2020 Advaced Information Engineering
Assignment #4 January 18, 2021

Objective

To undestand the basics of image enhancement.

Exercises

1. Let's think about the image with 4×4 pixels and 8 intensity levels shown in Fig.1. Please answer the following questions:
   (a) Make its histogram. (10 points)
   (b) Calculate the average intensity and standard deviation σ. (10 points)
   (c) Perform density conversion by the function of Fig.1(b), (c). Show the pixel values after conversion, respectively. (10 points)

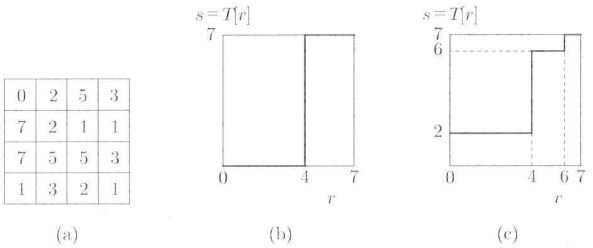

図 1:

2. The density conversion function for γ correction is given by $s = T[r] = r^{\gamma}$ when assuming $0 \leq r \leq 1$. Find the density function for γ correction when we assume $0 \leq r \leq 255$. (20 points)

3. When RGB values are $0 \sim 255$, show the range of the following Y, C_b, and C_r. (20 points)

$$\begin{bmatrix} Y \\ C_b \\ C_r \end{bmatrix} = \begin{bmatrix} 0.299 & 0.587 & 0.114 \\ -0.169 & -0.331 & 0.500 \\ 0.500 & -0.419 & -0.081 \end{bmatrix} \begin{bmatrix} R \\ G \\ B \end{bmatrix} \tag{1}$$

4. Focus on 2 pixels in Fig.2(a).
   (a) Apply 3×3 moving average filter. (10 points)
   (b) Apply 3×3 rectangular median filter. (10 points)
   (c) Apply weighted median filter shown in Fig2(b). (10 points)

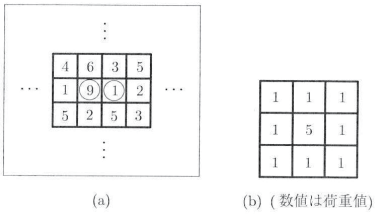

図 2:

Due date

By February 1, 2021 (Monday) 5 PM.