SLAM HW2

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1 Integrate Twist

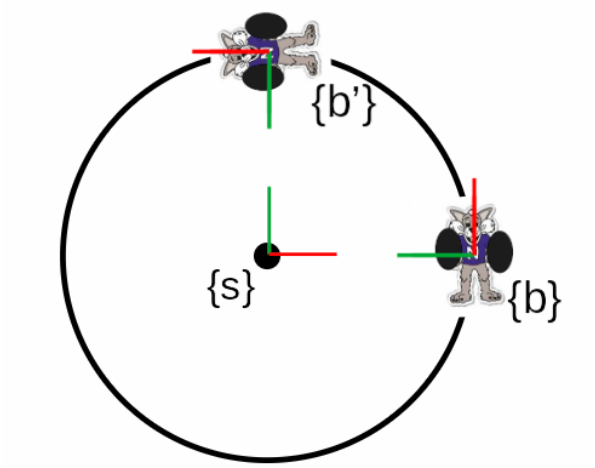

Figure 1: Caption of the image

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

$$T_{sb} = \begin{bmatrix} \Delta\theta \\ \Delta x_b \\ \Delta y_b \end{bmatrix} = \begin{bmatrix} 0 \\ \frac{\Delta y_b}{\Delta\theta} \\ \frac{\Delta -x_b}{\Delta\theta} \end{bmatrix} \tag{2}$$

$$T_{ss'} = \begin{bmatrix} \omega \\ 0 \\ 0 \end{bmatrix} \tag{3}$$

$$T_{bb'} = T_{bs} \times T_{ss'} \times T_{sb} \tag{4}$$

2 Forward Kinematics

2.1 Finding Twist

From Modern Robotics, Eq. 13.34

$$\mathcal{V}_b = F\Delta\theta = r/2 \begin{bmatrix} -1/d & 1/d \\ 1 & 1 \\ 0 & 0 \end{bmatrix} \begin{bmatrix} \Delta\theta_L \\ \Delta\theta_R \end{bmatrix} \tag{5}$$

Then use integrated twist to find $T_{wb'}$.

3 Inverse Kinematics

$$\begin{bmatrix} \Delta\theta_L \\ \Delta\theta_R \end{bmatrix} = 1/r \begin{bmatrix} d/2 & 1 & 0 \\ -d/2 & 1 & 0 \end{bmatrix} \mathcal{V}_b \tag{6}$$