Computer Vision Exercise 12

(2.) $\vec{O'}\vec{p'} \cdot (\vec{O'}\vec{O} \times \vec{O}\vec{p}) = 0 \quad \Rightarrow x'^T E x = 0$

$x' \cdot (t \times Rx) = 0$ ↑ $E = [t]_x R$

$x'^T \cdot [t]_x R x = 0$

$x'^T E x = 0$

(3.)

a)

$d = 1\,cm$, $b = 6\,cm$, $f = 1\,cm$

$d = \frac{b \cdot f}{z_p} \Rightarrow 1 = \frac{6 \cdot 1}{z_p} \Rightarrow 6 = z_p$

b) smallest disparity 1 px !

$px\,width = 0.01\,mm = 0.001\,cm$

$0.001 = \frac{6 \cdot 1}{z} \rightarrow z = \frac{6}{0.001} = 6000\,cm$

$\Rightarrow$ Range of coordinates: $z > 6000\,cm$

c) $Q = (3,0,3)$ $P_1 = [I\ 0]$

$t = (-6,0,0)^T$ $P_r = [I\ t]$

$E = [t]_x R$

Q on Cam 1:

$P_1 \cdot Q = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \end{bmatrix} \begin{bmatrix} 3 \\ 0 \\ 3 \\ 1 \end{bmatrix} = \begin{bmatrix} 3 \\ 0 \\ 3 \end{bmatrix}$

$R = I \rightarrow E = [t]_x$

$E = \begin{bmatrix} 0 & 0 & 0 \\ 0 & 0 & t \\ 0 & -t & 0 \end{bmatrix}$

$Ex = \begin{bmatrix} 0 & 0 & 0 \\ 0 & 0 & -6 \\ 0 & 6 & 0 \end{bmatrix} \begin{bmatrix} 3 \\ 0 \\ 3 \end{bmatrix} = \begin{bmatrix} 0 \\ -18 \\ 0 \end{bmatrix}$

4.