The rolling disk example

- The Lagrangian has some structure

$$L \to L_t(\dot{q}_t) + L_r(q_r, \dot{q}_r)$$

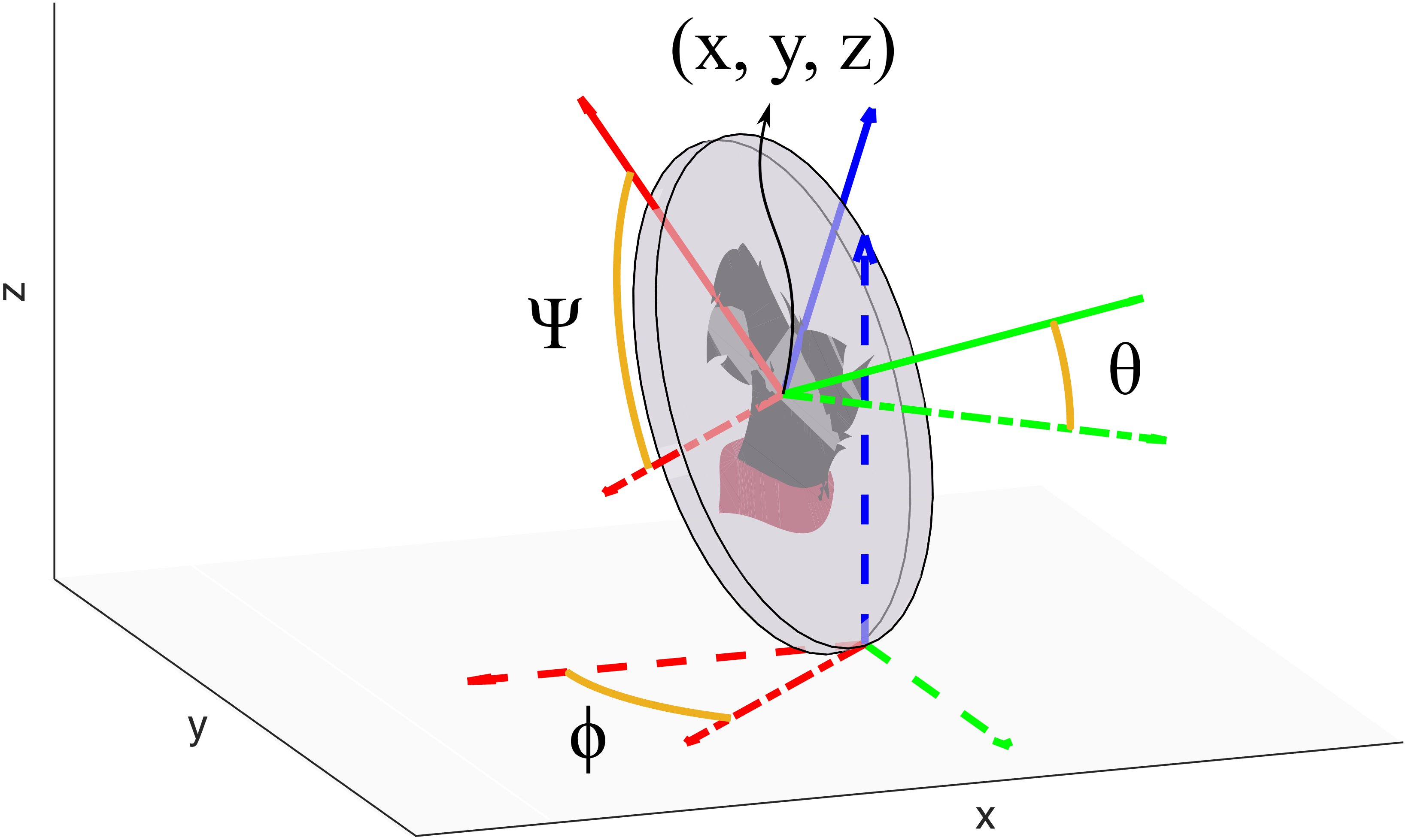
- The constraints have some structure

$$\dot{q}_t + \boldsymbol{A}_r(q_r)\dot{q}_r = 0$$

- The equations are

$$\frac{d}{dt}\frac{\partial L_t}{\partial \dot{q}_t} = \lambda$$

$$\frac{d}{dt}\frac{\partial L_r}{\partial \dot{q}_r} - \frac{\partial L_r}{\partial q_r} = \mathbf{A}_r(q_r)^T \lambda$$



