Assignment 1
CS 455/555

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Purpose:
To understand how to use different image processing tools. I used OpenCV 3.4.2.
To understand and implement different ways to enhance an image given the following concepts:

- Histogram equalization
- Histogram transformation
- Negative Imaging
- Binary Images
- Enhanced Images
- Image thresholding
- Image pixel connectivity
- Region detection

To Run:
On command line type: make (This will make the executable file assign1)
Next type: ./assign1 (All the images presented in this file will then be displayed)

To Remove Executable File:
On command line type: make clean

Methods to obtaining Images

Method for creating histogram:
        Create an array of length 256, and initialize it all to 0
        Obtain the value of intensity for each pixel, and increment this corresponding value in
        the array by 1.

Method for displaying histogram:
        Get the histogram array that needs to be displayed
        Create a blank image with size 512p by 400p
        Find the maximum intensity available in the image, and normalize the histogram
        intensity based on that
        Then plot the graph using the line function

Method for Negative Imaging:
        Change each value of pixel of image to:
                255 – [pixel_value]

Method for creating enhanced image:
        Calculate intensity probability by getting the intensity values for each pixel, and dividing
        by total pixels
        Calculate the cumulative frequency of each pixel by adding to the value of previous
        Intensity
        Calculate cumulative distribution probability by dividing previous cumulative array by
        total pixels
        Multiply cdf by the number of bins for each pixel
        Replace each pixel with the enhanced pixel

Method for creating binary image:
        Finding threshold by calculating the average of pixels
        If individual pixel is less than the threshold, change the pixel to 0
        If individual pixel is greater than the threshold, change the pixel to 255

