Programming Assignment-1 on course CSL442_IVP_S22

Instructions:

1. Solve any five questions out of six. Each question reserved 3 marks.
2. Required two items for submission:
    2.1. Solutions Jupiter notebook / MATLAB file
    2.2. Link to the recorded video of your program explanation and output demo. Try to keep the video duration minimum (preferably 10-15min).
3. All the submissions should be submitted only in teams. Assignment due date is 24-02-2022 before 5:00PM. Late submission is accepted till 25.02.2022 before 5:00PM with 2 marks penalty from the acquired marks.
4. Copying assignment solutions from others are strongly discouraged and will violate the academic code of conduct. If such acts are discovered, the entire score will be set to zero.

Assignment Questions:

Q1. Write a computer program capable of zooming and shrinking an image by pixel replication. Assume that the desired zoom/shrink factors are integers. Take any image and use your program to shrink the image by a factor of 10. Use your program to zoom the image back to the resolution of the original. Explain the reasons for their differences. Use provided lena_gray_256.jpg image for experimentation.

Q2. The function domIntensity(im, k) takes an image im and an integer k and returns a list of k most frequently occurring graylevel intensity in that image.
1. Implement the function. The code should work for grayscale images.
2. Implement a display function which takes the image im as input, the list returned by domIntensity(im, k) and displays the image, the most dominant graylevel intensity and the palette of k dominant intensities (see Figure 1).

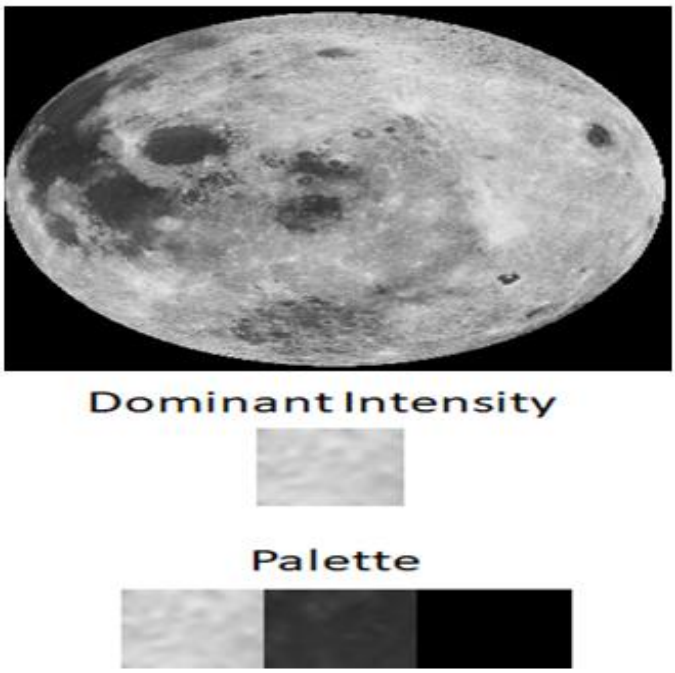
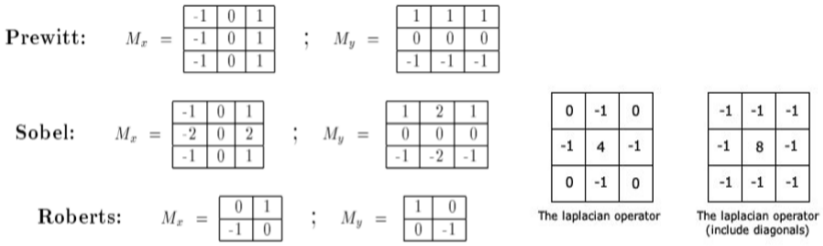
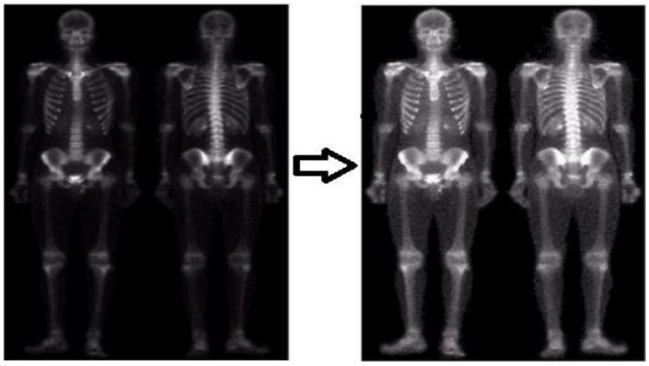


Figure 1. An example of input image and output for question Q2.

Q3. Consider Roberts, Prewitt, Sobel, Laplacian filters (shown in the below image). Apply these filters on Building.jpg and make observations upon comparing their outputs. You are allowed to do the same with an image of your own choice.



Q4. Enhance the 'skeleton.jpg' image by performing the sequence of operations as given below or any other alternative method. Make note of the observations in each step.

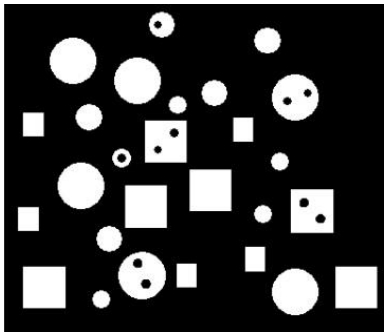


Skeleton.jpg

(Hint: #1. (a).read image of whole body bone scan.
#2. (b) Laplacian of (a).
#3. (c) Sharpened image obtained by adding (a) and (b).
#4. (d) Sobel gradient of image (a).
#5. (e) Sobel image smoothed with a 5 × 5 box filter.
#6. (f) Mask image formed by the product of (b) and (e).
#7. (g) Sharpened image obtained by the adding images (a) and (f).
#8. (h) Final result obtained by applying a power-law transformation to (g).)

Q5. Write functions/subroutines to design spatial filters (sizes of 3X3 and 5X5) - mean, median, Min-Max. Apply the appropriate filter for the given noise images to enhance the image quality. Use images Cameraman_SandP_0.08.jpg, Camerman_G_0.05.jpg. Make observations upon comparing their outputs.

Q6. Write a function Count_hole( ) that takes a black and white image (imghole.jpg) as input and returns number of holes in that image. Use morphological and logical operations in the Count_hole() function implementation.



Imghole.jpg