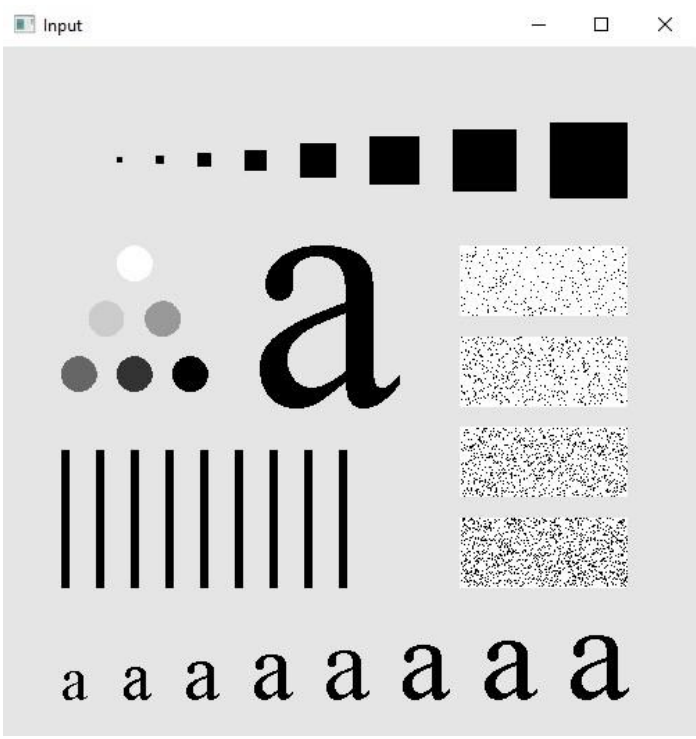
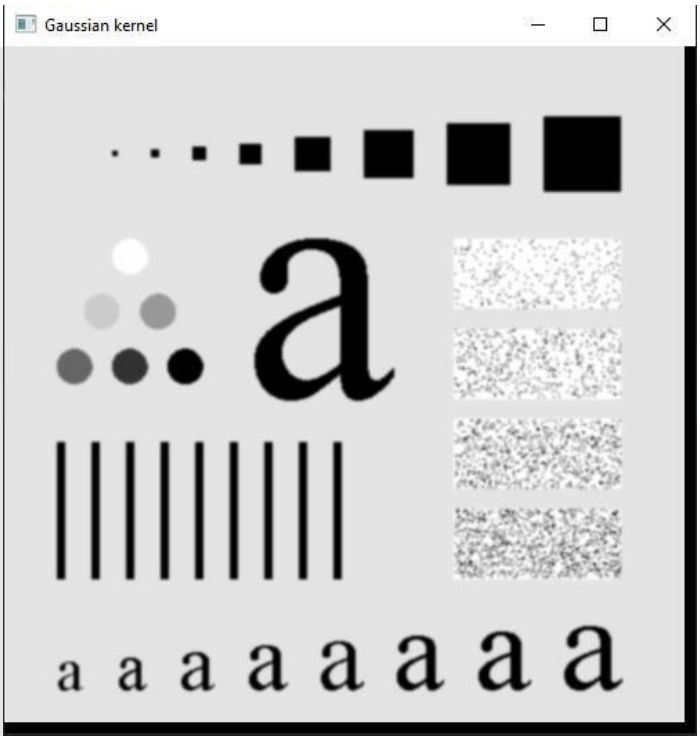
Task1 (C)Convolution

