Introduction to Image Processing

HW1

Due: 10/25

HW1.1 Image file format conversion

Read a color image (bmp file) and write it into other files, including jpg and gif formats (indexed color). You need to finish the following tasks.

Task 1: jpg files with two different quality factors (QF is between 0-100) are needed

Example: imwrite(x, 'lena_QF100.jpg, 'Quality', 100)

Task 2: show the images with different formats, including bmp, 2 jpgs and gif

Task 3: compare the file size of each format, including bmp, 2 jpgs and gif

Task 4: compute the PSNR where only the luminance is used.

(Both conversion and PSNR computation are your business)

$$Y = 0.299R + 0.587G + 0.114B$$

$$\text{PSNR} = 10 * log_{10}\frac{255^2}{MSE}, MSE = \frac{\sum_{i=1}^{M*N}(x_i - \hat{x}_i)^2}{M*N},$$

(x is the reference pixel (bmp file) while $\hat{x}$ is the reconstructed pixel)

HW1.2 Binary to Gray code

Perform binary to gray code conversion via the following steps

Step 1: Obtain the binary code of each pixels for the input image

Step 2: convert the binary code to gray code through the arithmetic operation.

Gray code: only 1 bit is changed between any two adjacent decimal numbers

$$a_{m-1}2^{m-1} + a_{m-2}2^{m-2} + \ldots + a_1 2^1 + a_0 2^0$$

$$g_i = a_i \oplus a_{i+1}$$

$$g_{m-1} = a_{m-1} \qquad 0 \le i \le m-2$$

a: binary code

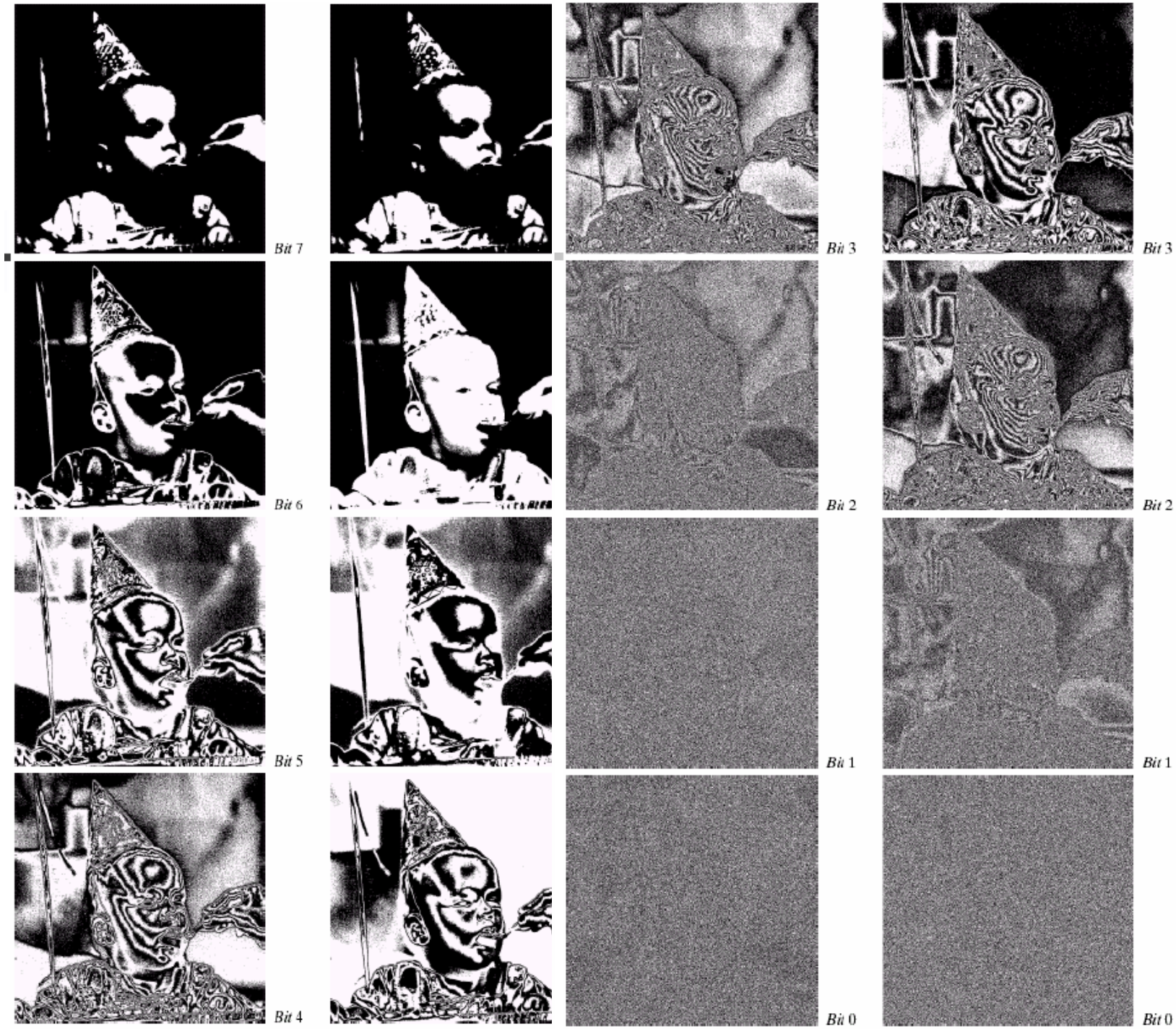
g: gray code

Step 3: show the bit plane image of the input image

Step 4: show the bit plane image of the gray coded image

Step 5: compare the results in step 3 and step 4 and make a discussion

Example:



Reminder

- Test two images (different characteristics) for each problems.
- Pack your report and source code into a zip file and upload to ecourse 2.