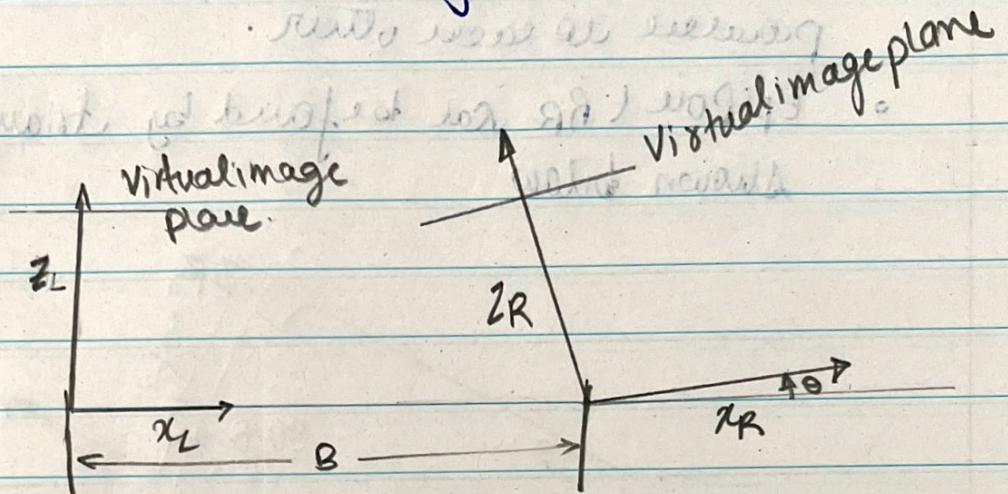


12/6/2021

Comp Vision Assignment - 4

P1. Stereo Camera Arrangement



a) Solution to calculate Essential matrix with two camera as shown in the above fig.

$$R = \begin{bmatrix} \cos(\theta) & 0 & \sin(\theta) \\ 0 & 1 & 0 \\ -\sin(\theta) & 0 & \cos(\theta) \end{bmatrix} = \begin{bmatrix} \cos \theta & 0 & \sin \theta \\ 0 & 1 & 0 \\ -\sin \theta & 0 & \cos \theta \end{bmatrix}$$

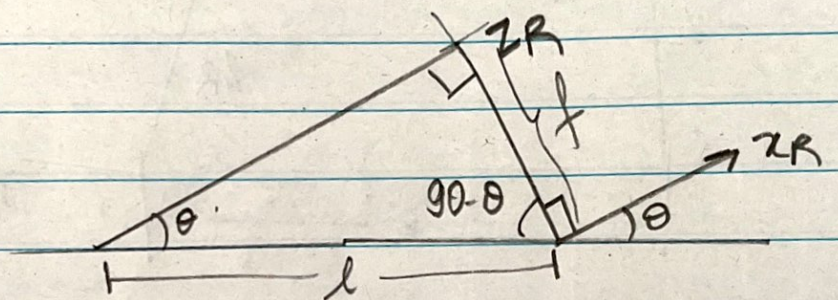
$$t = \begin{bmatrix} B & 0 & 0 \end{bmatrix}^T$$

$$t_x = \begin{bmatrix} 0 & 0 & 0 \\ 0 & 0 & -B \\ 0 & B & 0 \end{bmatrix}$$

$$E = t_x R = \begin{bmatrix} 0 & 0 & 0 \\ -B \sin \theta & 0 & -B \cos \theta \\ 0 & B & 0 \end{bmatrix}$$

15/5/2021
b) Solution for location of the two Epipoles.

- Epipole for the Right camera is at infinity, as the baseline of both the cameras are parallel to each other.
- Epipole (R) can be found by trigonometry as shown below



$$\sin \theta = \frac{f}{l}$$

Therefore the height is equal to

$$l = \frac{f}{\sin \theta}$$