ICS 483 – Computer Vision **(UH Manoa, Fall 2020)**

Homework Assignment #2 - Theory Problems

October 5, 2020

Instructor: Kyungim Baek *Name: Frendy Lio Can*

Problem 1

We know that each pixel corresponds to $0.01mm$. This implies that the sphered has a projected radius of $20pixels = 20 * 0.01 = 0.2mm$.
Therefore $0.2mm * Z = 10mm * 1m \Rightarrow Z = 50$ meters

Problem 2 a)

$$O_{cor}[0,0] = 0*(1) + 1*(1) + 2*(-1) = -1$$
$$O_{cor}[0,1] = 1*(1) + 2*(1) + 3*(-1) = 0$$
$$O_{cor}[0,2] = 2*(1) + 3*(1) + 0*(-1) = 5$$
$$O_{cor}[1,0] = 0*(1) + 4*(1) + 0*(-1) = 4$$
$$O_{cor}[1,1] = 4*(1) + 0*(1) + 5*(-1) = -1$$
$$O_{cor}[1,2] = 0*(1) + 5*(1) + 0*(-1) = 5$$
$$O_{cor}[2,0] = 0*(1) + 0*(1) + 0*(-1) = 0$$
$$O_{cor}[2,1] = 0*(1) + 0*(1) + 1*(-1) = -1$$
$$O_{cor}[2,2] = 0*(1) + 1*(1) + 0*(-1) = 1$$

$$O_{cor} = \begin{bmatrix} -1 & 0 & 5 \\ 4 & -1 & 5 \\ 0 & -1 & 1 \end{bmatrix}$$

Problem 2 b)

$$O_{cov}[0,0] = 0*(-1) + 1*(1) + 2*(1) = 3$$
$$O_{cov}[0,1] = 1*(-1) + 2*(1) + 3*(1) = 4$$
$$O_{cov}[0,2] = 2*(-1) + 3*(1) + 0*(1) = 1$$
$$O_{cov}[1,0] = 0*(-1) + 4*(1) + 0*(1) = 4$$
$$O_{cov}[1,1] = 4*(-1) + 0*(1) + 5*(1) = 1$$
$$O_{cov}[1,2] = 0*(-1) + 5*(1) + 0*(1) = 5$$
$$O_{cov}[2,0] = 0*(-1) + 0*(1) + 0*(1) = 0$$
$$O_{cov}[2,1] = 0*(-1) + 0*(1) + 1*(1) = 1$$
$$O_{cov}[2,2] = 0*(-1) + 1*(1) + 0*(1) = 1$$

$$O_{cov} = \begin{bmatrix} 3 & 4 & 1 \\ 4 & 1 & 5 \\ 0 & 1 & 1 \end{bmatrix}$$

Problem 3 a)

$$h = \begin{bmatrix} 1 & 3 & 1 \\ 0 & 0 & 0 \\ -1 & -3 & -1 \end{bmatrix}$$

Problem 3 b)

Yes, h is separable

$$h_1 = \begin{bmatrix} 1 & 0 & -1 \end{bmatrix}$$

$$h_2 = \begin{bmatrix} 1 \\ 3 \\ 1 \end{bmatrix}$$