

Biped Jacobian

$$J(\vec{\alpha}) * \vec{\alpha} = \begin{bmatrix} \nu^1 \\ \nu^2 \\ \omega \end{bmatrix}$$

Position Equations

$$\begin{bmatrix} x \\ y \\ \theta \end{bmatrix} = \begin{bmatrix} l_1 * \sin(\alpha_1) + l_2 * \sin(\alpha_1 + \alpha_2) \\ \frac{l_0}{2} + l_1 * \cos(\alpha_1) + l_2 * \sin(\alpha_1 + \alpha_2) \\ \alpha_1 + \alpha_2 + \alpha_3 \end{bmatrix}$$

Expanded Jacobian

$$J(\vec{\alpha}) = \begin{bmatrix} l_1 * \cos(\alpha_1) + l_2 * \cos(\alpha_1 + \alpha_2) & l_2 * \cos(\alpha_1 + \alpha_2) & 0 \\ -l_1 * \sin(\alpha_1) - l_2 * \sin(\alpha_1 + \alpha_2) & -l_2 * \sin(\alpha_1 + \alpha_2) & 0 \\ 1 & 1 & 1 \end{bmatrix}$$