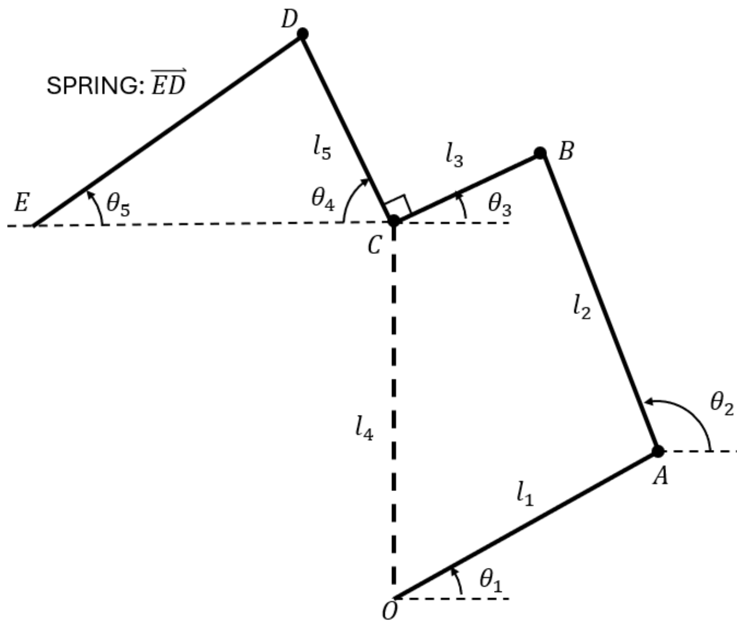
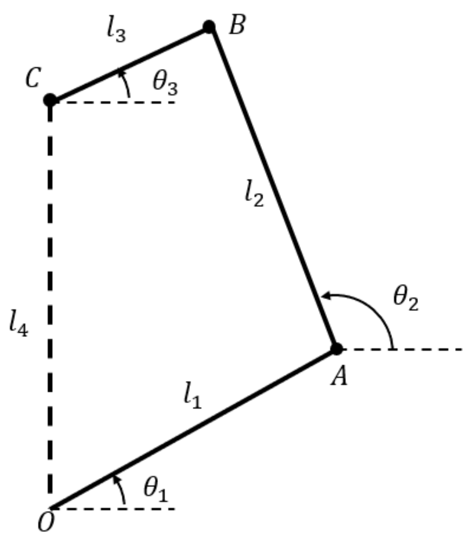


Our goal is to find the angles θ_2, θ_3, θ_4, and θ_5 given the input angle θ_1 and the lengths l_1, l_2, l_3, l_4, and l_5. We can use two methods to solve for these angles: the vector loop method and the circle intersection method.

Using the vector loop method:



$$\vec{r_1} = l_1 cos\theta_1 \hat{\imath} + l_1 sin\theta_1 \hat{\jmath}$$
$$\vec{r_2} = l_2 cos\theta_2 \hat{\imath} + l_2 sin\theta_2 \hat{\jmath}$$
$$\vec{r_3} = -l_3 cos\theta_3 \hat{\imath} - l_3 sin\theta_3 \hat{\jmath}$$
$$\vec{r_4} = 0\hat{\imath} + l_4 \hat{\jmath}$$

$$\vec{r_1} + \vec{r_2} + \vec{r_3} = \vec{r_4}$$

$$\boxed{\hat{\imath} = l_1 cos\theta_1 + l_2 cos\theta_2 - l_3 cos\theta_3 = 0}$$

$$\boxed{\hat{\jmath} = l_1 sin\theta_1 + l_2 sin\theta_2 - l_3 sin\theta_3 = l_4}$$

Given:
- l_1, l_2, l_3, l_4
- θ_1

By numerically solving the equations, we can find angles θ_2 and θ_3. Following that, we know that l_5 is always perpendicular to l_3, and thus we can find θ_4 by trigonometry. By using the vector from C to D $\vec{l_5}$ we can find the point D. Knowing both D and E, we can find angle

θ_5 using trigonometry as well.

Using the circle intersection method:

We found that it is faster and cleaner to use the circle intersection method to define the angles and points instead.

We know the locations of the fixed points O, C, and E:

$$O = (0, 0) \quad C = (0, l_4) \quad E = (-6, l_4)$$

We know the Cartesian coordinates for points A and B by defining it in terms of a vector relative their respective fixed points:

$$\vec{l_1} = \langle l_2 \cos(\theta_1), l_2 \sin(\theta_1) \rangle \implies A = \langle 0, 0 \rangle + \langle l_2 \cos(\theta_1), l_2 \sin(\theta_1) \rangle$$

$$\vec{l_3} = \langle l_3 \cos(\theta_3), l_3 \sin(\theta_3) \rangle \implies B = \langle 0, l_4 \rangle + \langle l_3 \cos(\theta_3), l_3 \sin(\theta_3) \rangle$$