Work Completed

This week I continued to work on the hardware to interface the linear actuators with the PIC. The braking system I originally designed used op amps to power the braking actuator. Dr. Enderle then reminded me that the op amps cannot supply enough current to power the actuator. Figure 1 shows the protoboard with the updated hardware.

I ordered another bi-directional DC motor speed control kit from Carl’s Electronics. This kit (seen in Figure 4) will produce -12V-12V based on the position of the potentiometer. The potentiometer sends a 0-6V signal to pin 3 of the first IC on the control board (LM324N – op amp). 3V is center for this signal and results in no output to the DC actuator.
For the braking system, the potentiometer will be removed and a voltage signal will be sent directly to pin 3 of the op amp. In joystick mode, the input from the braking half of the vertical signal (as described in week 3 report) will be used to calculate a PWM to be output to the braking hardware system. This PWM will be sent through a low pass filter (to convert the PWM to a DC signal). The DC 0-5V signal will then be sent to a summing amp to add 0.5V. This creates a 0.5V-5.5V signal with 3V being center (no output from motor speed control board). The MOSFET’s in the motor speed controller can supply sufficient current to operate the actuator. The same circuit will be used for wheel mode. The cherry switch used to accelerate in wheel mode supplies 0 or 5V to the PIC. When the PIC receives the 5V signal, a ramp program will be run to output a smoothly increasing PWM signal. The hardware described here has been verified.

I also focused on writing the actual code for the PWM outputs. A sample code was used and tested for PWM output. This code will eventually be modified for this specific application.

Other code was written to select between the two modes of operation. A switch has been attached to pin RA2 of port a. If this signal is high, 5V will be sent to the cherry switch buttons for wheel mode operation (output via RC5). If this signal is low, 5V will be sent to the MOSFET switch allowing the signal from the joystick to be sent to the hardware described in my week three report. The digital in from the switch will also be used in the other parts of the code to be written in the upcoming weeks. This will allow for effective switching between the two modes of operation. The code described here has been verified.

I assembled the first DC motor speed control kit for the steering mechanism (as described in week 3). I verified the operation of the speed controller. It works well with the steering actuator. When the potentiometer is turned to the right, the actuator arm extends. When the actuator arm is turned to the left, the arm is retracted.
Future Work

During week five, I will continue to work on code. My next goal is to write A to D conversion code to receive the analog signals coming from the joystick (separated into acceleration and braking using hardware as described in week 3 report). I will also work on modifying the PWM sample code for our application. My last goal will be to modify the code used to read the digital input from the mode select switch so it can be used to read the digital inputs from the cherry switches (wheel mode acc and braking).

Hours Worked

Hours Worked during week 4: 18