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%% Declarations and Initializations
clear all;
a = arduino(); %Create an arduino object

motor_pos = 0; %Initializing a vector that will be used to store the position of the motor.
            %Note: The voltage across the feedback potentiometer will be
            %sampled from the arduino. These voltage values
            %correspond to a position on the motor. For example, 0V
            %corresponds to the 0 degree position while 5V corresponds
            %to the 235 degrees position.

set_pos = 0; %This vector will be used to store the set position of the motor.
           %There is a seperate potentiometer that will be
           %used as our set potentiometer. The voltage across the set
           %potentiometer will correspond to a set position.

current_draw = 0; %This vector will be used to store the readings of the current draw
               %from the motor.

t = seconds(0); %This vector will be used to keep track of the elapsed time in seconds.

t0 = datetime('now'); %Take a snapshot of the time now. This will be necessary to
                   %keep track of how much time has elapsed since the
                   %beginning of the plot.

%% Creating the Plots
f1 = figure(); %Figure to contain the position plot
f2 = figure(); %Figure to contain the current plot
ax1 = axes(f1); %Set up the axes inside figure 1
ax2 = axes(f2); %Set up the axes inside figure 2

%Position plot properties
xlabel(ax1, 'Time elapsed');
ylabel(ax1, 'Motor Position (Degrees)');
title(ax1, 'Position vs Time');
hold(ax1, 'on');
grid(ax1, 'on');

%Current plot properties
xlabel(ax2, 'Time elapsed');
ylabel(ax2, 'Motor Current Draw (A)');
title(ax2, 'Current vs Time');
hold(ax2, 'on');
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grid(ax2, 'on');

%% Real-Time Plotting
while 1 %run until you close the script
  temp = readVoltage(a, 'A1'); %Sample voltage from the Arduino. This is the voltage across
                        %the feedback potentiometer.

  pos = (235/5)*temp; %Translate the voltage to a position on the motor.

  motor_pos = [motor_pos pos]; %Since this is a real-time plot, we need to keep a running
                        %total of the position values and grow
                        %the vector over time.


  temp = readVoltage(a, 'A0'); %This is the voltage across the set potentiometer.
  pos = (235/5)*temp; %Translate the voltage to a set position.
  set_pos = [set_pos pos];


  temp = readVoltage(a, 'A2'); %This is the output of the current sensor, which is a voltage.
                        %We can use a bit of math to convert this
                        %voltage reading to a current reading.

  current = temp * (1000/(7.28261*1041.83463)); %This is the conversion to a current reading
based off of the
                                %resistor values on the current
                                %sensor.
  current_draw = [current_draw current];


  t = [t datetime('now') - t0]; %Calculate elapsed time.
  plot(ax1, t, motor_pos, 'b');
  plot(ax1, t, set_pos, '--r');
  legend(ax1, 'Current Position', 'Set Position', 'Location', 'Southwest'); %A legend will be useful
to distiguish the
                                                %current and set position.
  legend(ax1, 'boxoff');

  plot(ax2, t, current_draw, 'm');

  drawnow(); %This function makes it possible so we can update our plot immediately (in
real-time).
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end
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