

ME 470 Final Project Analysis: Position Analysis

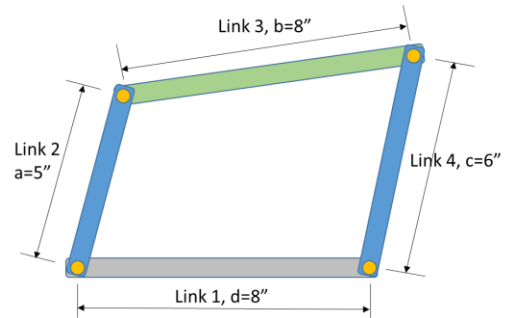
Due September 22, 2021

4 bar linkage

Chosen Value Table				
	Link 1	Link 2	Link 3	Link 4
Link Length	d=8"	a=5"	b=8"	c=6"

Drawing:

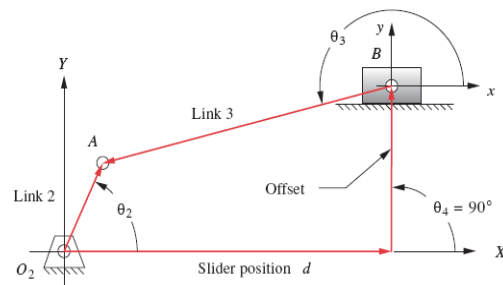
Determine $\theta_3, \theta_4,$ and μ at all possible values of θ_2 .



$K_1 = \frac{d}{a}$ $K_2 = \frac{d}{c}$ $K_3 = \frac{a^2 - b^2 + c^2 + d^2}{2ac}$ $K_4 = \frac{d}{b}$ $K_5 = \frac{c^2 - d^2 - a^2 - b^2}{2ab}$	$A = \cos\theta_2 - K_1 - K_2\cos\theta_2 + K_3$ $B = -2\sin\theta_2$ $C = K_1 - (K_2 + 1)\cos\theta_2 + K_3$ $D = \cos\theta_2 - K_1 + K_4\cos\theta_2 + K_5$ $E = -2\sin\theta_2$ $F = K_1 + (K_4 - 1)\cos\theta_2 + K_5$	$\theta_{4,1,2} = 2 \tan^{-1} \left(\frac{-B \pm \sqrt{B^2 - 4AC}}{2A} \right)$ $\theta_{3,1,2} = 2 \tan^{-1} \left(\frac{-E \pm \sqrt{E^2 - 4DF}}{2D} \right)$
μ	$\mu = \theta_4 - \theta_3$	

Crank Slider

Chosen Value Table			
	Link 2	Link 3	Link 4
Link Length	a=1.4"	b=4"	c=1"



Determine $d_{max}, d_{min},$ and Stroke length for this crank slider

Stroke length	$d_{max} = \sqrt{(b+a)^2 - c^2}$	$d_{min} = \sqrt{(b-a)^2 - c^2}$	Stroke length = $d_{max} - d_{min}$
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Determine the following values (open) of θ_3 and d and μ at all possible values of θ_2 .

θ_3	$\theta_{3,2} = \sin^{-1} \left(\frac{-a \sin\theta_2 + c}{b} \right) + 180^\circ$
d	$d = a \cos\theta_2 - b \cos\theta_3$
μ	$\mu = \theta_4 - \theta_3 - 180^\circ \text{ for } \theta_3 > 0^\circ$

Inverted Crank Slider

No analysis required.