Assignment 4

1. Normalization of intensity values between [0 to K]

In [19]:

```
import math
from random import *
import numpy as np
```

In [1]:

```
def getMaxIntensityValue(matrix):
    '''
        Description: Function to get the maximum intensity pixel value of an image
        Input: a 2-D matrix containing image pixel intensity values
        Output: maximum intensity value
    '''
    maximumIntensity = 0
    m = len(matrix)
    n = len(matrix[0])

    for i in range(m):
        for j in range(n):
            if matrix[i][j] > maximumIntensity:
                maximumIntensity = matrix[i][j]
    return maximumIntensity
```

In [44]:

```
def normalization(matrix, K):
    '''
        Description: Function to normalize intensity values of an image
        Input: a 2-D intensity matrix
        Output: a 2-D intensity matrix with normalized intensity values in the range [0
    '''
    m = len(matrix)
    n = len(matrix[0])
    maxIntensityValue = getMaxIntensityValue(matrix)
    normalizedMatrix = np.zeros([m,n], dtype=float)

    for i in range(m):
        for j in range(n):
            normalizedMatrix[i][j] = (matrix[i][j]/maxIntensityValue) * K

    return normalizedMatrix
```

In [27]:

```
def generateRandomImage(height, width):
    '''
        Description: Utility function to generate random matrix with grayscale values
    '''
    image = np.zeros([image_width, image_height], dtype=int)
    for row in range(height):
        for col in range(width):
            image[row][col] = randint(0, 1000)
    return image
```

User Input

In [28]:

```
print("Enter Image Size\n")
image_height = int(input("Image Height"))
image_width = int(input("Image Width"))
print('Image Height: {}\nImage Width: {}'.format(image_height, image_width))
```

```
Enter Image Size

Image Height: 4
Image Width: 4
```

In [29]:

```
image = generateRandomImage(image_height, image_width)
```

In [42]:

```
print("Generated Image: \n{}".format(image))
```

```
Generated Image: 
[[888 331 148 104]
 [885 334 869 492]
 [280 311 562  46]
 [134  80 452 926]]
```

Apply normalization on input image

In [51]:

```
# apply normalization
K = int(input("Enter K for normalization: "))
normalizedImage = normalization(image, K)
```

Final Result after Normalization

In [52]:

```
print("Original Image:\n\n{}\n\n".format(image))
print("Normalized Image for K = {}\n\n {}".format(K, normalizedImage))
```

```
Original Image:

[[888 331 148 104]
 [885 334 869 492]
 [280 311 562  46]
 [134  80 452 926]]


Normalized Image for K = 255

 [[244.53563715  91.15010799  40.75593952  28.63930886]
 [243.70950324  91.9762419  239.30345572 135.48596112]
 [ 77.10583153  85.6425486  154.76241901  12.66738661]
 [ 36.90064795  22.03023758 124.47084233 255.        ]]
```

In [ ]: