German University in Cairo
Faculty of Media Engineering and Technology
Spring 2022

DMET 1001 – Image Processing

Assignment #2

(Due on: May 25, 2022 at mid-night)

(This assignment can be done in teams of maximum 2 students – Please include a text files with your names and IDs in the submission)

Submit the Assignment to: dmet10012022@gmail.com

Problem

Implement a function that can increase the contrast of a colored image using morphological operators. One way to achieve this goal is to use the following expression to increase the contrast of image I:

$$I_{IncContrast} = I + a \times (I - I \circ B) - b \times (I \bullet B - I)$$

where I is the original image, B is the structuring element, a and b are constants, $\circ$ indicates opening and $\bullet$ indicates closing.

Apply your function to the image "Suez Canal.png".

Deliverables:

- Your code.
- Explain how the equation given above increases the contrast of images.
- The output image with a square structuring element of size 3 x 3 when $a = 1$ and $b = 1$.
- The output image with a square structuring element of size 9 x 9 when $a = 1$ and $b = 1$.
- The output image with a square structuring element of size 3 x 3 when $a = 5$ and $b = 1$.
- The output image with a square structuring element of size 3 x 3 when $a = 1$ and $b = 5$.
- Comment on the effect of increase the structuring element size on the output image.
- Comment on the effect of increasing or decreasing a and b on the output image.
- Suggest an expression that could decrease the contrast using morphological operators.

Note: Don't use already existing functions in Python for morphological operators. You have to implement them from scratch.