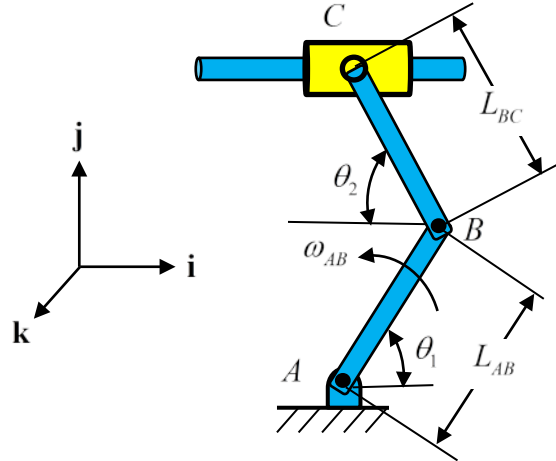


1-1. The angular velocity of bar AB is measured repeatedly and its distribution is found to be $\omega_{AB} \sim N(2, 0.2^2)$ rad/s . The lengths of the two bars are $L_{AB} = 0.6$ m and $L_{BC} = 0.8$ m , respectively. If $\theta_1 = 45^\circ$ and $\theta_2 = 60^\circ$, determine the velocity of the slider block C with the form of $\mu \pm 2\sigma$.



$$\mathbf{r}_{C/B} = -L_{BC} \cos \theta_2 \mathbf{i} + L_{BC} \sin \theta_2 \mathbf{j}$$

$$\mathbf{v}_C = \mathbf{v}_B + \boldsymbol{\omega}_{BC} \times \mathbf{r}_{C/B}$$

$$\begin{aligned} -v_C \mathbf{i} &= -\omega_{AB} L_{AB} \sin \theta_1 \mathbf{i} + \omega_{AB} L_{AB} \cos \theta_1 \mathbf{j} + \omega_{BC} \mathbf{k} \times (-L_{BC} \cos \theta_2 \mathbf{i} + L_{BC} \sin \theta_2 \mathbf{j}) \\ &= -\omega_{AB} L_{AB} \sin \theta_1 \mathbf{i} + \omega_{AB} L_{AB} \cos \theta_1 \mathbf{j} - \omega_{BC} L_{BC} \cos \theta_2 \mathbf{j} - \omega_{BC} L_{BC} \sin \theta_2 \mathbf{i} \end{aligned}$$

Equating \mathbf{i} and \mathbf{j} components gives

$$\mathbf{j}: \omega_{AB} L_{AB} \cos \theta_1 - \omega_{BC} L_{BC} \cos \theta_2 = 0$$

$$\omega_{BC} = \frac{\omega_{AB} L_{AB} \cos \theta_1}{L_{BC} \cos \theta_2}$$

$$\begin{aligned} \mathbf{i}: v_C &= \omega_{AB} L_{AB} \sin \theta_1 + \omega_{BC} L_{BC} \sin \theta_2 \\ &= \omega_{AB} L_{AB} (\sin \theta_1 + \cos \theta_1 \tan \theta_2) \end{aligned}$$

$$\mu_{v_C} = \mu_{\omega_{AB}} L_{AB} (\sin \theta_1 + \cos \theta_1 \tan \theta_2) = 2(0.6)(\sin 45^\circ + \cos 45^\circ \tan 60^\circ) = 2.32 \text{ m/s}$$

$$\sigma_{v_C} = \sigma_{\omega_{AB}} L_{AB} (\sin \theta_1 + \cos \theta_1 \tan \theta_2) = 0.2(0.6)(\sin 45^\circ + \cos 45^\circ \tan 60^\circ) = 0.23 \text{ m/s}$$

Therefore, $v_C = 2.32 \pm 0.46$ m/s .

Ans.