EE5356 LAB Assignment #1

Quantization

Apply the following 3 quantization schemes to a test image (8bpp 256 level gray scale).

1) **Uniform quantizer**
   Calculate and compare those three quantizers (128,64,and 32 levels) in terms of the PSNR and MSE.

2) **Contrast quantizer (See Figure 4.21 in the text book pp.120)**
   Use the equation (4.65) to design 3 different uniform quantizers. Let a = 1 and b =1/3. Those quantizers have the different number of quantization levels, 40, 60, and 80, respectively, and then compare in terms of the PSNR and MSE.

3) **Pseudorandom quantizer (See Figure 4.22 in the textbook pp.121)**
   Design a 3bit quantizer. Use three different values of A for pseudorandom noise generator and compare in terms of the PSNR and MSE.

NOTE:
   You may choose a test image from the UTA DIP website at
      http://www-ee.uta.edu/dip
   or Dr.Rafael Gonzalez's web site at
      http://www.imageprocessingbook.com/downloads/book_images_downloads.htm . (All the images are in jpeg format.)
   Also, go to data base in the class website..

   MSE (mean square error) is given by

$$MSE = \frac{1}{N^2} \sum_{i=1}^{N} \sum_{j=1}^{N} (x(i,j) - \bar{x}(i,j))^2$$

   where x is an original 8bpp N*N image and $\bar{x}$ is the quantized N*N image.
   PSNR (peak signal to noise ratio) is given by

$$PSNR = 10 \log_{10} \frac{255^2}{MSE}$$

References:

1) **Textbook pp.99-123**
2) **Rafael C. Gonzalez and Richard E.Woods, "Digital image processing", Prentice Hall 2002**
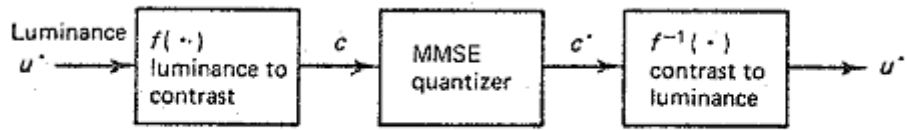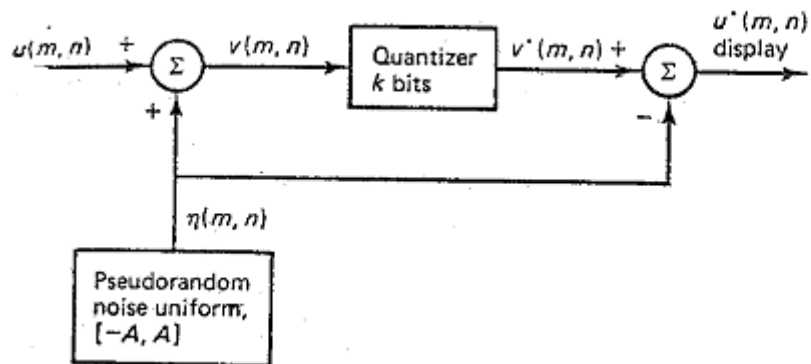
Figure 4.21 [1]

Figure 4.21 Contrast quantization.

Equation 4.65 Contrast quantization [1]

$$c = \alpha u^{\beta}$$

Where α and β are constants and u represents the luminance. Suggested values: α=1 and β=1/3

Figure 4.22 Pseudorandom quantization [1]

Reference
[1] A. K. Jain, " Fundamentals of digital signal processing," Prentice Hall, 1989