My Grand Challenges

CS background: correct answers, quickly

I want robust simulation of robot dynamics for morphological design, behavior validation
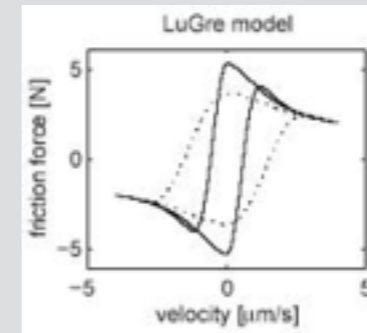
I don't care about model predictive control

I prefer coarse (simple) models

$$\frac{dz}{dt} = v - \sigma_0 \frac{|v|}{g(v)} z = v - h(v)z,$$
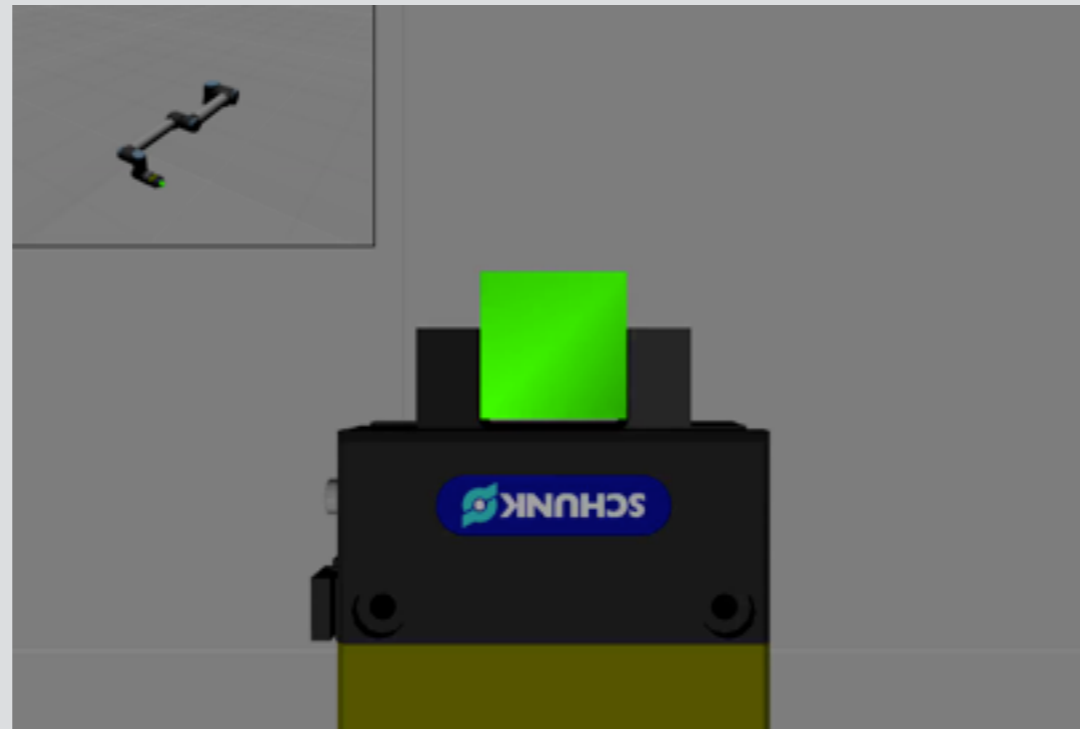
$$F = \sigma_0 z + \sigma_1 \dot{z} + f(v),$$

LuGre friction model
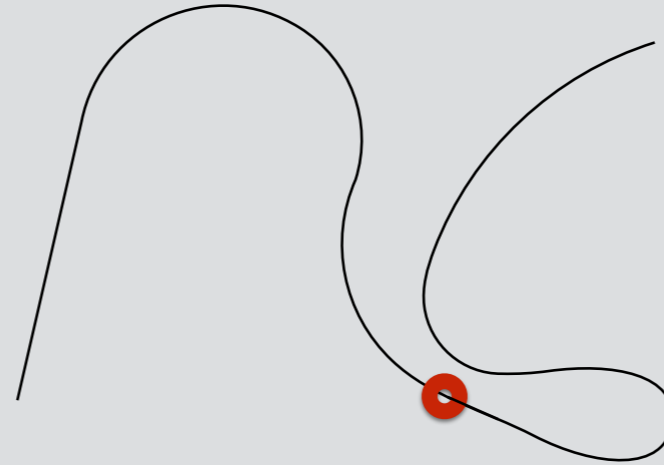(the opposite of simple)

- initial conditions unlikely to be known perfectly + controls = high accuracy wasted
- minimal modeling parameters

…but without interpenetration-related artifacts.

SEGUE: My solution for testing this.

Challenge: evaluate multi-rigid body dynamics simulation accuracy without parameter tuning.
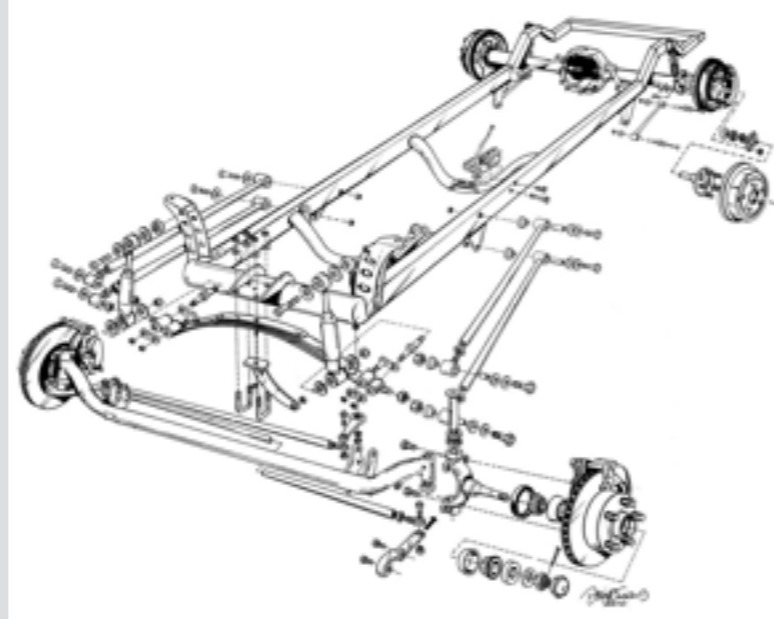
Key: not a halfspace geometry

Simulation doesn't know the shape of the wire a priori.

Initial state is consistent (bead is on the wire).

Can query the constraint function, but if you follow the gradient, you might jump to another part of the wire.

My "creative" idea: assemble an auto suspension and test it virtually.

Know nothing about joints.

Contact must work at large scale and small scales. Fasteners?