

Lecture 16

Post-Test Review

Q1:

$$\text{Width: } (00\ 00\ 0b\ 8c)_{16} = 11 \times 16^2 + 8 \times 16 + 12 = (2956)_{10}$$

$$\text{Height: } (00\ 00\ 08\ a7)_{16} = 8 \times 16^2 + 10 \times 16 + 7 = (2215)_{10}$$

$$\text{Bit Depth: } 08 \Rightarrow 8 \text{ bits/pixel}$$

$$2956 \times 2215 \times 8 = 52,380,320 \text{ bits}$$

Side topic:

>> A = magic(2)

$$A = \begin{bmatrix} 1 & 3 \\ 4 & 2 \end{bmatrix}$$

>> B = max(A)

$$B = \begin{bmatrix} 4 & 3 \end{bmatrix}$$

>> X = A/B

$$X = \begin{bmatrix} 0.5200 \\ 0.8800 \end{bmatrix} = \begin{bmatrix} x_1 \\ x_2 \end{bmatrix}$$

>> X*B

$$\text{ans} = \begin{bmatrix} 2.0800 & 1.5600 \\ 3.5200 & 2.6400 \end{bmatrix}$$

$$\Rightarrow \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} \begin{bmatrix} 4 & 3 \end{bmatrix} = \begin{bmatrix} 4x_1 & 3x_1 \\ 4x_2 & 3x_2 \end{bmatrix} \stackrel{?}{=} \begin{bmatrix} 1 & 3 \\ 4 & 2 \end{bmatrix}$$

Least-Square solution

$$\begin{cases} 4x_1 = 1 \\ 3x_1 = 3 \\ 4x_2 = 4 \\ 3x_2 = 2 \end{cases}$$

Two unknowns
Four equations

Q2:

$$\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 10 & 20 & 1 \end{bmatrix} \begin{bmatrix} 0.5 & 0 & 0 \\ 0 & 0.5 & 0 \\ 0 & 0 & 1 \end{bmatrix} = \begin{bmatrix} 0.5 & & \\ & 0.5 & \\ & & 1 \end{bmatrix}$$

Q3:

(a) $S = T(r)$

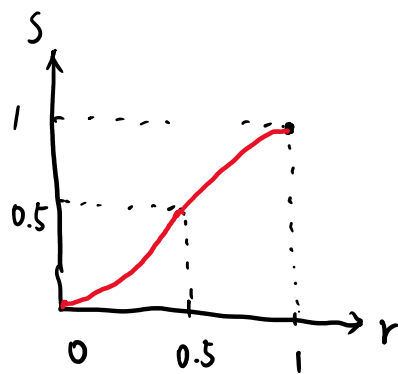
If $0 \leq r < 0.5$, $P_r(r) = 4r$

$$S = \int_0^r 4w \, dw = 2w^2 \Big|_0^r = 2r^2$$

If $0.5 < r \leq 1$

$$\begin{aligned} S &= \int_0^r P_r(w) \, dw = \int_0^{0.5} P_r(w) \, dw + \int_{0.5}^r P_r(w) \, dw \\ &= \int_0^{0.5} 4w \, dw + \int_{0.5}^r (4 - 4w) \, dw = 4r - 2r^2 - 1 \end{aligned}$$

(b)



Q4:

$$P_S[0] = 0.1, \quad P_S[1] = 0, \quad P_S[2] = 0.5, \quad P_S[3] = 0.4.$$

Q5: