

DC Servo with Velocity Observer

This simulation introduces several new concepts to the DC motor servo simulation. First, the position feedback is quantized with an encoder module which allows for adjustable counts per revolution and state-width error (SWE). In addition to being used as the position feedback signal, the encoder output is also fed to a Velocity Observer which utilizes a closed position loop and torque feedforward to synthesize a numerical approximation of velocity. This is a very pragmatic solution for encoder based servo systems since obtaining velocity information directly from the encoder signals can be difficult.

TRANSIENTS: At $t=0$, the commanded position is set to zero. At $t=5\text{mS}$, the commanded position is changed to 2000 encoder counts (one complete revolution). At $t=100\text{mS}$, a load of 0.6 N-M is applied to the motor shaft to demonstrate the disturbance rejection capability of the position controller. (Notice that the velocity observer can accurately track changes associated with the commanded torque, but has problems tracking changes associated with unexpected torque perturbations.)

PLOTS: Commanded Position, Actual Position, Commanded Speed, Actual Speed, Observer Estimated Speed, Commanded Current, Sampled Feedback Current, Actual Acceleration and Observer Estimated Acceleration.

REQUIREMENTS: [Spice Executable](#), [Support Pack](#)

Unzip the files for this simulation into the same folder as the files extracted from the Support Pack. Then run "14 DC Motor Digital Servo Control with Velocity Observer.asc".