Fundamental 3D Computer Vision
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HW3 **Deadline**: 1402/08/30 **Support mail**: alirezath49@gmail.com

Problem 1. Explain Internal and External camera properties (explain the meaning of each parameter) and which parameters (from intrinsic, extrinsic or both) are changing if

a. one moves the position of the camera in the scene.

b. one changes the optic (i.e. lens) of its camera.

Problem 2. Suppose R and t of a camera are as follows:

$$R = \begin{bmatrix} 0.1 & 0.5 & 0.3 \\ 0.6 & 0.1 & 0.2 \\ 0.4 & 0.5 & 0.8 \end{bmatrix} \qquad t = \begin{bmatrix} 10 \\ 20 \\ 30 \end{bmatrix}$$

- If the coordinate of a point is [25, 40, 50] in the world coordinate system, calculate its coordinate in the camera coordinate system.
- If the coordinate of a point is [50, 80, 100] in the world coordinate system and the camera rotated around x-axis by 45 and around y-axis by 45, calculate its coordinate in the camera coordinate system.

Problem 3. Prove that image of a line in 3-D space is a line in the image.

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Problem 4. Suppose we have the following Homography matrix:

$$H = \begin{bmatrix} 8.5 & 0 & -1.8 \\ 0 & 3.3 & 0 \\ 4.8 & 0 & 7.3 \end{bmatrix}$$

Compute all possible R and T.