

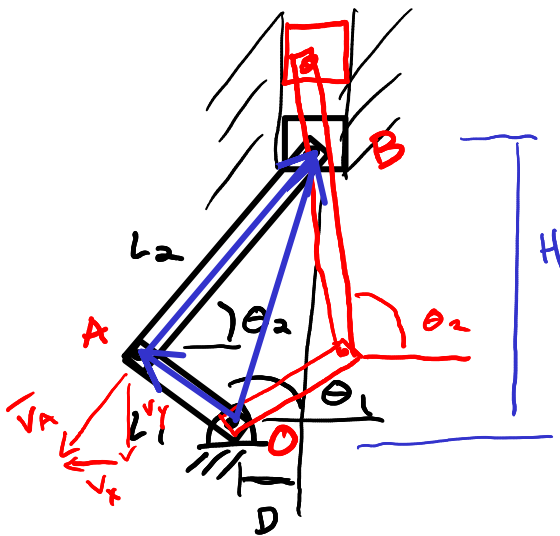
$$\vec{r}_A + \vec{r}_{B/A} = \vec{r}_C + \vec{r}_{B/C}$$

$$x \rightarrow L_1 \cos \theta_1 + L_2 \cos \theta_2 = L_3 \cos \theta_3 + 1$$

$$y \rightarrow L_1 \sin \theta_1 + L_2 \sin \theta_2 = L_3 \sin \theta_3$$

$$v_x \rightarrow L_1 \dot{\theta}_1 \sin \theta_1 + L_2 \dot{\theta}_2 \sin \theta_2 = L_3 \dot{\theta}_3 \sin \theta_3$$

$$v_y \rightarrow L_1 \dot{\theta}_1 \cos \theta_1 + L_2 \dot{\theta}_2 \cos \theta_2 = L_3 \dot{\theta}_3 \cos \theta_3$$



$$|\vec{v}_A| = L_1 \dot{\theta}_1$$

$$\vec{r}_A = L_1 (\cos \theta_1 \hat{i} + \sin \theta_1 \hat{j})$$

$$\vec{v}_A = L_1 \dot{\theta}_1 (-\sin \theta_1 \hat{i} + \cos \theta_1 \hat{j})$$

$$\vec{r}_A = \vec{r}_A(t) = L_1 (\cos(\theta_1(t)) \hat{i} + \sin(\theta_1(t)) \hat{j})$$

$$\frac{d}{dt}(\vec{r}_A(t)) = \vec{v}_A(t) = \frac{d}{d\theta_1}(\vec{r}_A(t)) \cdot \frac{d\theta_1}{dt}$$

$$\vec{r}_A + \vec{r}_{B/A} = \vec{r}_B$$

$$L_1 \cos \theta_1 \hat{i} + L_1 \sin \theta_1 \hat{j} + L_2 \cos \theta_2 \hat{i} + L_2 \sin \theta_2 \hat{j} = D \hat{i} + H \hat{j}$$

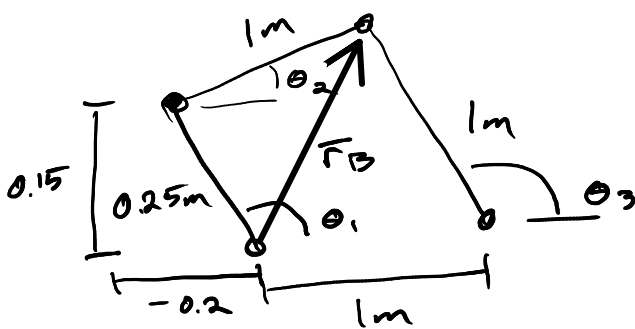
$$x \rightarrow L_1 \cos \theta_1 + L_2 \cos \theta_2 = D \rightarrow \text{given } \theta_1 \rightarrow \cos \theta_1 = \frac{D - L_2 \cos \theta_2}{L_1}$$

$$y \rightarrow L_1 \sin \theta_1 + L_2 \sin \theta_2 = H$$

$$v_x \rightarrow L_1 \dot{\theta}_1 \sin \theta_1 + L_2 \dot{\theta}_2 \sin \theta_2 = 0 \rightarrow \frac{\dot{\theta}_1}{\dot{\theta}_2} = \frac{L_2 \sin \theta_2}{L_1 \sin \theta_1}$$

$$v_y \rightarrow L_1 \dot{\theta}_1 \cos \theta_1 + L_2 \dot{\theta}_2 \cos \theta_2 = V_B$$

Back to our Program



$$\vec{r}_O = \vec{0}$$

$$\vec{r}_A = -0.2\hat{i} + 0.15\hat{j} \text{ m}$$

$$\vec{r}_B = 0.49\hat{i} + 0.86\hat{j} \text{ m}$$

$$\vec{r}_C = 1\hat{i} + 0\hat{j} \text{ m}$$

$$\dot{\theta}_1 = 10 \text{ rad/s}$$

$$\theta_1 \Rightarrow \cos \theta_1 = \frac{-0.2}{0.25} \quad \sin \theta_1 = \frac{0.15}{0.25}$$

$$\theta_2 \Rightarrow \cos \theta_2 = \frac{0.49 + 0.2}{1} \quad \sin \theta_2 = \frac{0.86 - 0.15}{1}$$

$$\theta_3 \Rightarrow \cos \theta_3 = \frac{0.49 - 1}{1} \quad \sin \theta_3 = \frac{0.86 - 0}{1}$$

$$v_x \rightarrow 0.25 \cdot 10 \left( \frac{0.15}{0.25} \right) + 1 \cdot \dot{\theta}_2 \left( \frac{0.86 - 0.15}{1} \right) + 1 \cdot \dot{\theta}_3 \left( \frac{0.86}{1} \right)$$

$$v_y \rightarrow 0.25 \cdot 10 \left( \frac{-0.2}{0.25} \right) + 1 \cdot \dot{\theta}_2 \left( \frac{0.49 + 0.2}{1} \right) + 1 \cdot \dot{\theta}_3 \left( \frac{0.49 - 1}{1} \right)$$

$$\begin{bmatrix} 10 \cdot (0.15) \\ 10 \cdot (-0.2) \end{bmatrix} = \begin{bmatrix} (0.86 - 0.15) & 0.86 \\ (0.49 + 0.2) & 0.49 - 1 \end{bmatrix} \begin{bmatrix} \dot{\theta}_2 \\ \dot{\theta}_3 \end{bmatrix}$$