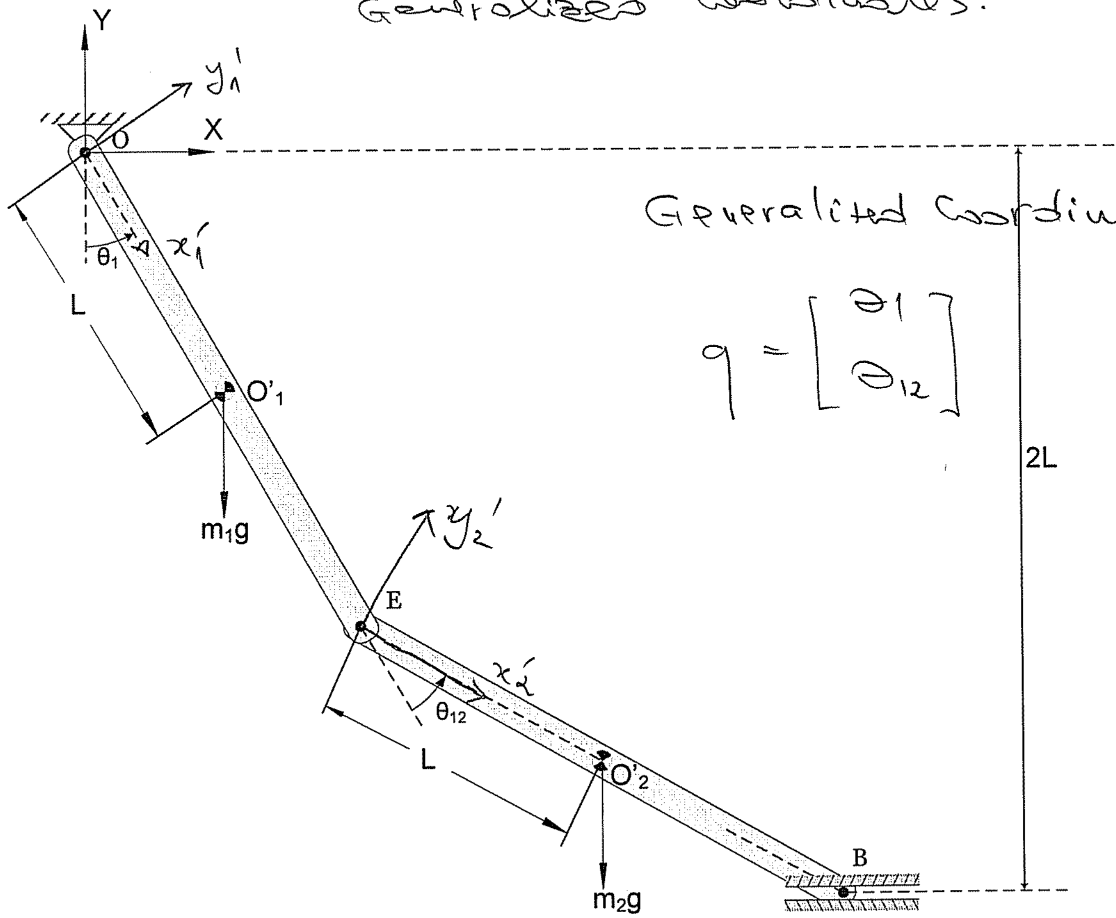
Example, using Relative Generalized coordinates.



Generalized Coordinates used:

$$q = \begin{bmatrix} \theta_1 \\ \theta_{12} \end{bmatrix}$$

$$\vec{OB} = \vec{OE} + \vec{EB} \Rightarrow r_B = \begin{bmatrix} C(\theta_1 + \frac{3\pi}{2}) & -S(\theta_1 + \frac{3\pi}{2}) \\ S(\theta_1 + \frac{3\pi}{2}) & C(\theta_1 + \frac{3\pi}{2}) \end{bmatrix} \begin{bmatrix} 2L \\ 0 \end{bmatrix}$$

$$+ \begin{bmatrix} C(\frac{3\pi}{2} + \theta_1 + \theta_{12}) & -S(\frac{3\pi}{2} + \theta_1 + \theta_{12}) \\ S(\frac{3\pi}{2} + \theta_1 + \theta_{12}) & C(\frac{3\pi}{2} + \theta_1 + \theta_{12}) \end{bmatrix} \begin{bmatrix} 2L \\ 0 \end{bmatrix}$$

Then,

$$r_B = \begin{bmatrix} S\theta_1 & C\theta_1 \\ -C\theta_1 & S\theta_1 \end{bmatrix} \begin{bmatrix} 2L \\ 0 \end{bmatrix} + \begin{bmatrix} S(\theta_1 + \theta_{12}) & C(\theta_1 + \theta_{12}) \\ -C(\theta_1 + \theta_{12}) & S(\theta_1 + \theta_{12}) \end{bmatrix} \begin{bmatrix} 2L \\ 0 \end{bmatrix}$$

$$r_B = \begin{bmatrix} 2L\left[S\theta_1 + S(\theta_1 + \theta_{12})\right] \\ -2L\left[C\theta_1 + C(\theta_1 + \theta_{12})\right] \end{bmatrix}$$