Is there an alternative?

- The Lagrangian has some structure

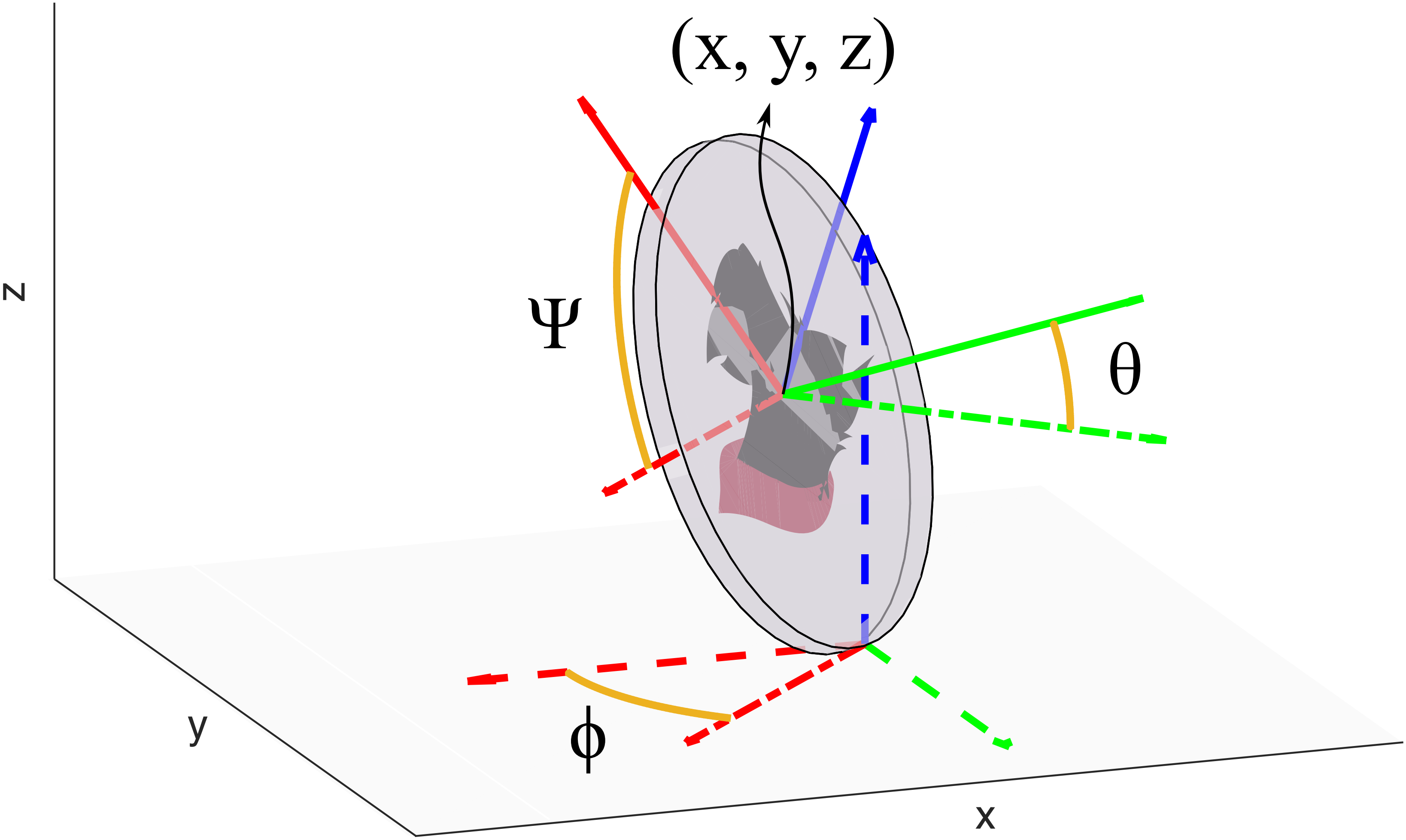
$$L \to L_t(\dot{q}_t) + L_r(q_r, \dot{q}_r)$$

- The constraints have some structure

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

- What if we eliminate $\dot{q}_t$?

