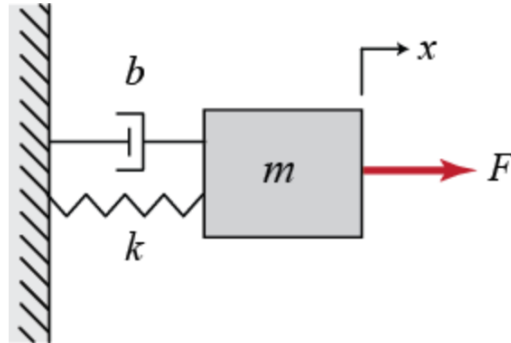


Astranis GNC Engineer Interview Project

Your task is to build a closed-loop simulation of the following Mass-Spring-Damper system. As we code primarily in C++ and Python here at Astranis, we prefer the simulation to use one of those languages:



You can assume: $m = 1 \text{ kg}$, $b = 2 \text{ N/m/s}$, $k = 3 \text{ N/m}$

First, get a working simulation that can bring the mass to a desired set-point, then choose one of the following 3 extensions:

Sensor Model

Now your controller does not actually know the true state of the mass, it only gets a noisy measurement of the position of the mass every 100ms, and the measurement arrives up to 10ms late.

Integrate this sensor model into the simulation and show that your controller is still robust.

Actuator Model

Now the control input is not a continuous force, but an on/off thruster. The thruster only fires in the +X direction with a thrust of 1N, and it has a minimum on-time of 50ms.

Integrate this actuator model into the simulation and show that your controller is still robust.

Reference Tracking

Now the desired set-point is not a fixed value, but a sine wave with a frequency of 0.25 Hz and amplitude of 0.1m.

Integrate this reference signal into the simulation and show that your controller is still robust.

This prompt is left purposefully open-ended, so feel free to get creative with your implementation and with any additional features that you think demonstrate your abilities.

Please do not spend more than 5 hours on this project.