(x, y, z)
z
Ψ
θ
y
ϕ
x

$$KE \rightarrow KE_t(\dot{q}_t) + KE_r(q_r, \dot{q}_r)$$

$$q = (\overbrace{x, y, z}^{q_t}, \overbrace{\phi, \theta, \psi}^{q_r})$$

$$PE \to PE(q_r)$$

$$F_{\text{non-conservative}} = 0$$

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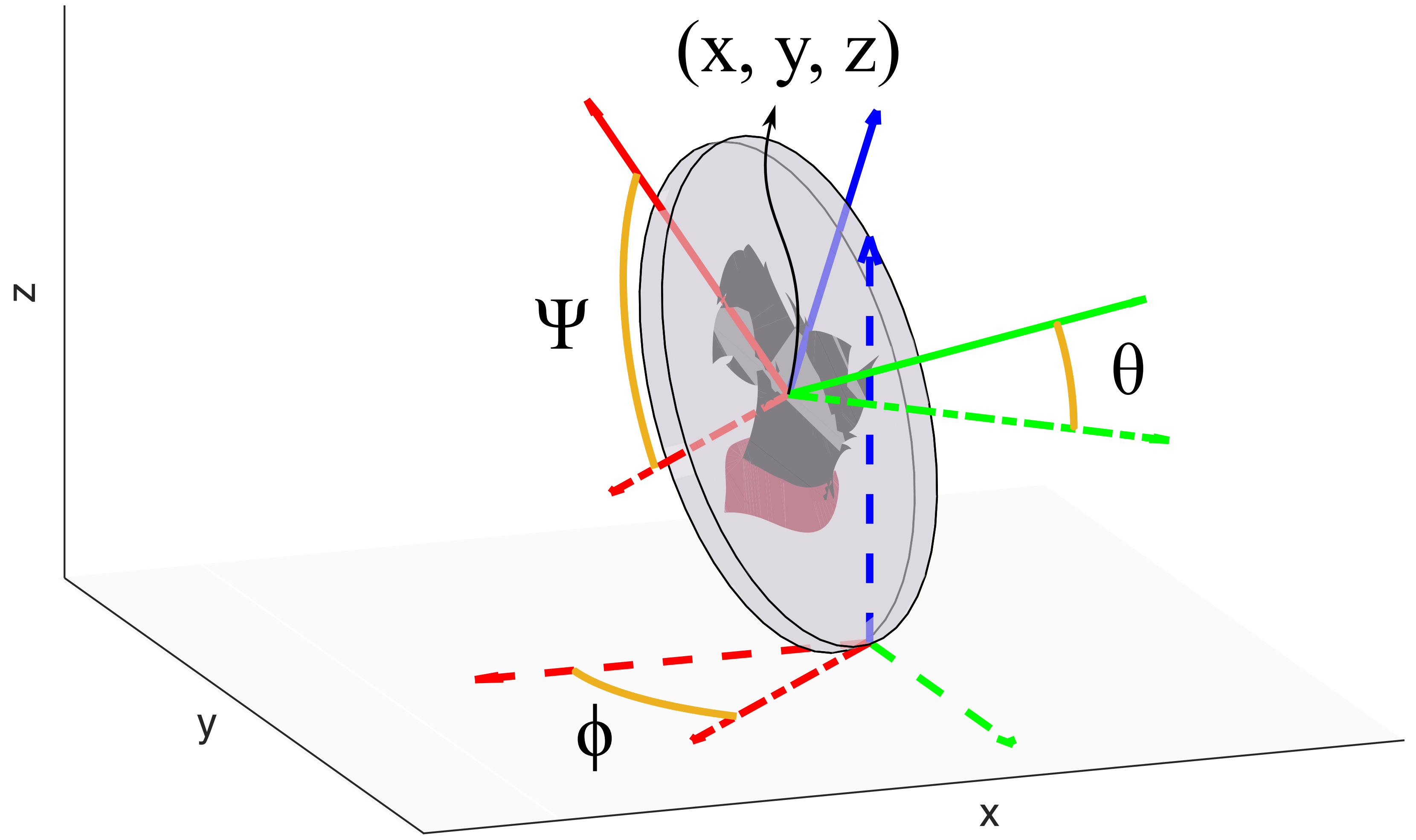

