

Determine the parameters of your system by executing test trajectories, recording torque versus position, and performing a least squares analysis.

1. Execute a trajectory by specifying a desired torque, then recording the resultant position. It is suggested you try a sinusoidal torque profile, repeated until the handle drifts out of range.
2. Determine the total system inertia, coulomb friction, and viscous friction using least squares. You'll have to differentiate position twice to determine acceleration. Use a two-sided filter.
3. Fashion a feedforward controller that predicts the driving torques based on this system model, and combine it with the PID controller from Lab 2. Execute a sinusoidal position trajectory, with a period of 1 Hz and an amplitude of 20 degrees. Compare the position tracking error when using the feedforward controller with PID control, versus just using the PID controller alone.