Lab 07

Image Processing I

A. Multiple Choice (20 points, 5 points each question)

1. How many different colors you can have in a 16-bit RGB image?

   (a) $256 \times 256 \times 256$ (b) 2^{16}

   (c) $2^{16} \times 3$ (d) $2^{16} \times 2^{16} \times 2^{16}$

2. How many bytes are required to store a grayscale image of 20×20 pixels having 64 different intensity levels?

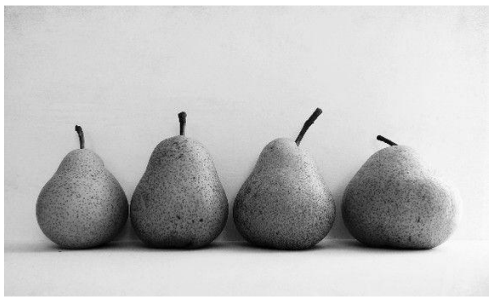
   (a) 300 (b) 400

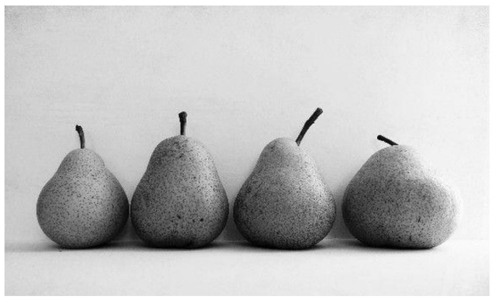
   (c) 2400 (d) 3200

3. On the original gray scale image, which of the following point processing operations could have been applied to obtain the processed image?

   (a) Contrast compression (b) Image inversion

   (c) Some gray scale slicing operation (d) Extraction of the least significant bit

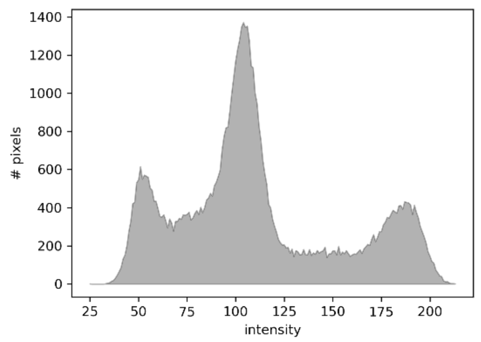

Original image


Processed image

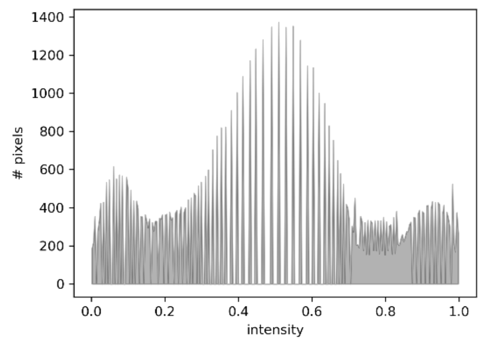
4. The figures below are histograms before and after processing a grayscale image. What is the most plausible processing applied on the original image?

   (a) Gray scale inversion (b) Binary thresholding

   (c) Histogram equalization (d) Some gray scale slicing



Histogram of the original image



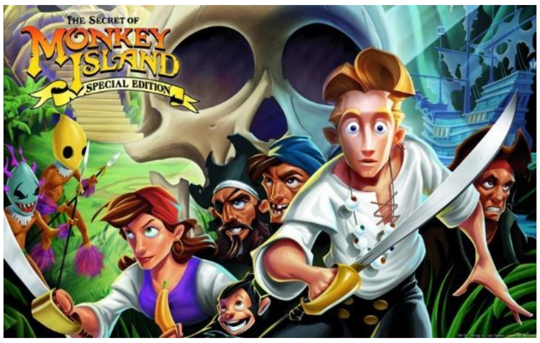
Histogram of the processed image

B. Basic Image Processing (40 points, 20 points each question)

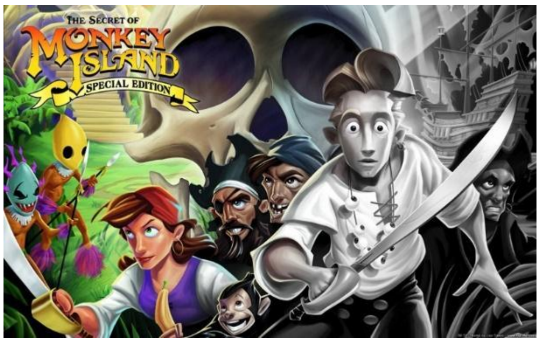
Note: All of the question in this part will be tested using several images, thus do NOT hard code your program to the example images. Also, you may want to make sure if your program works on different image file formats (e.g., JPG, PNG, TIFF). Find the function templates and usage in

Lab07_B.py.

1. Write a function that make the input color image gradually fade from color to grayscale as the figure below.

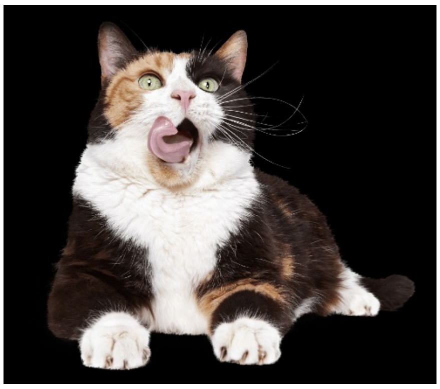


Original image

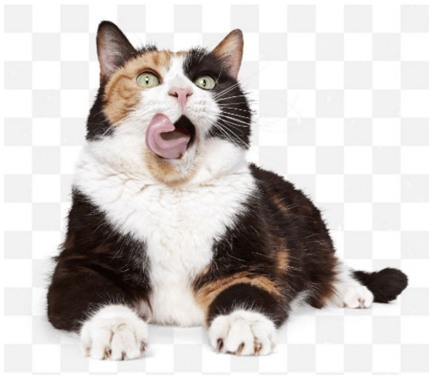


Processed image

2. Image matting is an important task in image and video editing. Matting refers to the process of extracting foreground object from the background in a given image. In this question, you are going to write a function that conducts image matting. You can assume that all the input images are with black (#000000) background. The background of the output image should be **transparent**.



Original image



Processed image

C. **Implementation of Image Processing Algorithm (40 points, 20 points each question)**

1. Resizing an image to a desired spatial dimension is a common operation when building computer vision applications based on convolutional neural networks. **Bilinear interpolation** is an intuitive algorithm for image resizing. As you might have guessed, you are going to implement your own image resizing function, `my_resize(img, height, width)`. `height` and `width` are the desired spatial dimension of the resized image. Do NOT use any of the build in functions in `skimage.transform` and try not to use `for` loop in the function. You can assume that all the input images are grayscale and square.
2. Please implement your own image rotation function, `my_rotation(img, angle)`, the unit of `angle` should be degree. You can choose any interpolation algorithm to complete the function. Also, do NOT use any of the built-in functions. You can assume that all the input images are grayscale.

   [10% Bonus]

   Modified `my_rotation` function to make it able to rotate RGB images.