

Homework - 3 CSE464
DIGITAL IMAGE PROCESSING
Hamza YOĞURTCUOĞLU - 171044086

Exercise 1 :

I implemented marginal strategy and vector strategy(lexicographical ordering, bitmix ordering, and norm based ordering).

Usage

Step 1: Firstly, image name.

```
Enter picture path ( Example: image.jpg ) :  
image.jpg
```

Step 2: enter kernel size.

```
Enter picture path ( Example: image.jpg ) :  
image.jpg  
  
Enter kernel size : (Example: 3x3 -> 3, 5x5 -> 5 ... ) :  
3
```

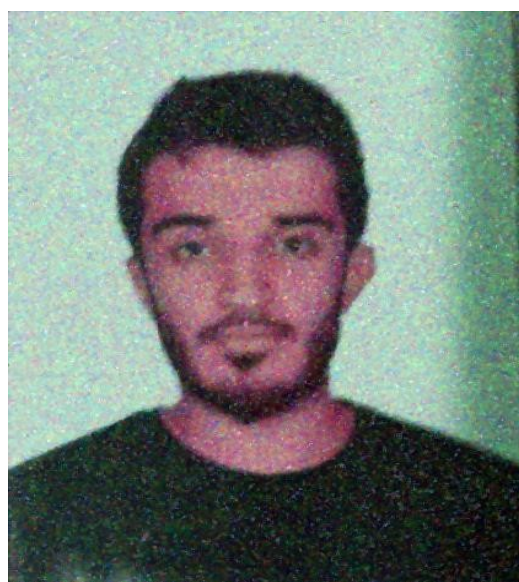
Step 3: Choose a ordering method. Then **check output.jpg**

```
Choose Your Compare Method :  
  
Marginal Strategy -> 1  
Lexicographical Ordering -> 2  
Bitmix Ordering -> 3  
Norm Based Ordering -> 4  
  
1
```

Noise Image :



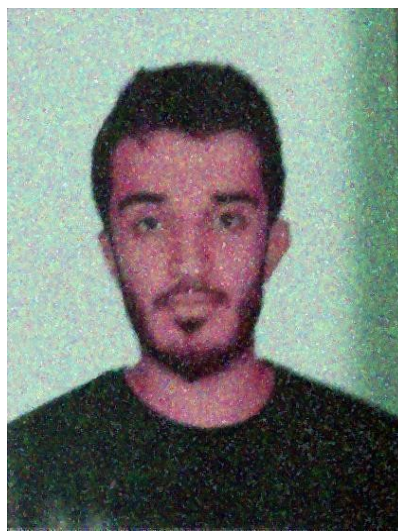
Marjinal :



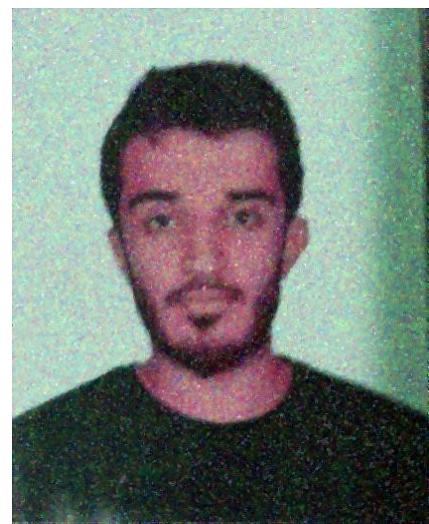
Lexicographical :



Bitmix :



Norm Based :



MSE : For image.jpg → Mean Square Error.

```
Mean Squared Error :  
Red : 922.1956379849237  
Green : 965.2715940430226  
Blue : 899.5795228902372
```

→ Best filter is marginal because it separate RGB then takes median of them and create a pixel. But bad order is lexicographical that can decide directly just red color.

I apply 50 different pixel noise. But that varied background to green. But it depends on the image.

If I use bigger filter size. Output image is more blur.

Example : I used 7x7 kernel size.