$$L = L_t(-A_r(q_r)\dot{q}_r) + L_r(q_r, \dot{q}_r)$$


(x, y, z)
Ψ
θ
ϕ
z
y
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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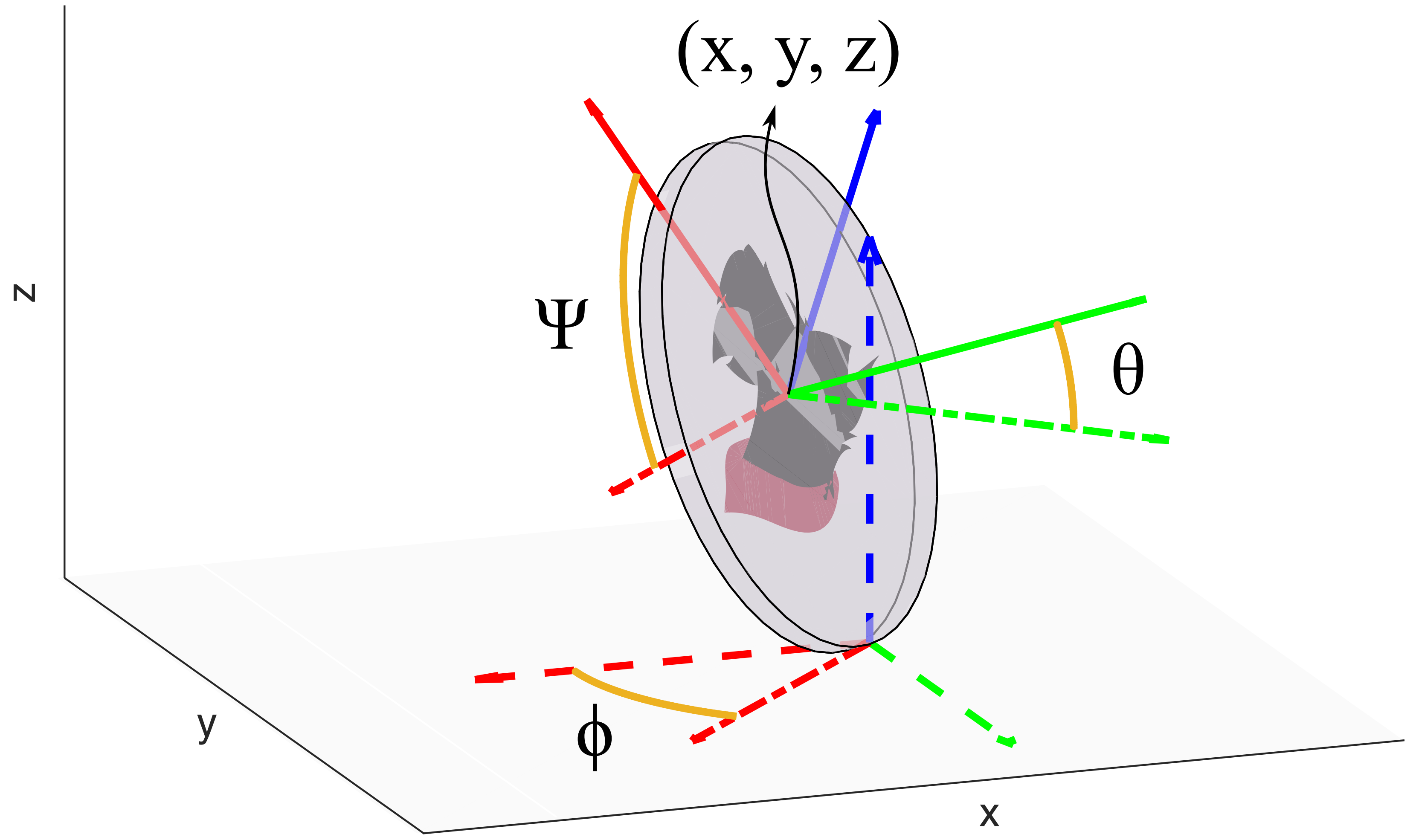

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Do both approaches yield the same dynamics?