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1. The inverse Jacobian J^{-1} for a parallel robot maps the end-effector twist $\mathcal{V}$ to the actuated joint velocities $\dot{\theta}$, and therefore the inverse Jacobian has n rows (if there are n actuators) and 6 columns (since a twist is 6-dimensional).

1 / 1 point

If the twist $\mathcal{V}$ consists of a 1 in the i'th element and zeros in all other elements, then what is the corresponding vector of actuated joint velocities $\dot{\theta}$?

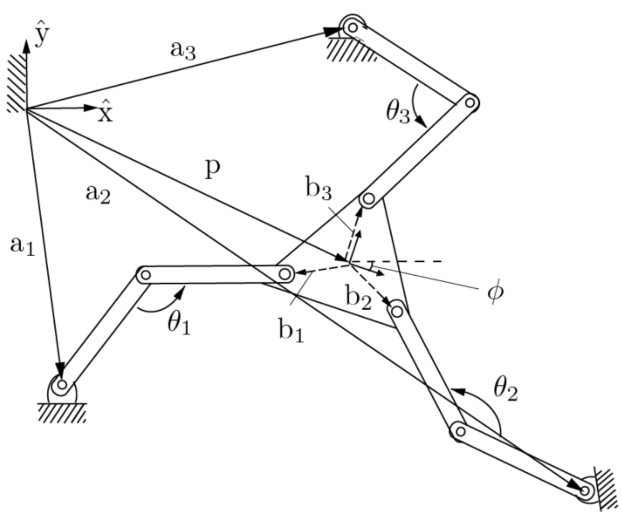
- ○ The i'th row of J^{-1}.
- ◉ The i'th column of J^{-1}.

Correct

2. For the 3xRRR planar parallel mechanism shown below, let ϕ be the orientation of the end-effector frame and $p \in \mathbb{R}^2$ be the vector p expressed in fixed frame coordinates. Let $a_i \in \mathbb{R}^2$ be the vector a_i expresed in fixed frame coordinates and $b_i \in \mathbb{R}^2$ be the vector b_i expressed in the moving body frame coordinates. Define vector $\mathrm{d}_i = \mathrm{p} + R\mathrm{b}_i - \mathrm{a}_i$ for $i = 1, 2, 3$, where

1 / 1 point

$$R = \begin{bmatrix} \cos\phi & -\sin\phi \\ \sin\phi & \cos\phi \end{bmatrix}.$$



Derive a set of independent equations relating (ϕ, p) and $(\theta_1, \theta_2, \theta_3)$. Which of the following is correct?

- ○ $(p + Rb_i - a_i)^2 = 2L^2(1 + \cos\theta_i), i = 1, 2, 3.$
- ○ $(p + Rb_i - a_i)^\intercal(p + Rb_i - a_i) = 2L^2(1 - \sin\theta_i), i = 1, 2, 3.$
- ◉ $(p + Rb_i - a_i)^\intercal(p + Rb_i - a_i) = 2L^2(1 - \cos\theta_i), i = 1, 2, 3.$
- ○ $(p + Rb_i - a_i)^\intercal(p + Rb_i - a_i) = 2L^2(1 + \cos\theta_i), i = 1, 2, 3.$

Correct