Tech Talk Notes

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1. Common Pose Operations:

$$P_B^A \cdot P_C^B = P_C^A$$
$$\left(P_B^A\right)^{-1} = P_A^B$$
$$T_B^A \cdot v_A = v_B$$

2. Position Operations:

$$\begin{bmatrix} x \\ y \\ z \end{bmatrix} \quad \begin{bmatrix} x \\ y \end{bmatrix}$$
$$p_B^A + p_C^B = p_C^A$$
$$-p_B^A = p_A^B$$
$$p_B^A + p_A = p_B$$

3. commutative:

$$R_1 \cdot R_2 = R_2 \cdot R_1$$
$$R_1 \cdot R_2 \neq R_2 \cdot R_1$$

4. Rotation Matrix:

$$R = \begin{bmatrix} r_{11} & r_{12} \\ r_{21} & r_{22} \end{bmatrix}$$

$$z = a + bi, \quad \sqrt{a^2 + b^2} = 1$$

$$R = \begin{bmatrix} r_{11} & r_{12} & r_{13} \\ r_{21} & r_{22} & r_{23} \\ r_{31} & r_{32} & r_{33} \end{bmatrix}$$

$$R = \begin{bmatrix} \begin{bmatrix} r_{11} \\ r_{21} \\ r_{31} \end{bmatrix} & \begin{bmatrix} r_{12} \\ r_{22} \\ r_{32} \end{bmatrix} & \begin{bmatrix} r_{13} \\ r_{23} \\ r_{33} \end{bmatrix} \end{bmatrix}$$

$$\begin{bmatrix} v_1 & v_2 & v_3 \end{bmatrix}^\top \cdot \theta$$

$$v \quad p \quad p_{\text{rot}}$$

$$\mathbf{q} = \begin{bmatrix} x & y & z & w \end{bmatrix}^\top = w + x\mathbf{i} + y\mathbf{j} + z\mathbf{k}$$

$$\mathbb{S}^3$$

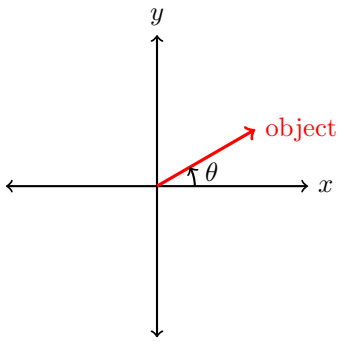
5. Pose Operations:

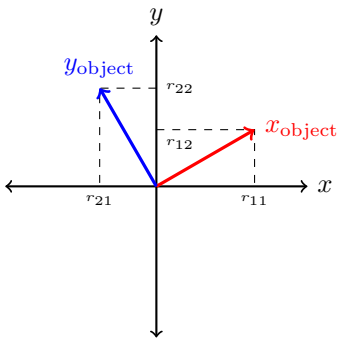
$$M = \begin{bmatrix} R & t \\ 0 & 1 \end{bmatrix} = \begin{bmatrix} r_{11} & r_{12} & r_{13} & t_x \\ r_{21} & r_{22} & r_{23} & t_y \\ r_{31} & r_{32} & r_{33} & t_z \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

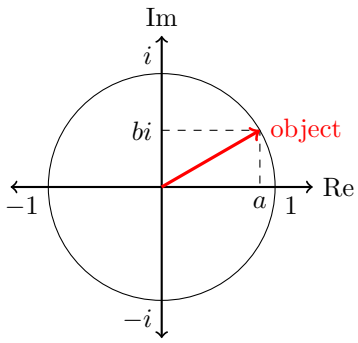
$$M_1 M_2 = \begin{bmatrix} R_1 & t_1 \\ 0 & 1 \end{bmatrix} \begin{bmatrix} R_2 & t_2 \\ 0 & 1 \end{bmatrix}$$

$$= \begin{bmatrix} R_1 R_2 & R_1 t_2 + t_1 \\ 0 & 1 \end{bmatrix}$$

6. 2D diagrams:




y
y_{object}
r_{22}
x_{object}
r_{12}
x
r_{21}
r_{11}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