Method for region detection of image:
        Color each region with 120, but keep track of the minimum region and maximum region
        Use queue to do a breadth first search on the pixels to see which pixels have been
        visited and which have not – to be colored.
        If not visited, color the pixel with the specified amount
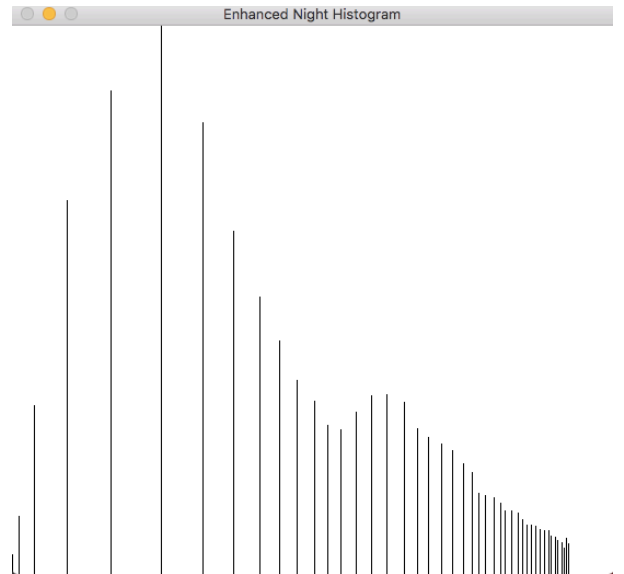   Once all pixels have been visited, color the minimum and maximum regions accordingly
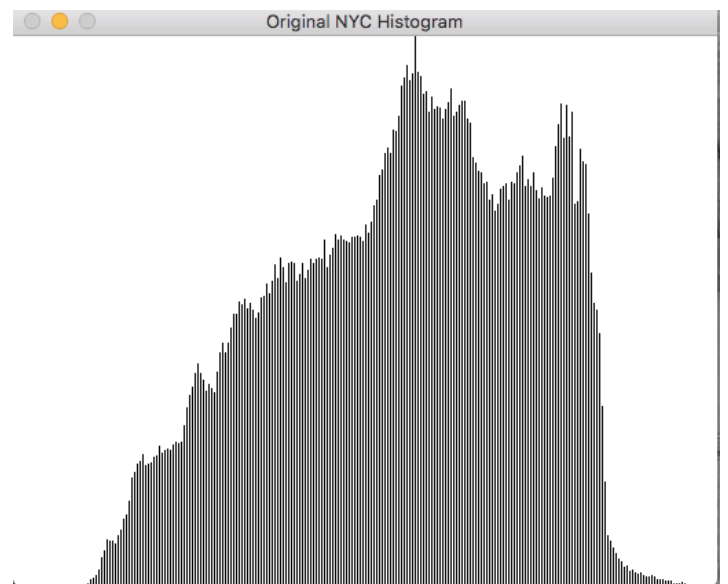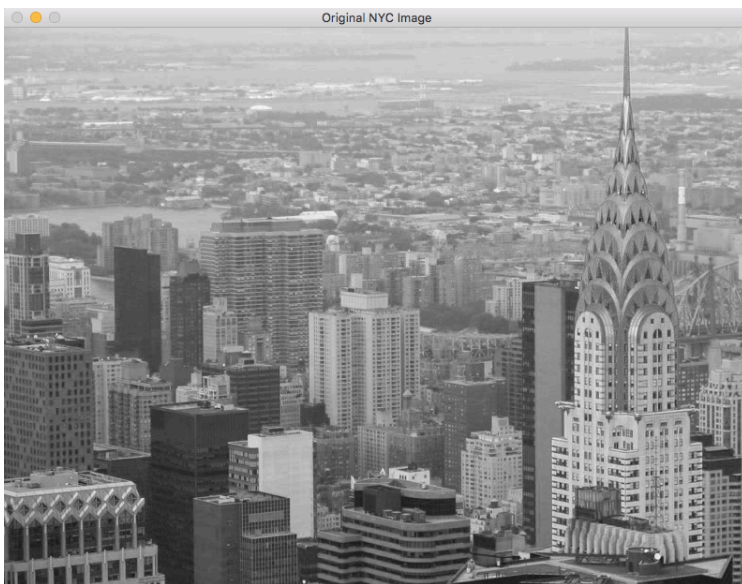
Results:
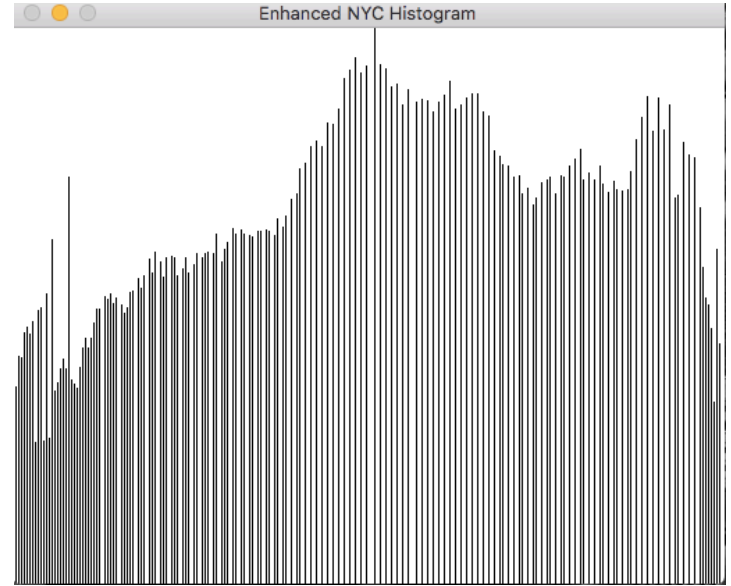
Original Night Image:
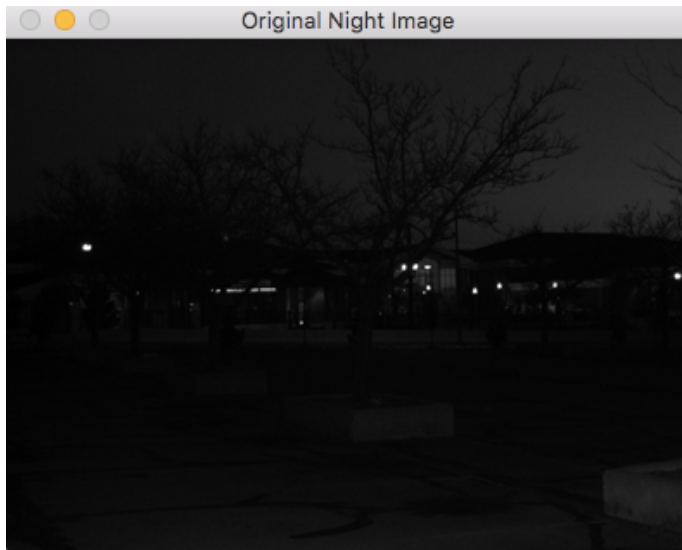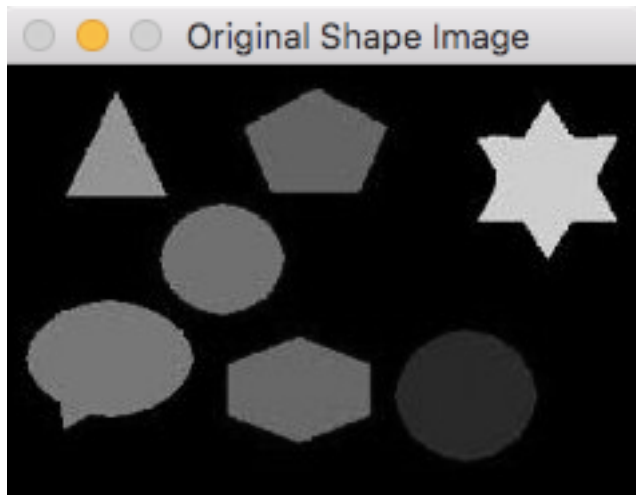

