DIGITAL IMAGE PROCESSING

Homework 3 Report

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AHMET YUŞA TELLİ
151044092

Part 1:

In this part, we have 10 different RGB image and four different median filter methods.

We apply these rules:

Image 1 -> Marginal – Filter size = 3

Image 2 -> Norm Based – Filter size = 5

Image 3 -> Bitmix – Filter size = 3

Image 4 -> Lexical – Filter size = 3

Image 5 -> Marginal – Filter size = 5

Image 6 -> Bitmix – Filter size = 3

Image 7 -> Marginal – Filter size = 7

Image 8 -> Lexical – Filter size = 7

Image 9 -> Bitmix – Filter size = 5

Image 10 -> Norm Based – Filter size = 5

In marginal strategy, when the filter size is increases then the blur of the pictures increases. The salt and pepper noise in the pictures are removed. When the filter size is small like 3, 5 then the strategy is faster results.

In vector strategy, when we apply norm-based ordering the picture is more blur then the other ordering methods. If the filter size is small the other ordering methods are clearer than norm-based method.

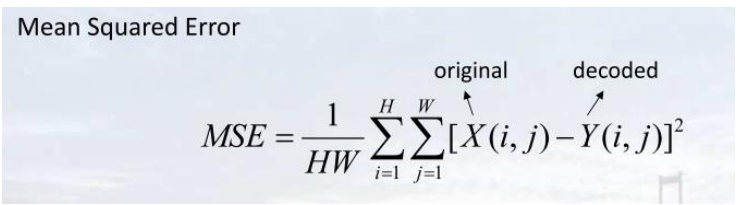
Bitmix ordering is create the clearest picture in this part. The blur does not chance too much even if the filter size increases. When the filter size increases the result finding time increases a little.

Lexical ordering is like bitmix's results. When the filter size is increases then the blur of the pictures increases.

We save result images in "Part1_Results" file.

Mean Squared Error:

When we calculate the Mean Squared Error (MSE), we use the formula in the 7th course pdf.



Part 2:

In this part, we read an image from dataset file. Then, we apply histogram equalization formula. In each equalized image we create a Local Binary Pattern (PBP). When we are using LBP, we take radius is 1 and visit eight circular neighbors.

Then we apply this formula:

$$L\ B_{p,r}^{P}(q) = \sum_{i=0}^{p-1} g(q - q_i)2^i \quad \text{and} \quad g(x) = \begin{cases} 0, x < 0 \\ 1, x \geq 0 \end{cases}$$

We create a pattern for each image. In LBP, we apply a new histogram equalization then we write these results to a pattern file ("train_pattern.txt" and "test_pattern.txt"). Each row in these pattern files is an image and the equalized pixels values of that image.

In LBP, I could not calculate rotations. I encountered an error when rotating the filter. I could not solve the problem.

After LBP, we are calculating the accuracy for each image's class. Read pattern's values from patterns files. First, we find maximum and minimum values. We calculate the accuracies by using these numbers and train and test values. We subtract the minimum number from the train value, then divide the difference between maximum and minimum numbers. We have found the proximity of the numbers in the same index in train and test values.

Then we print the accuracies for each images class.

Outex_TC_00012/000 Result

```
Finding Accuracies
Class 00  Accuracy: 0,6111
Class 01  Accuracy: 0,7333
Class 02  Accuracy: 0,7111
Class 03  Accuracy: 0,5556
Class 04  Accuracy: 0,3611
Class 05  Accuracy: 0,6278
Class 06  Accuracy: 0,3833
Class 07  Accuracy: 0,5111
Class 08  Accuracy: 0,4833
Class 09  Accuracy: 0,3056
Class 10  Accuracy: 0,3056
Class 11  Accuracy: 0,3000
Class 12  Accuracy: 0,3611
Class 13  Accuracy: 0,6278
Class 14  Accuracy: 0,4000
Class 15  Accuracy: 0,4500
Class 16  Accuracy: 0,4556
Class 17  Accuracy: 0,4222
Class 18  Accuracy: 0,5000
Class 19  Accuracy: 0,7667
Class 20  Accuracy: 0,4778
Class 21  Accuracy: 0,4722
Class 22  Accuracy: 0,8611
Class 23  Accuracy: 0,9667
Accuracy Average: 0,5271
```

Outex_TC_00012/001 Result

```
Finding Accuracies
Class 00  Accuracy: 0,6333
Class 01  Accuracy: 0,7444
Class 02  Accuracy: 0,7278
Class 03  Accuracy: 0,6167
Class 04  Accuracy: 0,3722
Class 05  Accuracy: 0,6389
Class 06  Accuracy: 0,4000
Class 07  Accuracy: 0,6000
Class 08  Accuracy: 0,4778
Class 09  Accuracy: 0,3778
Class 10  Accuracy: 0,3167
Class 11  Accuracy: 0,2556
Class 12  Accuracy: 0,3278
Class 13  Accuracy: 0,6833
Class 14  Accuracy: 0,4556
Class 15  Accuracy: 0,4500
Class 16  Accuracy: 0,3611
Class 17  Accuracy: 0,4278
Class 18  Accuracy: 0,5056
Class 19  Accuracy: 0,8833
Class 20  Accuracy: 0,5556
Class 21  Accuracy: 0,4778
Class 22  Accuracy: 0,9278
Class 23  Accuracy: 0,9667
Accuracy Average: 0,5493
```

Ahmet Yuşa Telli

151044092