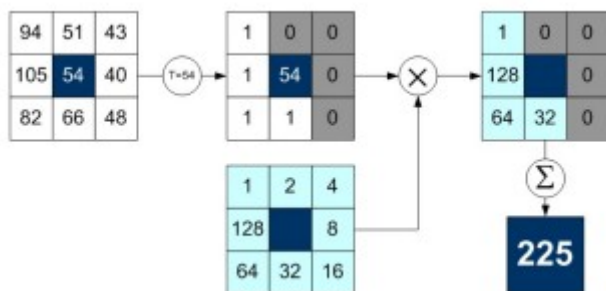


That is more blur. If I use bigger kernel size.



Exercise 2 :

Algorithm : Firstly I implement histogram equalization. I apply to all images to histogram equalization. Then I feature extract with local binary pattern algorithm.



[https://www.researchgate.net/publication/305152373 Texture Feature Extraction by Using Local Binary Pattern](https://www.researchgate.net/publication/305152373_Texture_Feature_Extraction_by_Using_Local_Binary_Pattern)

I implement a nearest neighbor classifier based on the L2 distance using the features of images.

When I removed histogram equalization. Some accuracy of labels are either decrease or increase.

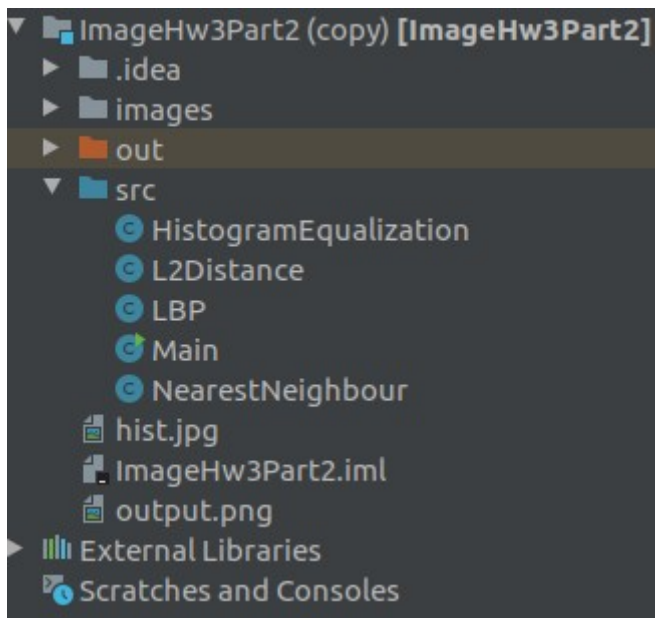
When I used just 1 radius and no rotation solution.

```
Accuracy of class 0 is 43.0%
Accuracy of class 1 is 84.39999999999999%
Accuracy of class 2 is 68.8%
Accuracy of class 3 is 40.6%
Accuracy of class 4 is 84.39999999999999%
Accuracy of class 5 is 71.89999999999999%
Accuracy of class 6 is 68.8%
Accuracy of class 7 is 65.600000000000001%
Accuracy of class 8 is 46.9%
Accuracy of class 9 is 84.39999999999999%
Accuracy of class 10 is 71.89999999999999%
Accuracy of class 11 is 66.600000000000001%
Accuracy of class 12 is 43.8%
Accuracy of class 13 is 27.6%
Accuracy of class 14 is 41.0%
Accuracy of class 15 is 65.600000000000001%
Accuracy of class 16 is 33.0%
Accuracy of class 17 is 67.0%
Accuracy of class 18 is 21.099999999999998%
Accuracy of class 19 is 33.300000000000004%
Accuracy of class 20 is 15.6%
Accuracy of class 21 is 68.8%
Accuracy of class 22 is 25.0%
Accuracy of class 23 is 62.2%
Took 192 second
```

But I tried rotation invariant and 1,2,3 radius result : **If you change radius option check** LBP.java → extractFeatureLBPAccordingToRadius method.