Negative Night Image:
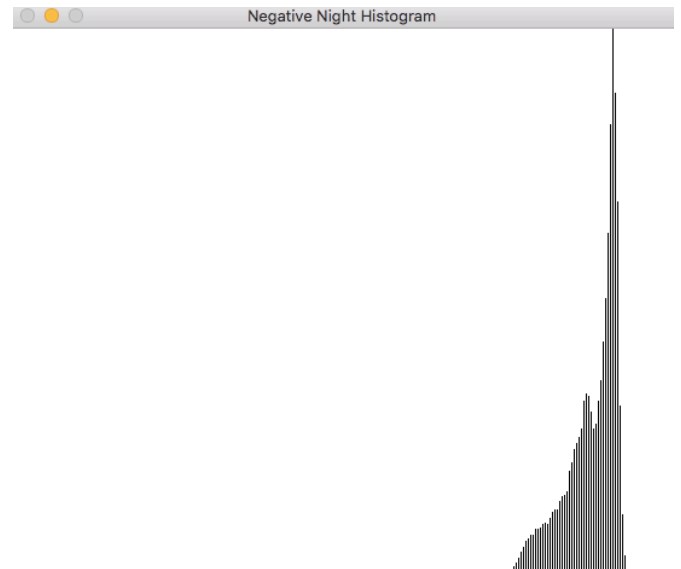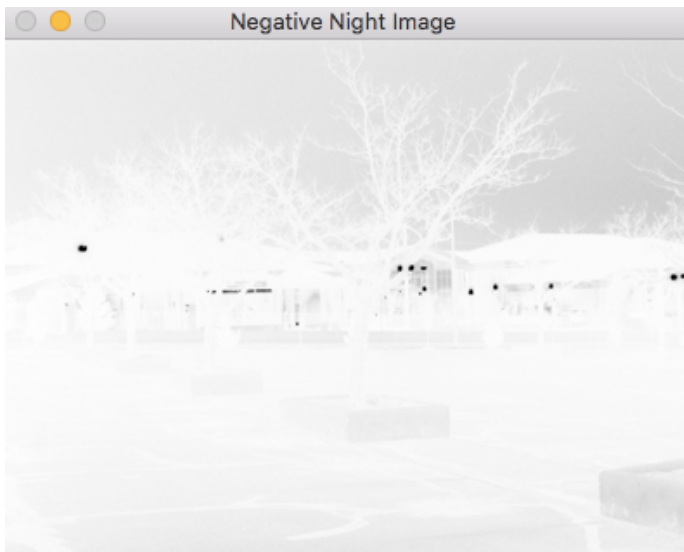
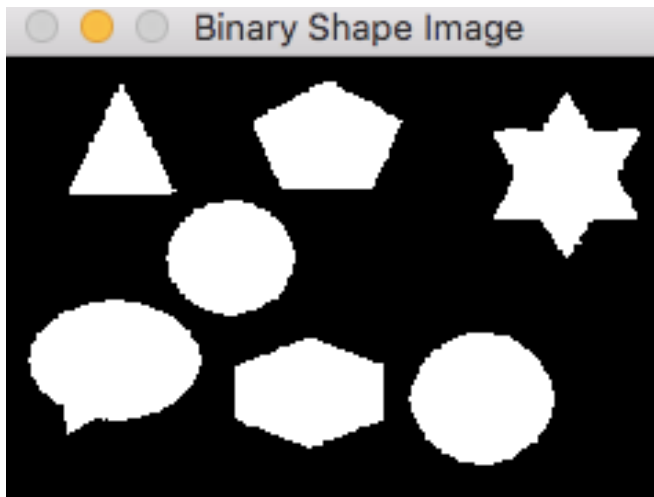Enhanced Night Image:

