ECE Senior Design Weekly Report

Engineer’s Name: Mark Luna Date: 4/6/17

Team Name: The Globetrotters Lab Section: 4, Thursday 12:30 PM

Week’s Task: Study, setup, and test necessary peripherals for levitation control on the microcontroller and layout a PCB breakout board for the SSOP package version of the microcontroller.

Results:

* The specific model that we are using, PIC24EP64GP202, contains all the necessary peripherals that we are planning to use for levitation control. This includes at least 4 digital output pins to control H-Bridge direction, two Output Compare modules that will be used to generate two PWM signals to control the current in the coils, one Analog-Digital Converter module for the Hall-Effect sensors that can simultaneously sample four analog input channels with a 10-bit resolution, and interrupt vectors for these peripherals.
* Setting the ADC module to auto-sample and auto-convert, using the ADC’s internal RC oscillator, with a corresponding interrupt that is fired when the conversion is finished, the sampling and conversions appear to be occurring in periods of about 25 microseconds, which should be more than necessary for our purposes but can be modified to use another clock source for slower execution.
* No PWM module exists for this model, but the Output Compare modules can be used for this purpose and they do not need a separate timer configured for it to use as the counter if the peripheral clock is used. All that is necessary is an upper bound value used to set the resolution and frequency of the PWM signal and a match value used to set the duty cycle of the signal. However, the frequency can also be set by using a different clock source than the peripheral clock, in which case a timer module would be necessary to generate a clock.
* Interrupts are enabled by simply clearing the appropriate interrupt flag and setting the appropriate enable bit in the status and control registers, and using the appropriate interrupt vectors when declaring the interrupt functions.
* Since the initial package of the PIC we are using was an SSOP package that required a breakout board, instead of waiting for it to get ordered, in conjunction with Andres we developed our own breakout board using Expedition PCB layout software. We recently received DIP packages of this microcontroller, so we will use the DIP package for prototyping and may use the SSOP package in our final design, for which we will already have a PCB model for, and we can later expand the design to accommodate all the circuitry that we’ll need.