

$$\begin{array}{l} B^3 \\ \mathbf{O}-xyz \\ \mathbf{x} \\ \mathbf{y} \\ \mathbf{z} \\ (p_x,p_y,p_z)\in \\ B^3 \\ \mathbf{p} \\ \mathbf{p}(t)= \\ (p_x(t),p_y(t),p_z(t))\in \\ B^3 \\ \mathbf{p} \\ \mathbf{q} \\ \|\mathbf{p}(t)-\mathbf{q}(t)\|=\|\mathbf{p}(0)-\mathbf{q}(0)\|=K\forall t. \end{array}$$

$$\begin{array}{l} (1) \quad ?? \\ ?? \\ \mathbf{O}' \\ \mathbf{O}-xyz \\ \mathbf{o}'=o'_x\mathbf{x}+o'_y\mathbf{y}+o'_z\mathbf{z}, \end{array}$$

$$\begin{array}{l} (2) \quad o'_x \\ o'_y \\ o'_z \\ \mathbf{o}' \\ \mathbf{o}'=\begin{bmatrix} o'_x \\ o'_y \\ o'_z \end{bmatrix}. \end{array}$$

$$\begin{array}{l} (3) \quad \mathbf{O}'-x'y'z' \\ \mathbf{x}' \\ \mathbf{y}' \\ \mathbf{z}' \\ \in \\ B^3 \\ \mathbf{O}-xyz \\ ?? \end{array}$$

$$\begin{array}{l} \mathbf{x}'=x'_x\mathbf{x}+x'_y\mathbf{y}+x'_z\mathbf{z}, \\ \mathbf{y}'=y'_x\mathbf{x}+y'_y\mathbf{y}+y'_z\mathbf{z}, \\ \mathbf{z}'=z'_x\mathbf{x}+z'_y\mathbf{y}+z'_z\mathbf{z} \end{array}$$

$$\begin{array}{l} ?? \\ \mathbf{R}=[\mathbf{x}'\mathbf{y}'\mathbf{z}']=\begin{bmatrix} x'_xy'_xz'_xx'_yy'_yz'_yx'_zy'_z \end{bmatrix}=\begin{bmatrix} \mathbf{x}'^T\mathbf{x}\mathbf{y}'^T\mathbf{y}\mathbf{z}'^T\mathbf{z}\mathbf{x}'^T\mathbf{x}\mathbf{y}'^T\mathbf{y}\mathbf{z}'^T\mathbf{y}\mathbf{x}'^T\mathbf{z}\mathbf{y}'^T\mathbf{z}\mathbf{z}'^T\mathbf{z} \end{bmatrix}, \end{array}$$

$$\begin{array}{l} (5) \quad \mathbf{P} \\ \mathbf{O}-xyz \\ \mathbf{P} \\ \mathbf{O}'-x'y'z' \end{array}$$

$$\begin{array}{l} (6) \quad p=p'_xx'+p'_yy'+p'_zz'=[\mathbf{x}'\mathbf{y}'\mathbf{z}']\begin{bmatrix} p'_xp'_yp'_z \end{bmatrix}=Rp'. \end{array}$$

$$\begin{array}{l} \mathbf{R}^T\mathbf{R}= \\ \mathbf{I}_{3\times 3} \\ \det\mathbf{R}= \\ \pm 1 \\ \det\mathbf{R}=\mathbf{x}'^T(\mathbf{y}'\times\mathbf{z}'). \end{array}$$

$$\begin{array}{l} (7) \quad \det\mathbf{R}= \\ SO(3)= \\ \{R\in \\ R^{3\times 3}: \\ R^TR=\overline{\overline{R}} \\ I, \det R= \\ 1\} \\ \mathbf{R}_z(\alpha)=[c\,\alpha-s\alpha 0s\alpha c\alpha 0001];\mathbf{R}_y(\beta)=[c\,\beta 0s\beta 010-s\beta 0c\beta];\mathbf{R}_x(\gamma)=[1\,000c\gamma-s\gamma 0s\gamma c\gamma]. \end{array}$$

$$\begin{array}{l} (8) \quad cv= \\ \cos(v) \\ sv= \\ \sin(v) \\ v= \\ \alpha,\beta,\gamma \\ ? \\ \dot{O}_{1-x_1y_1z_1} \\ O_{2-x_2y_2z_2} \\ T_{12} \\ T_{12}=\begin{bmatrix} R_{12}(p_{12})_10_{1\times 3}1 \end{bmatrix}. \end{array}$$

$$\begin{array}{l} (9) \quad p_{12}\in \\ B^3 \\ R_{12}\in \\ SO(3) \\ SE(3)= \end{array}$$