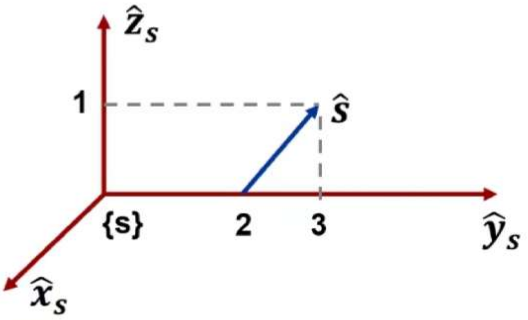
Quiz # 2



$\{b\}$-frame is initially aligned with {s}-frame, i.e. $T_{sb}(0) = I$.
Starting from $t = 0$, {b}-frame rotates about $\hat{s}$ with speed $\dot{\theta} = 3$

1) Find the screw axis in twist form $S = (\omega, v)$ (expressed in {s})

2) What is $T_{sb}(t)$? (expression in terms of the screw axis is fine)

Quiz 2:

(1) $\hat{S} = \frac{1}{\sqrt{2}}\begin{bmatrix} 0 \\ 1 \\ 1 \end{bmatrix}$ $q = \begin{bmatrix} 0 \\ 2 \\ 0 \end{bmatrix}$ $h = 0$ $\dot{\theta} = 3$

$$\begin{bmatrix} W \\ V \end{bmatrix} = V = S \cdot \dot{\theta} = \begin{bmatrix} \hat{S} \\ h \cdot \hat{S} - \hat{S} \times q \end{bmatrix} \cdot \dot{\theta} = \begin{bmatrix} 0 \\ \frac{3}{\sqrt{2}} \\ \frac{3}{\sqrt{2}} \\ 3\sqrt{2} \\ 0 \\ 0 \end{bmatrix} = ;$$

$S =$ [redacted] $= \begin{bmatrix} 0 \\ \frac{1}{\sqrt{2}} \\ \frac{1}{\sqrt{2}} \\ \sqrt{2} \\ 0 \\ 0 \end{bmatrix}$

(2) $$T_{sb}(t) = e^{[S] \cdot \dot{\theta} t} \cdot T_{sb}(0) = e^{[V] \cdot t} \cdot T_{sb}(0)$$

where $$[S] = \begin{bmatrix} [W] & V \\ 0 & 0 \end{bmatrix} = \left[\begin{array}{ccc|c} 0 & -\frac{1}{\sqrt{2}} & \frac{1}{\sqrt{2}} & \sqrt{2} \\ \frac{1}{\sqrt{2}} & 0 & 0 & 0 \\ -\frac{1}{\sqrt{2}} & 0 & 0 & 0 \\ \hline 0 & 0 & 0 & 0 \end{array}\right]$$

$$T_{sb}(0) = \begin{bmatrix} 1 & & 0 & \\ & 1 & & \\ 0 & & 1 & \\ & & & 1 \end{bmatrix}$$

即: $T_{sb}(t) = e^{[S] \cdot 3t} \cdot T_{sb}(0)$