Taking 9x9 kernel

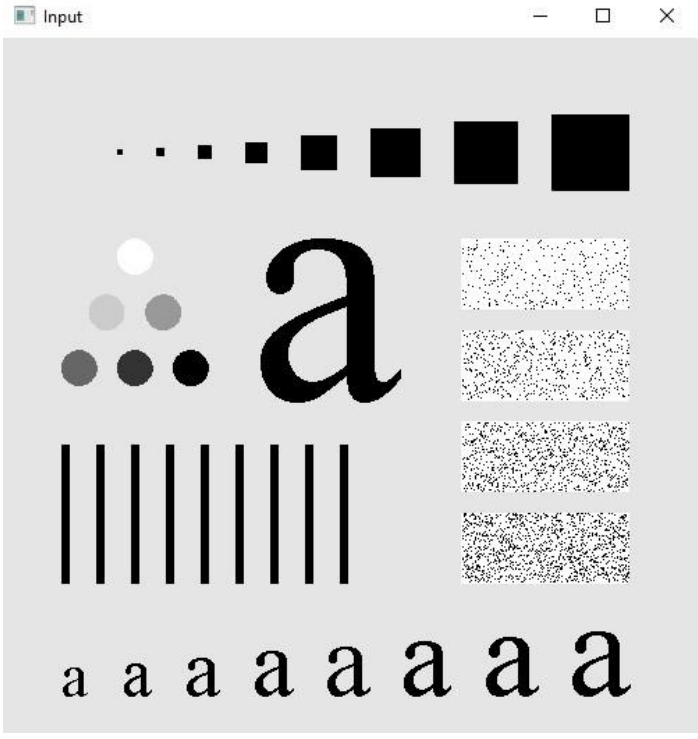


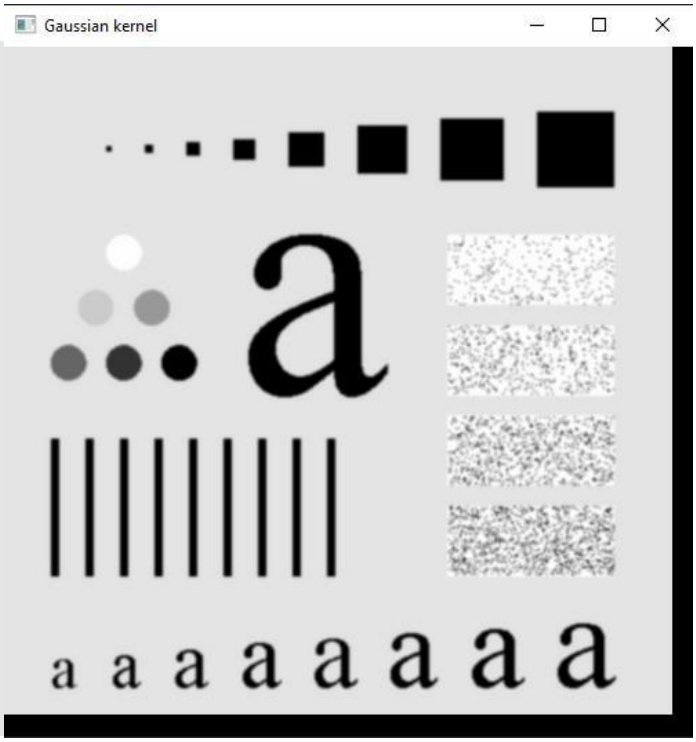
Input



Output

Taking 17x17 kernel





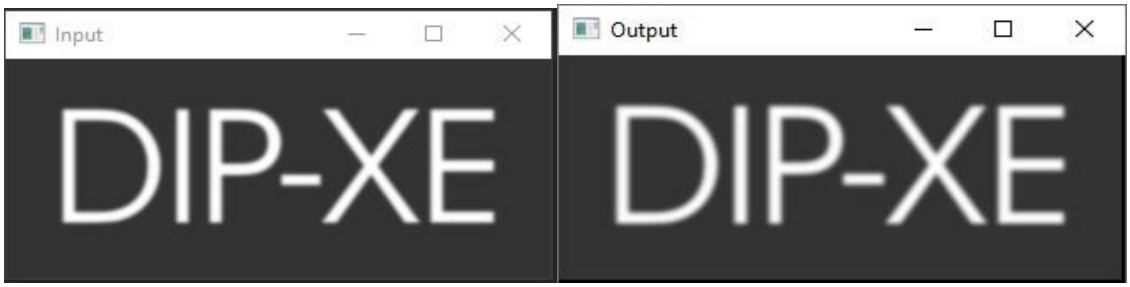
Taking 31*31 kernel

Task 2

(a) Linear filtering is filtering in which the output matrix is obtained by sliding sum of multiplication of each pixel of the image and its neighboring with the filter (convolution)

Gaussian Filter and Box Filter both does blurring using convolution so the operations are linear