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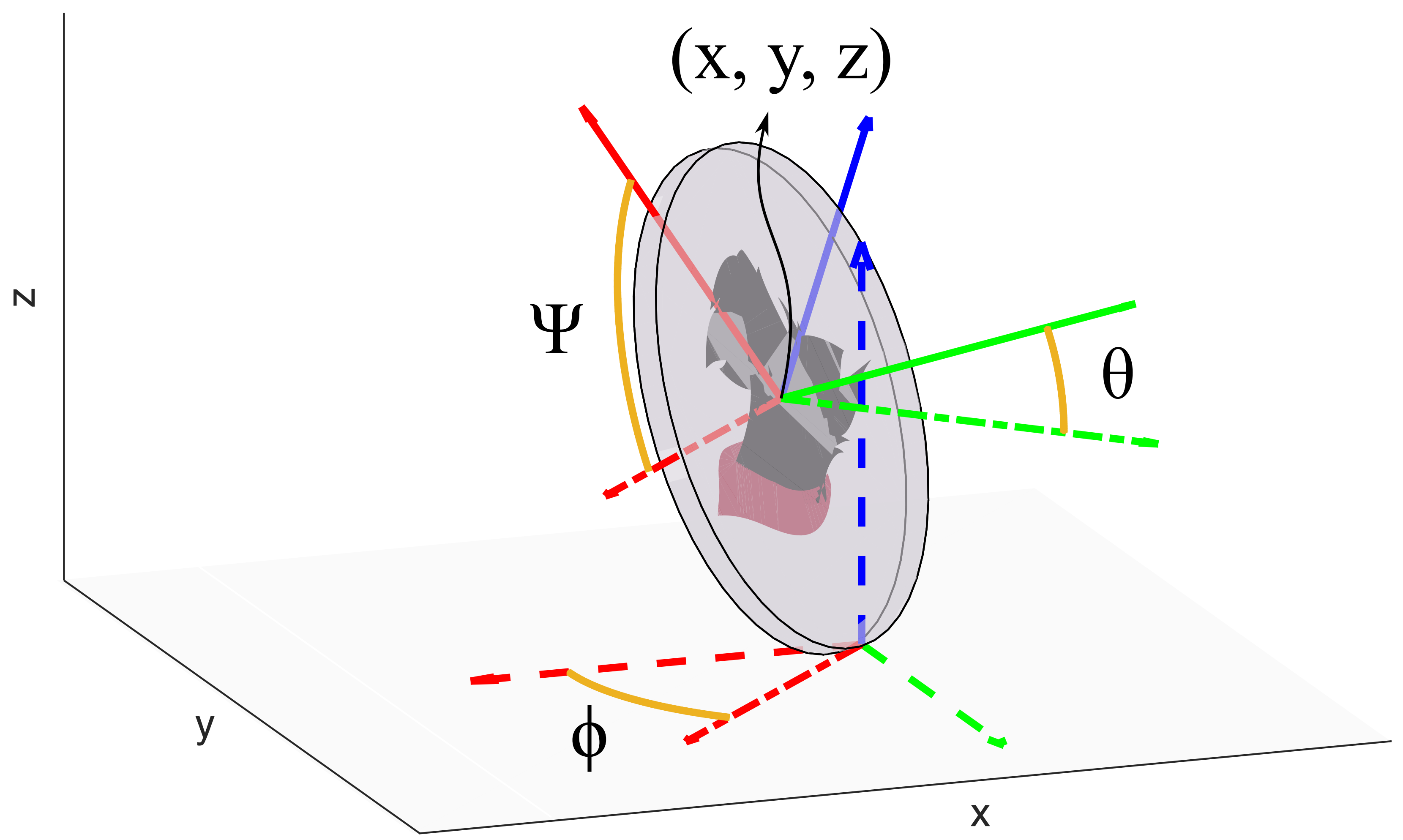
Is there an alternative?



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