Kinematics Proof

Integrate Twist

$$\begin{bmatrix} \theta \\ 0 \\ 0 \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 \\ y_s & 1 & 0 \\ -x_s & 0 & 1 \end{bmatrix} \begin{bmatrix} \Delta\theta \\ \Delta x_b \\ \Delta y_b \end{bmatrix}$$

$$T_{bb'} = T_{bs} \times T_{ss'} \times T_{sb}$$

$$T_{sb} = \begin{bmatrix} 0 & \frac{\Delta y_b}{\Delta\theta} \\ \frac{\Delta -x_b}{\Delta\theta} \end{bmatrix} \quad ; \quad T_{ss'} = \begin{bmatrix} \omega \\ 0 \\ 0 \end{bmatrix}$$

Forward Kinematics

$$V_b = \frac{r}{2} \begin{bmatrix} -1/d & 1/d \\ 1 & 1 \\ 0 & 0 \end{bmatrix} \begin{bmatrix} \Delta\theta_L \\ \Delta\theta_R \end{bmatrix}$$, use Integrated twist to find $T_{wb'}$

Invere Kinematics

$$\begin{bmatrix} \Delta\theta_L \\ \Delta\theta_R \end{bmatrix} = \frac{1}{r} \begin{bmatrix} d/2 & 1 & 0 \\ d/2 & 1 & 0 \end{bmatrix} V_b$$