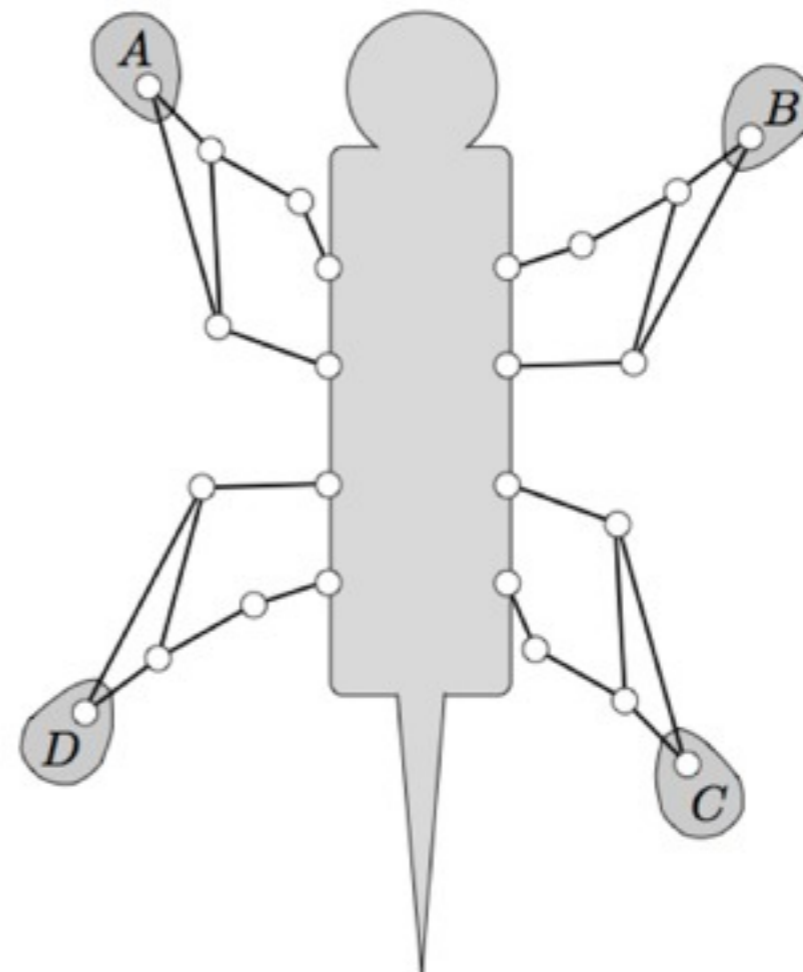


Problem 1

Full Stickybot

Stickybot is climbing a wall. At the shown instant, the points A, B, C, and D are kept fixed to the wall. How many joints must the robot lock to keep the shown configuration?



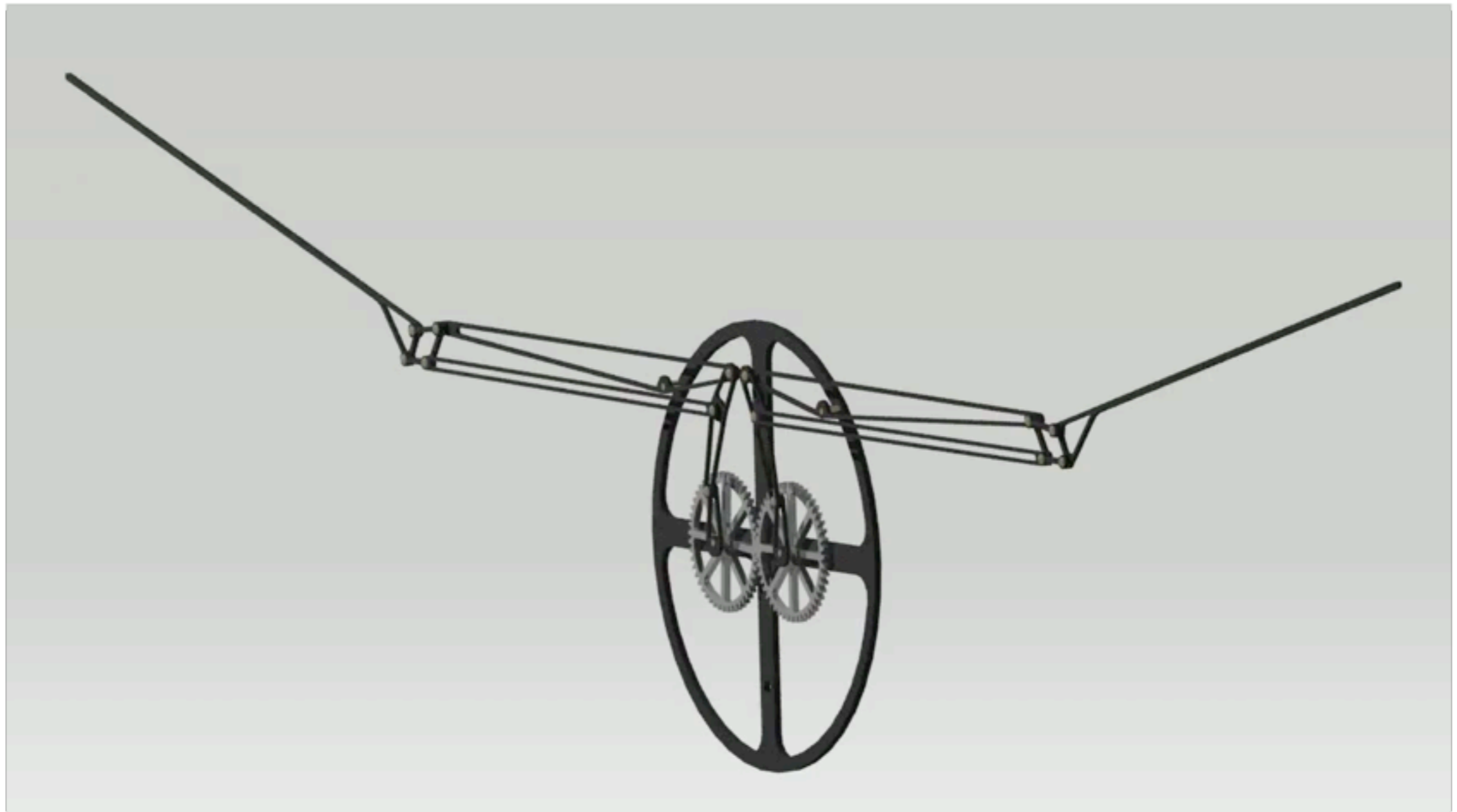
Problem 2

Smartbird (FESTO, Germany)



Determine the number of actuators needed in its wing mechanism

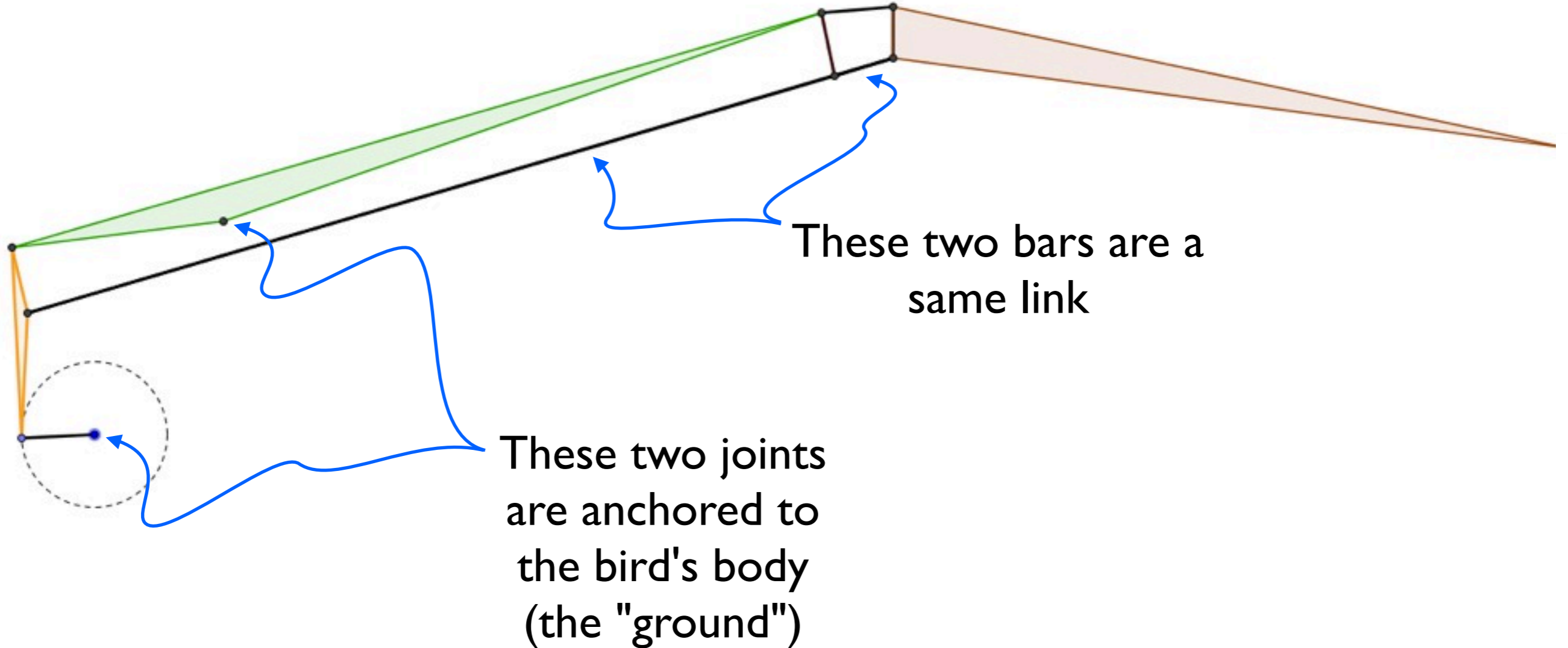
Smartbird's wing mechanism



<http://youtu.be/N9b45bRSIG8>

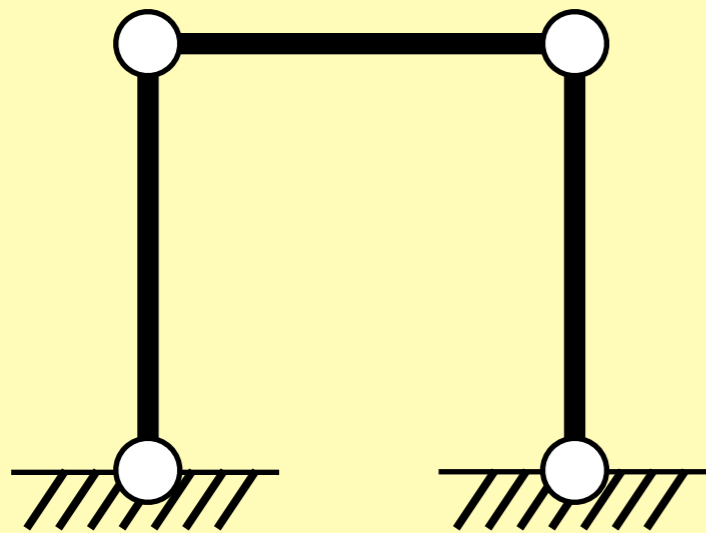
Schematic structure

Every small circle is a
free-to-rotate
revolute joint

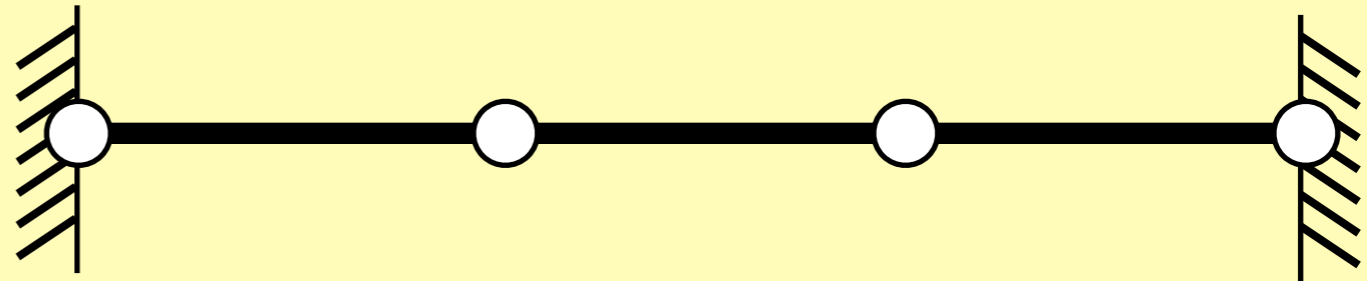


Problem 3

The two mechanisms have the same structure. Show mathematically that (A) is in a regular configuration, whereas (B) is in a non-regular one. Assume that all bars are of unit length.



(A)



(B)

Hint: use the loop closure equation provided below

Problem 4

Write the loop equations of Stickybot's leg

Add extra equations to include the (x, y) coords of point P

$$\begin{aligned} l_1 &= 3.8 \\ l_2 &= 6.1 \\ l_3 &= 6.6 \\ l_4 &= 6.1 \\ l_5 &= 2.8 \end{aligned}$$

$$\begin{aligned} \mathbf{r}_2 &= (0, 0) \\ \alpha &= 45^\circ \\ a &= 3.8 \end{aligned}$$

