**Week 1 – Equipment Automation**

/lab/1/

Goals:

* Automate measurement equipment (digital multimeter, waveform generator, oscilloscope) over USB using MATLAB

Purpose:

The primary focus of this week’s laboratory experiment is to write MATLAB scripts to automate the measurement equipment in the lab. Using MATLAB’s USB commands, one is able to set-up and capture data from the digital multimeter, waveform generator, and oscilloscope.

Estimating the value of a resistor

Firstly, one will manually change the output voltage on the AWG and record data from digital multimeter. In order to capture more data points more efficiently, one will be writing scripts for the equipment to estimate the value of a resistor.

Digital Multimeter (DMM)

Arbitrary Waveform Generator (AWG)

Oscilloscope

Results:

Deliverables:

* MATLAB:
  + /lab/1/deliverables/section\_061\_Carver\_Muhammad.m
* PNG
  + /lab/1/deliverables/lab1\_automated\_mm\_100pts.png
  + /lab/1/deliverables/lab1\_automated\_osc.png
  + /lab/1/deliverables/lab1\_manual\_measured\_mm.png
    - Manual measurements taken

**Week 2 – DC Motor Characterization**

/lab/2/

Goals:

* Generate a PWM signal to control the H-Bridge of a DC motor.
* Read in and display the number of counts from a rotary optical encoder.
* Generate an RPM vs. duty cycle characteristic plot in MATLAB

Deliverables:

* Arduino:
  + /lab/2/section\_061\_Carver\_Muhammad\_arduino.ino
    - Read in a constant DC voltage from the AWG and output a PWM signal with a duty cycle that is linearly dependent on the input voltage
* MATLAB:
  + /lab/2/section\_061\_Carver\_Muhammad\_matlab.m
    - Read in the number of counts from the serial monitor and generate an RPM vs. duty cycle characteristic plot.
    - Automate the arbitrary waveform generator (AWG) and oscilloscope to step through voltages in 0.1V increments from 0V to 5V. Obtain the duty cycle of the input signal from the oscilloscope and store the values in a vector.
* Arduino/MATLAB: Send the number of counts (from a rotary optical encoder) via serial from an Arduino input to MATLAB. Generate an RPM vs. duty cycle characteristic plot