IVP Lab 4: Exercises on Morphological and Color Image processing

Q1. Write your own code for some basic 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.

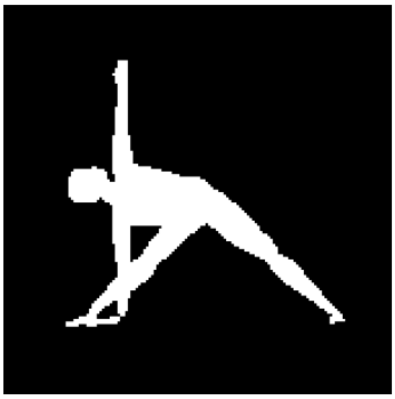


Figure 2. body1.bmp

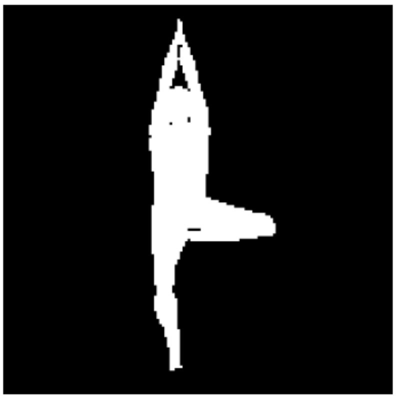


Figure 1. body2.bmp

Q2. 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.

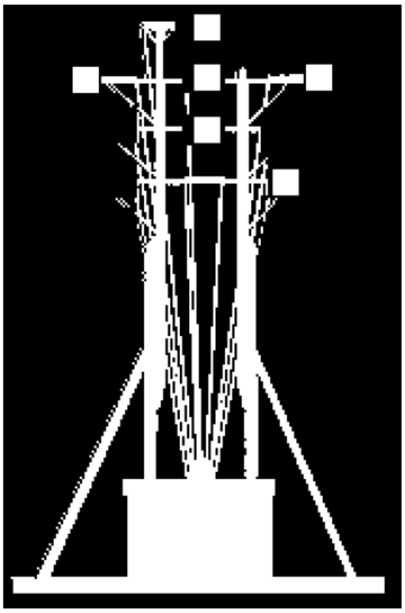


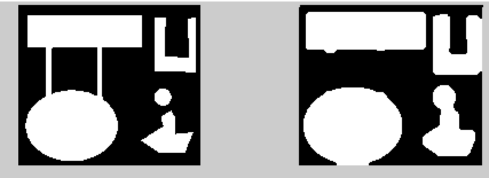
Figure 3. semafor.bmp

Q3. 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.



Q4. The task here is to help a robot to identify a bright orange ball in its surrounding. The ***ball.bmp*** is an image obtained from a camera mounted on the robot.

a) Implement a **Myrgb2hsi** function to convert red-green-blue (RGB) colors to hue-saturation-intensity (HSI). The function prototype should be:

function [H, S, I] = Myrgb2hsi(Im)

where Im is the original color image, and H, S, and I are the normalized hue value, saturation-value, and intensity value in the HSI color space, respectively. That is, H, S, and I should be in the range of [0, 1].

Load and convert ***ball.bmp*** to HSI color space by calling the **Myrgb2hsi** function. Display the three images in figures 1 to 3 with the appropriate titles. Call an appropriate Matlab function to do the similar conversion and display the three images (i.e., Hue, Saturation, and Intensity) in figures 4 to 6 with appropriate titles. Display the difference images between your results and the Matlab's results in figures 7 to 9 with appropriate titles. Explain the reason for these differences and the visual differences between your results and the Matlab's results.

b) Find the edges of the image ***ball.bmp*** using any edge detector methods on the Value (i.e., Intensity) image obtained from calling the Matlab built-in function, which converts the RGB color images to HSV images.

c) In H-space, find a threshold for the ball. Find the centroid of the ball and indicate its location by a cross on the original color image.