4.How to run the code

In the car detection, use the detection_2.py.
First of all, user have to input which parking lot user want to detect **(input a or b or 2)**.
Secondly, user have to input the path of the image. ***(ex: C:\Users\Tommy\Desktop\Spring_2018\Computer_vision\assignment3_folder\PKLot\parking1b\rainy\2013-03-16\2013-03-16_16_45_12)***
Therefore, the program will tell user which cascade is better for this parking lot **(ex: cascade_LBP or cascade_HAAR)**
(Have to change from **cv2.CascadeClassifier)**



In the car analysis part, the step is the same as detection part. Only the result is different.
The car analysis part shows the parking space from ground true, which color is blue. The result of my detection will show green color if their overlap area satisfy the threshold > 50%.
For the FP, and the ignore part show yellow color.
And the result will tell user the number of true positive and the accuracy of detection.


img