DC Motor Speed Control

This simulation utilizes a cascaded control topology with an inner current loop and an outer speed loop. The current regulator is a standard parallel PI controller but the speed regulator uses a PI controller with a dynamically clamped integrator. This simulation also shows the effects of dual sampling, where the current loop is sampled at 10kHz and the speed loop is sampled at 2kHz. Since this is a digital control loop simulation, it also models some of the peripherals found in a digital control system, such as an ADC and PWM module. It is assumed that the exact value of motor speed is known, and is used as the feedback signal for the speed loop.

TRANSIENTS: At t=0, the commanded speed is set to zero. At t=20mS, a load of 0.5 N-M is applied to the motor shaft to demonstrate the disturbance rejection capability of the speed controller. At t=50mS, the commanded speed is changed to 120 rad/sec, and then at 120mS, it is changed again to -60 rad/sec.

PLOTS: Commanded Speed, Actual Speed, Commanded Current, and Sampled Feedback Current.

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 "10 DC Motor Digital Speed Control.asc".