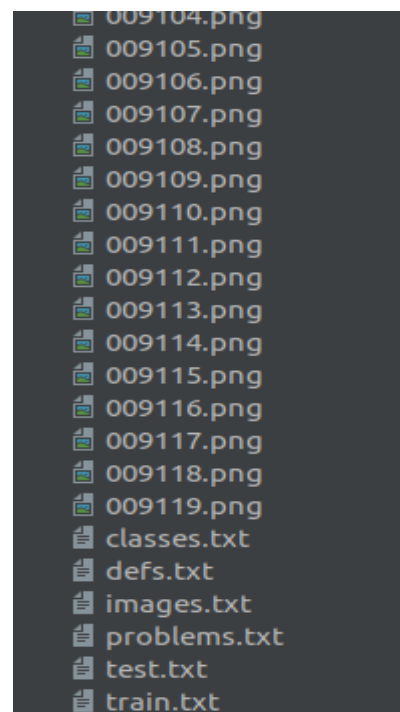
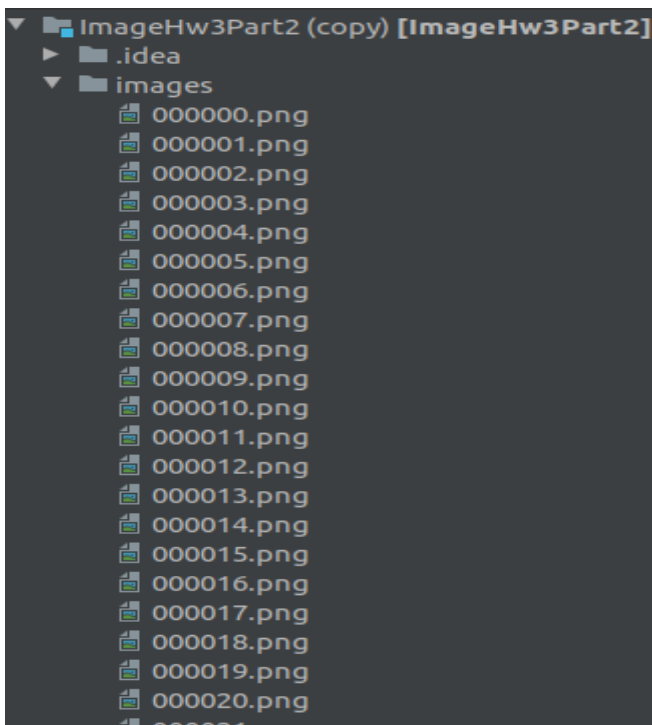
```
Accuracy of class 0 is 8.333333333333332%
Accuracy of class 0 is 8.333333333333332%
Accuracy of class 1 is 1.1111111111111112%
Accuracy of class 2 is 16.666666666666664%
Accuracy of class 3 is 11.111111111111111%
Accuracy of class 4 is 0.0%
Accuracy of class 5 is 0.0%
Accuracy of class 6 is 4.444444444444445%
Accuracy of class 7 is 6.111111111111111%
Accuracy of class 8 is 0.0%
Accuracy of class 9 is 0.0%
Accuracy of class 10 is 0.5555555555555556%
Accuracy of class 11 is 0.5555555555555556%
Accuracy of class 12 is 11.111111111111111%
Accuracy of class 13 is 0.0%
Accuracy of class 14 is 16.666666666666664%
Accuracy of class 15 is 11.111111111111111%
Accuracy of class 16 is 6.111111111111111%
Accuracy of class 17 is 10.0%
Accuracy of class 18 is 0.5555555555555556%
Accuracy of class 19 is 0.0%
Accuracy of class 20 is 0.5555555555555556%
Accuracy of class 21 is 0.0%
Accuracy of class 22 is 5.555555555555555%
Accuracy of class 23 is 46.111111111111114%
```

NOTE : Create images file put images and def.txt , train.txt , test.txt files.



1) images directory

All images and defs.txt, images.txt, test.txt , train.txt inside the directory . Then run the code , wait to operation.



All data is 90 MB. So, the data can not be submit to moodle that has limit with 20 MB. Please do above issues in order to run code.