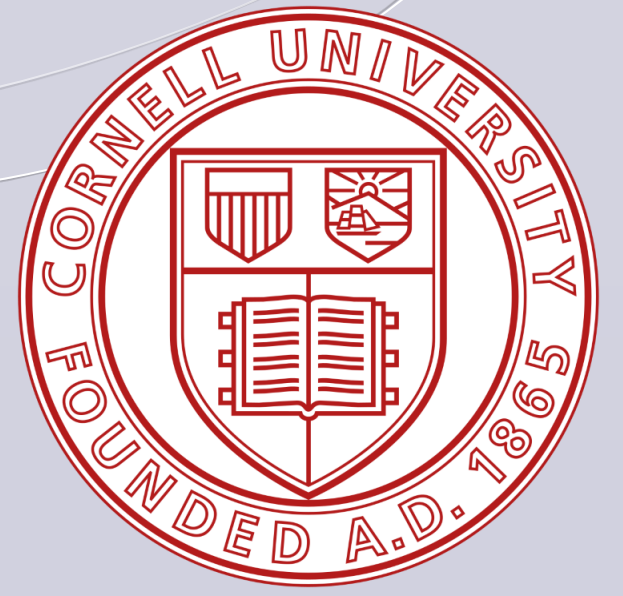# Path Following for a 3D Point Mass Biped Walker
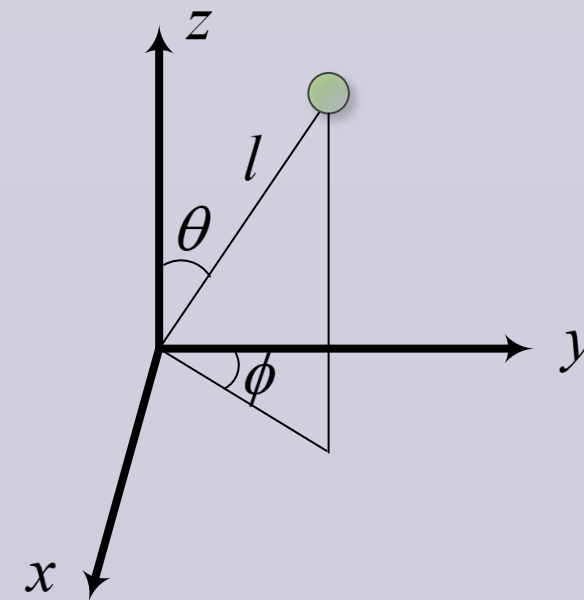
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Model: 3D inverted pendulum
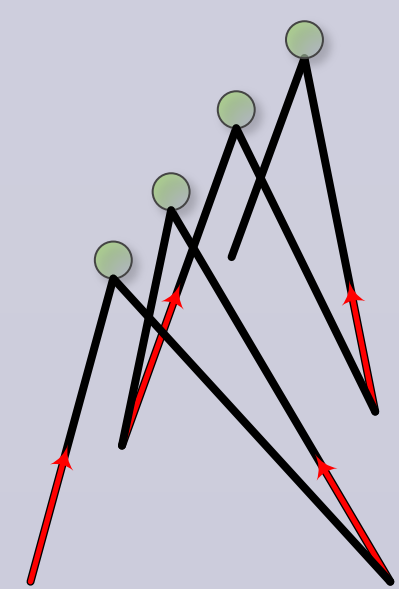
$$\begin{cases} \ddot{\theta} = \dot{\phi}^2 \sin\theta\cos\theta + g\sin\theta/l \\ \ddot{\phi} = -2\dot{\phi}\dot{\theta}/\tan\theta \end{cases}$$

Control inputs: push off & foot placement

Push off determines the initial velocity of each step $\rightarrow \dot{\theta}, \dot{\phi}$

Foot placement determines the final position of each step $\rightarrow \theta_{st}, \phi_{sw}$

Two walking gaits: human walking $\rightarrow \dot{\theta} \gg \dot{\phi}$ duck walking $\rightarrow \dot{\theta} \ll \dot{\phi}$

Simulation Results:

Walk in a line

Walk in a circle

Walk along a given path

Walk along a given path