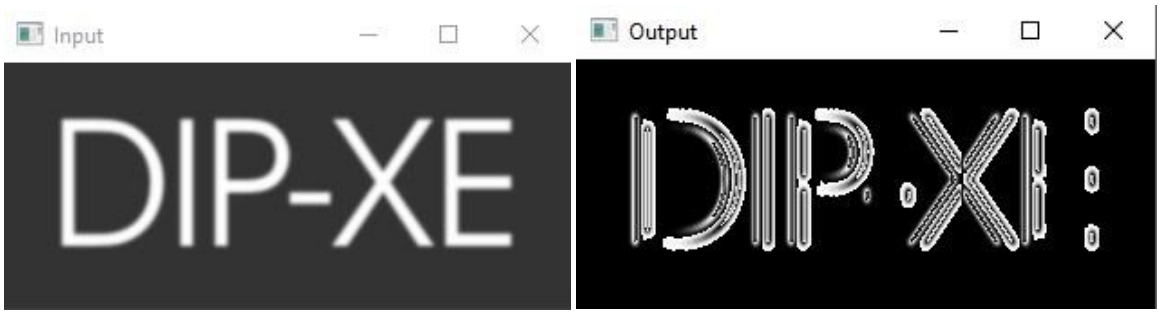
(b) Applying B Filter, we get blurred Image



Input Output

Applying G Filter on result we get sharped boundaries

Applying G filter, we get



Input Output

Applying B Filter on result we get

Output of applying B filter on filter G

(c)

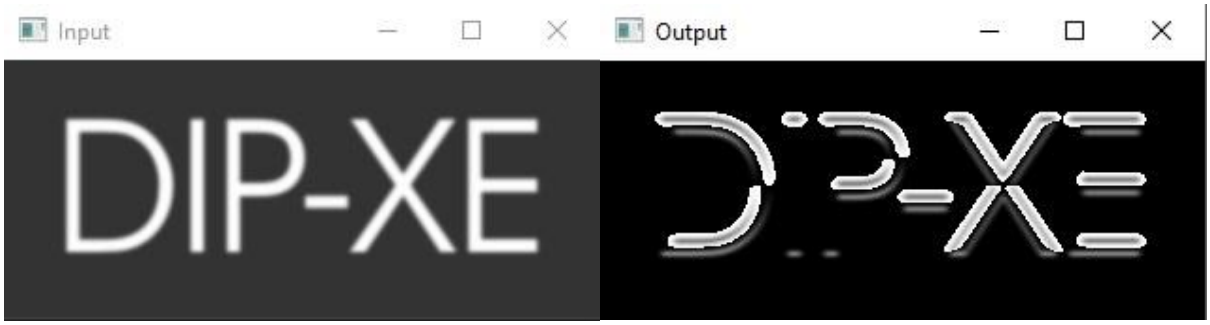
If I need to combine the two filters, I will take 1D vector from G filter as well as from B filter and then combining both will return us a filter that will have combined effects

1/3*(transpose ([-1 0 1]) *[1 1 1])

S = [-1 -1 -1]

[0 0 0] [1 1 1]

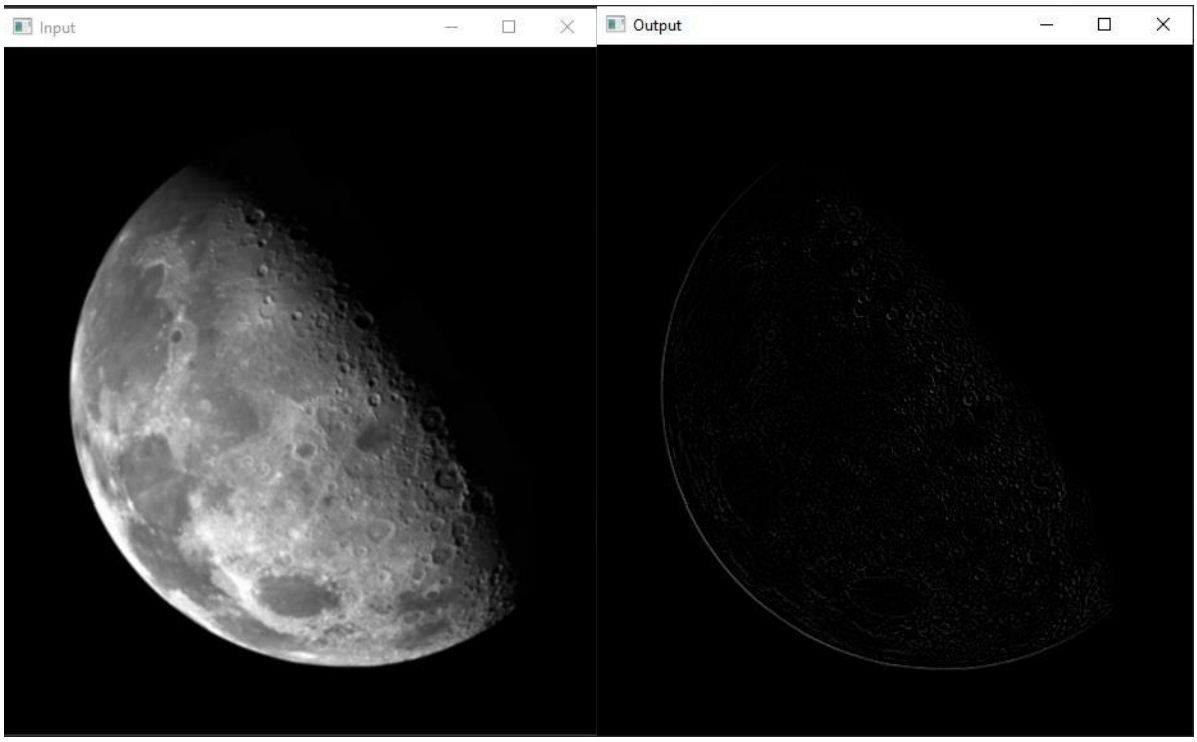
Applying S



Input Output

Task 3

90-degree Isotropic Laplacian with scaling

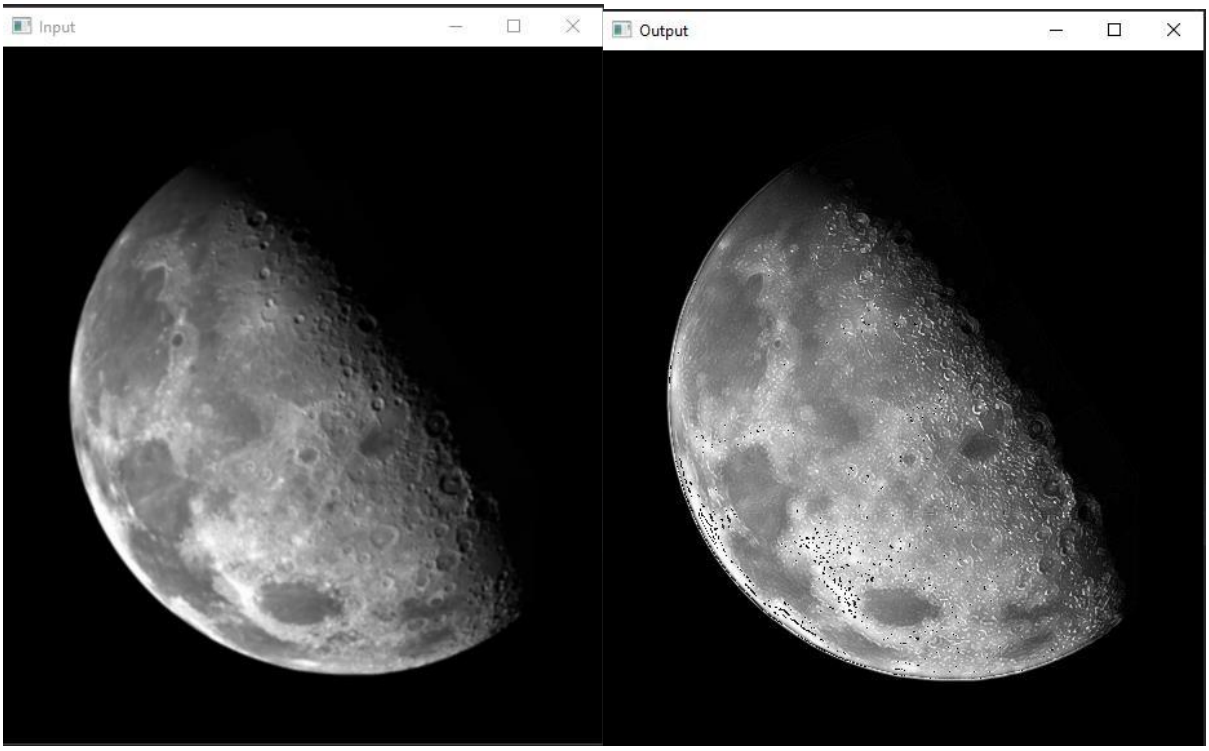


Input Output

45-degree Isotropic Laplacian with scaling

Input Output

(b)Sharpening the image using 90-degree Isotropic Laplacian



(b)Sharpening the image using 45-degree Isotropic Laplacian

Input Output

When we apply 90 degree scaled Isotropic Laplacian, we get the sharp areas of image. Then we combine or add the details in the original image and as a result get the sharp image the same is the case with 45 degree scaled Isotropic Laplacian but the later one does a little bit more sharpening