Original NYC Image:
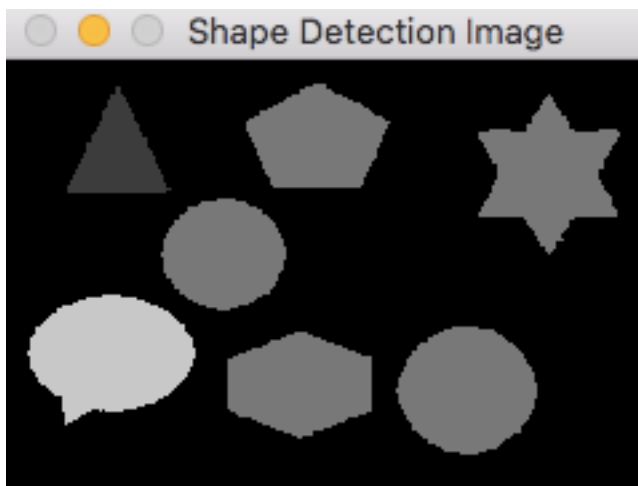
Enhanced NYC Image:

Original Shape Image:

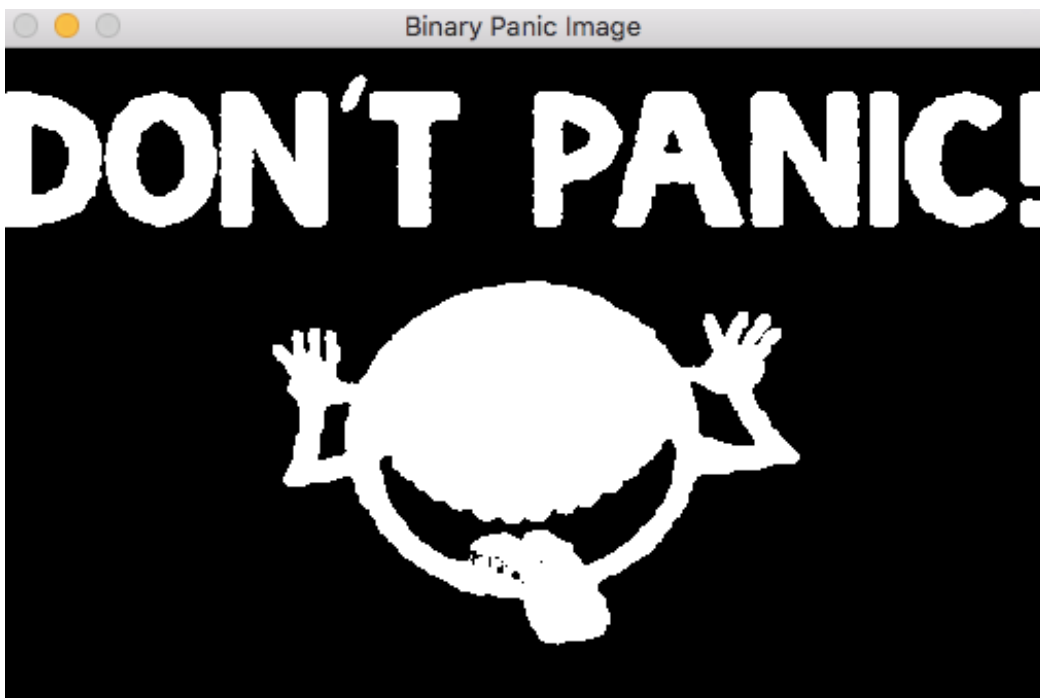Binary Shape Image:

Region Detection Shape Image:

Original Panic Image:

Binary Panic Image

Enhanced Panic Image:

Threshold Values:

Shape:

Threshold Value: 32

Panic:

Threshold Value: 31