Project Identity:

Assistive Robotic Arm
Week 1
Danielle McGeary

Work Completed:

A trip to Hampton Elementary School was made on January 17, 2007 by Megan Madaraga and myself. The intent of this trip was to touch base with the supporting staff and our main client contact, Merriam Kurland regarding the project. The trip was necessary since the school had not been updated with the project’s progress since the final design was completed. As of the last visit, the utensils being used in the gripping mechanism had been changed. We had previously planned to insert a spatula and machine it to the client’s need. Recently, special perpendicular, plastic utensils, made specifically for the disabled, had been implemented into the design. This can be view on page 50 of our final report.

Megan and I also took time to meet with each member of the assessment committee. We had brought the final report and showed each member the highlights of the design. The staff was also able to give us feedback about how we could improve the device to make it even more effective for our client’s specific needs. While at the elementary school, we also came up with set visits to keep the staff updated with the device’s progress. We will be presenting to the assessment committee every second Wednesday for each month.

Megan and I were also able to examine the client’s wheelchair to find a convenient place to mount the completed device. As seen in the photos below, it appears that the most suitable place to mount the device is on the steel rod under the client’s armrest. Placing the arm in this location will allow the arm to be in a good position to function properly while not interfering with any mechanisms of the wheelchair itself.

Figure 1: Top view of the mountable steel panel.
During the first week of design, many of the small parts for our design came in. The belt for the pulleys that we had ordered was smaller than expected. The outside diameter of the pulley that we order was also larger than what was accounted for in the final design.

Later in the week, Megan and I went to Home Depot to examine the different types and sizes of PVC piping that the store had to offer. This was done since it is hard to visualize components from a website. Also, we needed to figure out how to remedy the large diameter of the pulley. Initially, we had planned to buy a large ten-foot tube of the piping and cut it into two-foot sections in the machine shop. While at the store, Megan and I found pre-cut, two-foot sections of the piping in various diameters. These two-foot sections are not offered on the Home Depot website.

While at the store, we also tried to find a larger pulley belt to fit the length of our robotic arm. After speaking with a store manager, he recommended a lawn mower belt. He also suggested going to ACME Auto Parts since they have a great variety of belts in an array of sizes. At ACME we spoke with a sales associate who had completed a project similar to ours. He showed us many types of pulleys along with their corresponding timing belts. The pulley he suggested was the Idler Pulley seen below in Figure 3.

Figure 2: Side view of the wheelchair along with the mountable steel panel located under the armrest.

Figure 3: Idler Pulley
I did much research throughout the week regarding different pulleys and their various sizes. While the Idler Puller does provide much more strength, the size of the pulleys themselves are much too large to fit into the piping we had previously planned for. With each pulley, our main concern is the outside diameter. In order to increase the size of the pulley, the diameter of the PVC piping would need to be increased. If this were to be done, additional weight would be added to the entire device and more powerful motors and batteries would be needed. As of now, it was decided that the original pulley that was ordered will stay in the design.

Megan and I also spent time in the machine shop. We first spoke with Surge and Rich and explained our design plans to make sure they were logical given the equipment. We began milling the joint connections for the wrist and grippers in the PVC tubing that was purchased.

Much work was also done on the abstract for the Bioengineering conference. This paper was revised multiple times. The paper was completed and submitted on January 30th. I also created an explicit spreadsheet with a budget analysis for our design. I also tried contacting the client’s father via e-mail but no response was received.

**Future Work:**

It is imperative the all the mechanical components of the design be completed as soon as possible. Once the body of the device is completed, motors can be ordered. Since the motors that were chosen for the design were expensive, we need to make sure that they are necessary. Also, the circuit cannot be tested on the arm until it is built. I also plan on working the Microchip Microprocessor this week and becoming extremely familiar with it. I plan to also continue working in the machine shop all week until the PVC skeleton of the device is completed. We are also working on trying to find a belt that will satisfy the length and strength requirements of the upper arm. I will try contacting the client’s father again via e-mail.

**Project Work:**

When it was discovered that the pulleys purchased were larger then planned, a compensation need to be made. This compensation was done by increasing the diameters of the PVC tubing in the upper arm. The new diameter of the upper arm is 2 inches and lower arm remains at 1.5 inches. The pulleys now fit into the upper arm.

**Total Number of Hours Worked:** 10 hours