IVP

Programming Assignment – 2

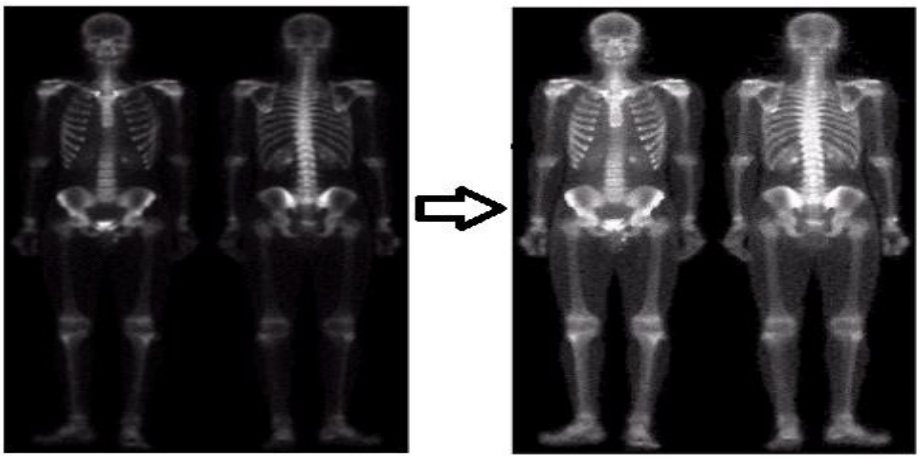
Q1. Consider the figure below and the problem of matching a given image template (ex. Image with symbol 'T') to different regions/objects in a target image (the bigger image with many symbol). Based on the techniques studied till now, try implementing a method to locate the region in the target image which matches with the template image.

Q2. Image 1 (*img1noisy*.tif) contains impulsive noise (left side) and additive white gaussian noise (right side). Try to use a median filter and an arithmetic mean filter. Calculate the mean-square error:

$$E = \frac{1}{MN}\sum_{x=1}^{M}\sum_{y=1}^{N}(I_o(x,y) - I_f(x,y))^2$$

(where Io is the original/noise-free image and If the noisy/filtered image), in both sides separately of the image both before and after filtering with the different filters. Compare and discuss both the numerical results and visual appearance. Finally, show 'the best possible' filtered image, where both the left and the right side are filtered with the filter that produces the minimum mean-square error. Show also the respective error image (i.e. the difference image between the original and the corrected image). (Remember to scale the error image properly!). The original noise-free image is in the file *img1original.tif*.

Q3. Try to enhance the 'skeleton.jpg' image as shown by appropriate choice of operations.



Q4. **A**pply Marr-Hildreth edge detector and canny edge detector algorithms on given image Building.jpeg then compare the results and explain the difference?

Q5. Write your own code for some basic morphological functions that work on binary images. The functions are:

- dilation
- erosion
- opening
- closing

Use the images “body1.bmp” and “body 2.bmp” to test your code. You are not allowed to use standard functions such as "BWMORPH" but it is a good idea to explore how that function works.

Figure 2. body1.bmp

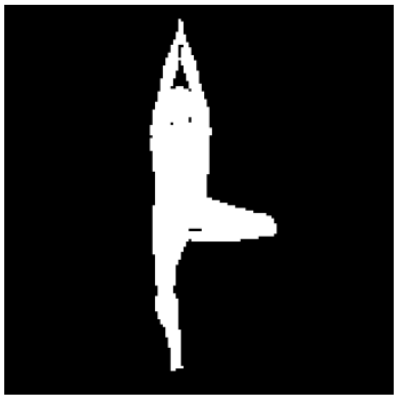


Figure 1. body2.bmp

Q6. The image of the optical telegraph “semafor.bmp” contains six black rectangles in size 11 x 11 pixels. Use the functions that you wrote in part 1 and the method of the Hit-or-Miss transform to find the centre coordinates of these rectangles. You are not allowed to use the function BWHITMISS.

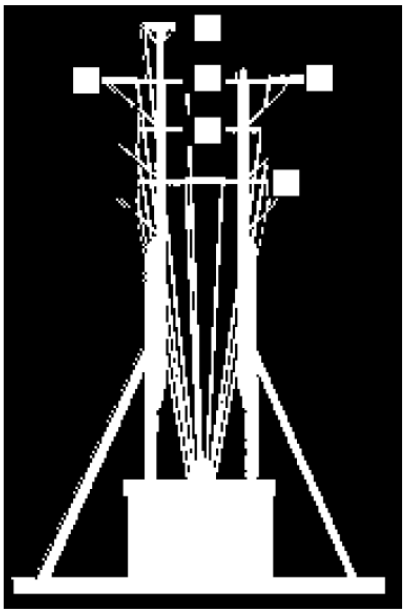


Figure 3. semafor.bmp

Q7. Perform morphological operations to enhance the following images,
a) Improve *‘test1.bmp’* by isolating each circle so that there are no overlapping circles.
b) Now Fill up the holes in *‘test1.bmp’* image.
c) Remove both connected lines in ‘test 2.bmp’ to produce only four isolated objects as shown below.