Congratulations! You passed!

Grade received 100% To pass 80% or higher

Go to next item

1. To adapt the Newton-Raphson root-finding method to inverse kinematics when the desired end-effector configuration is represented as a transformation matrix $X_d \in SE(3)$, we need to express the error between $T_{sb}(\theta^i)$ (the forward kinematics, where θ^i is our current guess at a joint solution) and X_d. One expression of this error is the twist that takes the the robot from $T_{sb}(\theta^i)$ to X_d in unit time. When this twist is expressed in the end-effector frame {b}, we write it as $\mathcal{V}_b$. Which of the following is a correct expression?

1 / 1 point

- ○ $\mathcal{V}_b = \log(T_{sb}^{-1}(\theta^i)X_d)$
- ◉ $[\mathcal{V}_b] = \log(T_{sb}^{-1}(\theta^i)X_d)$
- ○ $\mathcal{V}_b = \exp(T_{sb}^{-1}(\theta^i)X_d)$

Correct
T_{sb}^{-1} is the same as T_{bs}, and X_d can be written as T_{sd}, so $T_{sb}^{-1}T_{sd} = T_{bd}$ by the subscript cancellation rule. The log of this is the $se(3)$ matrix representation of the twist (expressed in the {b} frame) that takes {b} to {d} in unit time.

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- ◉ $[\mathcal{V}_b] = \log(T_{sb}^{-1}(\theta^i)$
- ○ $\mathcal{V}_b = \exp(T_{sb}^{-1}(\theta^i)X$

Correct
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