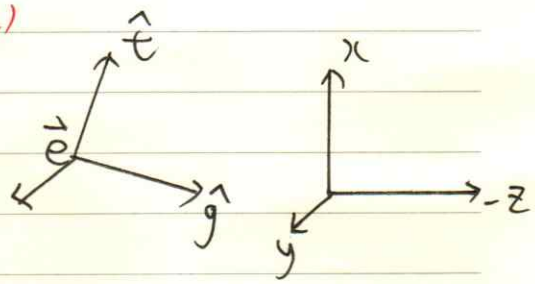
View / Camera Transformation 视图变换 / 相机变换

步骤：
① 将相机位置 $\vec{e}$ 移到 $(0,0,0)$
② 将相机观察方向 $\hat{g}$ 移到 $-z$ 轴方向 (gaze direction)
③ 将相机的上方 $\hat{t}$ 移到 y 轴方向 (up direction)



如何表示：

$$M_{view} = R_{view} T_{view}$$

(视图矩阵) (再旋转) (先平移)

$$T_{view} = \begin{pmatrix} 1 & 0 & 0 & -x_e \\ 0 & 1 & 0 & -y_e \\ 0 & 0 & 1 & -z_e \\ 0 & 0 & 0 & 1 \end{pmatrix}$$

R_{view} 不好写，先写 R_{view}^{-1}，$(R_{view}^{-1})^T$ 就是 R_{view}。(正交矩阵)

$$R_{view}^{-1} = \begin{pmatrix} x_{\hat{g}\times\hat{t}} & x_t & x_{-g} & 0 \\ y_{\hat{g}\times\hat{t}} & y_t & y_g & 0 \\ z_{\hat{g}\times\hat{t}} & z_t & z_{-g} & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix}$$

$$R_{view} = \begin{pmatrix} x_{\hat{g}\times\hat{t}} & y_{\hat{g}\times\hat{t}} & z_{\hat{g}\times\hat{t}} & 0 \\ x_t & y_t & z_t & 0 \\ x_{-g} & y_{-g} & z_{-g} & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix}$$