Project Identity

Adjustable Back Angle Controller
Week 8
March 28, 2007
Ray Pennoyer

Work Completed

This week we took a drive to a hardware store to look for steel parts that we could machine our motor cage out of. We also needed angle iron to support the back of the bed. We found the parts that we needed and purchased them using our group account. Once we had the steel parts, we went to the machine shop. Serge was kind enough to punch 1 inch holes at the 3 points that Steve had marked, as well as set the milling machine up for our awkwardly dimensioned pieces. I then started to mill out the long slot in each piece that is required for our cage design. Alaena did the bulk of the milling, however. When they were done, the steel pieces fit on the scissor jack as shown in Figure 1.

Figure 1
Machined Steel Frame and Scissor Jack
This week I also worked with the H-bridge circuit. I tested the H-bridge using our motor at reduced voltage. I used the 5V supply and ground to simulate the microcontroller’s output. After some adjustments to the resistor network, the circuit worked as intended. Sending 5V to 2 of the N-channel MOSFETs caused the motor to turn clockwise, and the motor turned counter-clockwise when the other 2 MOSFETs were activated. There were no heat problems at 20V and 3A. The test setup is shown in Figure 2.

![Figure 2](image)

*Figure 2
H-Bridge Test Circuit*

One problem with the previous design was that the 5V regulator could not handle the 48V that our power source will be outputting. Using a resistor to lower the voltage for the 7805 would not work because the current could fluctuate depending on other parts of the circuit. A more reliable way to lower the voltage is a diode. Most normal diodes have a .7V difference across them. A zener diode, however, has a much larger voltage across it when placed in the opposite direction, but will still allow current to flow after that voltage is reached. I found 12V zener diodes that would work for this
purpose, and tested them using a simple circuit and the lab’s adjustable power sources. Using 2 of these zener diodes as protection, the voltage that the 7805 receives will be 24V, which is within its operational range. I also researched and reviewed PIC microcontroller assembly language and drew up the basic functions that our program should accomplish.

**Future Work**

Early in the next week I will experiment with the H-Bridge using the full 48V and 8.1A. The main problem with this is that the breadboard that the circuit is built on cannot handle such a larger current, so external wires will need to be implemented. This week we also need to work on the handle design so that I can know what range the potentiometer input will have. When the final values are certain, I can begin finish the code for the microcontroller. We should also receive the castor wheel, so it can be attached to the scissor jack. This will allow construction of the track that runs along the back of the bed.

**Project Review**

The deadline for the project is less than a month away, and we accomplished a lot during the past week. However, much still needs to be done, and we need to work even faster in order to complete the project in time. We are still within budget with about $600 remaining. We have currently spent about $1400 of our $2,000 budget.

**Hours Worked**

16 hours