Assignment 3.2 (Arithmetic Operations on Grayscale Images)

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In [26]:
```
from random import *
import math
```

In [15]:
```
def generate_Matrix(size):
    '''
        Function to generate random matrix with binary values
    '''
    matrix = [[0 for i in range(size)] for j in range(size)]
    for row in range(len(matrix)):
        for col in range(len(matrix[row])):
            matrix[row][col] = randint(0, 255)
    return matrix
```

In [16]:
```
def display(matrix):
    '''
        Description: Utility function to display matrix
    '''
    for i in range(len(matrix)):
        print(matrix[i], end="\n")
```

In [31]:
```
def addition(matrix1, matrix2):
    '''
        Function to perform Arithmetic Addition operation on grayscale image
    '''
    output = [[0 for j in range(len(matrix1))] for i in range(len(matrix1))]

    for i in range(len(matrix1)):
        for j in range(len(matrix1)):
            res = matrix1[i][j] + matrix2[i][j]
            output[i][j] = math.floor(res/2) if res > 255 else res
    return output
```

In [73]:
```
def subtraction(matrix1, matrix2):
    '''
        Function to perform Arithmetic Subtraction operation on grayscale image
    '''
    output = [[0 for j in range(len(matrix1))] for i in range(len(matrix1))]

    for i in range(len(matrix1)):
        for j in range(len(matrix1)):
            res = abs(matrix1[i][j] - matrix2[i][j])
            output[i][j] = res
    return output
```

In [74]:
```
def multiplication(matrix1, matrix2):
    '''
        Function to perform Arithmetic Multiplication operation on grayscale image
```

```
    '''
    output = [[0 for j in range(len(matrix1))] for i in range(len(matrix1))]

    for i in range(len(matrix1)):
        for j in range(len(matrix1)):
            res = matrix1[i][j] * matrix2[i][j]
            while res > 255:
                res = math.floor(res/2)
            output[i][j] = res
    return output
```

In [57]:

```
def scalarOperation(matrix, scaler, op):
    '''
        Function to perform Arithmetic Scaling operation on grayscale image
    '''
    output = [[0 for j in range(len(matrix))] for i in range(len(matrix))]

    for i in range(len(matrix)):
        for j in range(len(matrix)):
            if op == '+':
                output[i][j] = matrix[i][j] + scaler
            if op == '-':
                output[i][j] = matrix[i][j] - scaler
            if op == '*':
                output[i][j] = matrix[i][j] * scaler
            if op == '/':
                output[i][j] = math.floor(matrix[i][j] / scaler)

            while output[i][j] > 255:
                output[i][j] = math.floor(output[i][j]/2)
    return output
```

In [21]:

```
matrix_size = int(input("Enter matrix size"))
```

In [22]:

```
matrix1 = generate_Matrix(matrix_size)
matrix2 = generate_Matrix(matrix_size)
```

In [23]:

```
print("Randomly generated Matrix 1:\n")
display(matrix1)
print("\nRandomly generated Matrix 2:\n")
display(matrix2)
```

```
Randomly generated Matrix 1:

[27, 30, 179, 196]
[218, 41, 42, 213]
[223, 25, 197, 224]
[15, 228, 158, 213]

Randomly generated Matrix 2:

[28, 215, 3, 105]
[177, 188, 27, 53]
[247, 109, 11, 188]
[239, 44, 141, 213]
```

Arithmetic Operation Result

Arithmetic Addition Result

In [32]:
```
print("Addition of Matrix 1 and Matrix 2:\n")
display(addition(matrix1, matrix2))
```

```
Addition of Matrix 1 and Matrix 2:

[55, 245, 182, 150]
[197, 229, 69, 133]
[235, 134, 208, 206]
[254, 136, 149, 213]
```

Arithmetic Subtraction Result

In [33]:
```
print("Subtraction of Matrix 1 and Matrix 2:\n")
display(subtraction(matrix1, matrix2))
```

```
Subtraction of Matrix 1 and Matrix 2:

[1, 185, 176, 91]
[41, 147, 15, 160]
[24, 84, 186, 36]
[224, 184, 17, 0]
```

Arithmetic Multiplication Result

In [42]:
```
print("Multiplication of Matrix 1 and Matrix 2:\n")
display(multiplication(matrix1, matrix2))
```

```
Multiplication of Matrix 1 and Matrix 2:

[189, 201, 134, 160]
[150, 240, 141, 176]
[215, 170, 135, 164]
[224, 156, 174, 177]
```

Scalar Operations Result

In [72]:
```
scalar = int(input("Enter scaler value"))
print("Scalar value = {}".format(scalar))
```

```
Scalar value = 4
```

In [71]:
```
print("Scalar Addition by {}:\n".format(scalar))
display(scalarOperation(matrix1, scalar, '+'))
```

```
Scalar Addition by 3:

[30, 33, 182, 199]
[221, 44, 45, 216]
[226, 28, 200, 227]
[18, 231, 161, 216]
```

In [70]:
```
print("Scalar Subtraction by {}:\n".format(scalar))
display(scalarOperation(matrix1, scalar, '-'))
```

```
Scalar Subtraction by 3:

[24, 27, 176, 193]
[215, 38, 39, 210]
[220, 22, 194, 221]
[12, 225, 155, 210]
```

In [69]:
```
print("Scalar Mulitplication by {}:\n".format(scalar))
display(scalarOperation(matrix1, scalar, '*'))
```

```
Scalar Mulitplication by 3:

[81, 90, 134, 147]
[163, 123, 126, 159]
[167, 75, 147, 168]
[45, 171, 237, 159]
```

In [67]:

```
print("Scalar Division by {}:\n".format(scalar))
display(scalarOperation(matrix1, scaler, '/'))
```

```
Scalar Division by 3:

[9, 10, 59, 65]
[72, 13, 14, 71]
[74, 8, 65, 74]
[5, 76, 52, 71]
```

In [ ]: