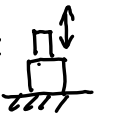


Mobility formula.

$$\text{System DoF} = \sum_{\text{bodies}} \text{DoF} - \sum_{\text{joint}} \text{independent constraints}$$

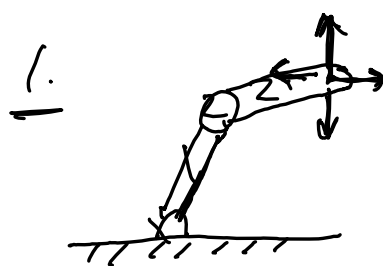
in 2D: $\rightarrow = 3 \cdot b - \sum_{\text{joints}} (3 - \text{"freedom"})$

$$= 3(b - j) + \sum_{\text{joints}} f$$

type of joint	# freedoms	# constraints (= 3 - f)
revolute 	1	2
prismatic 	1	2

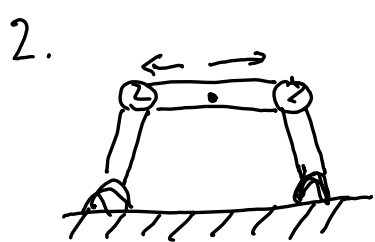
(more in 3D)

open chain mechanism



$$\text{DoF} = 3(2 - 2) + 2(1) = 2$$

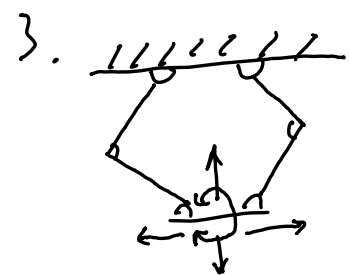
$$\text{DoF} = \sum_i^{\text{joints}} f_i$$



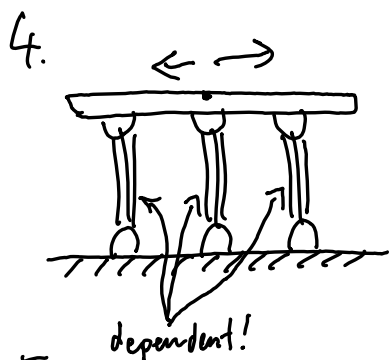
closed chain mechanism

$$\text{DoF} = 3(3 - 4) + 4(1) = 1$$

$$\text{DoF} = \sum_i^{\text{joints}} f_i - 3$$



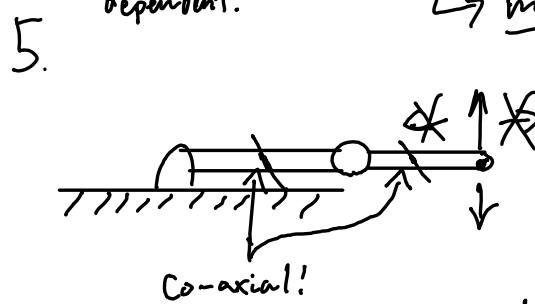
$$\text{DoF} = 6 - 3 = 3$$



$$\text{DoF} = 3(7 - 6) + 6 = 7$$

overconstrained mechanism

$\rightarrow$ more DoFs than expected.



$$\text{DoF} = 7 - 1$$

gimbal lock

$\rightarrow$ less DoF than expected

motors in a system $\neq$
DoF in a system