# Programming Assignment 1

## (1) Image grey-scale transformation and enhancement

(1) Given the following image, apply a grey-scale transformation function to create its negative image. Write your grey-scale transformation function and plot the corresponding transformation curve. Show the corresponding negative image.
(2) Print out the histogram of the original image and the histogram of its negative image.

Figure 1: Test Image 1

(3) Histogram equalization is one of the effective approaches to enhance the image quality. This assignment is to implement the histogram equalization algorithm to process the above image for better visual quality. It is required to print out the images and the corresponding histograms before and after the histogram equalization.
(4) Apply the above procedure (3) to another test image (as shown below):

Figure 2: Test Image 2

## (2) Region detection: finding the largest region, medium region, and the smallest region of the given image

- **Description:** Given the following image showing a car plate, detect and label the letters of the image. Rank the detected regions from largest to smallest based on the number of

pixels in each region. Your program should count the connected components of the detected regions. Connected component is to describe the basic relationship among the neighbor pixels in an image. Pixels that are connected can be labeled as a same region. In this assignment you are to implement this algorithm incorporating with the Histogram Calculation and image Thresholding Operations. Given a gray scale image, after converting this image into binary image by using thresholding algorithm, the binary image can be labeled on several connected component regions. The resulted image will show the separate regions detected.

Figure 3: Test Image 3

- **Your implementation:**

  *(1) Determine the optimal threshold T for further thresholding based on the image histogram.*
  *(2) Apply T to converting the original image into binary image f1.*
  *(3) Apply the 4-connected component algorithm to detect the regions of each character. Rank the sizes of detected letters based on the count of their number of pixels. Label the letter with the largest region as RED (or gray level 200); the letter with medium size as GREEN (or grey level 120); the letter with the smallest size as BLUE (or grey level 60), obtain the labeled image f2.*
  *(4) Print out your images f1and f2.*
  *(5) Print out the threshold value T.*
  *(6) Apply the above procedure (1)-(5) to another test image as follow:*

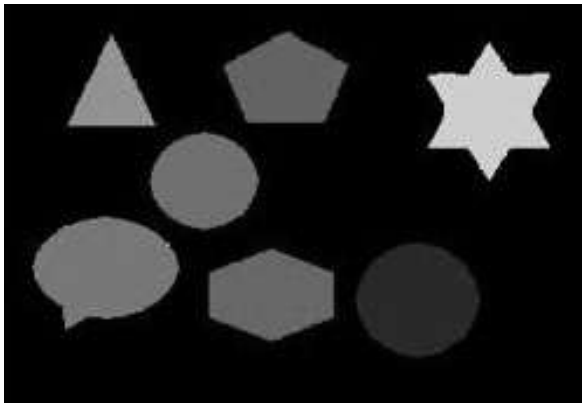
Figure 4: Test Image 4

## (3) Show the contours of the detected letters or regions

Apply the gradient operator to extracting the contours of the detected letters or regions of Figure 3 and Figure 4. (Hint: You can create the binary image based on the image thresholding algorithm. Then apply the gradient operator to the binary image and extract the contours of the letters or regions). Show the resulting images with contours.