Project Identity

Assistive Robotic Arm
Week 9
March 28 2007- April 4, 2007
Megan Madariaga

Work Completed:

On Friday March 30th we filled out the return sheet for our large base motor then traveled to the post office to send it out. On the way back from the post office we stopped in and looked at a device in Dr. Fox’s office that would be effective for our base unit. It consisted on bearing plates with three supports that are stationary and bolted to the base plate. A motor was mounted on the side of the bearing plates where it spun the plates around. A picture of this rotation device can be seen in Figure 1. Also while we were there Dr. Fox gave us a motor that will be used to rotate our base. He also gave us a couple of switches that we could use for safety stops and for buttons on our key pad.

On Saturday I went to Lowe’s Hardware store to find a bearing device for our base unit. Both of the plates I found were for lazy susan normally. These should be okay for the base, but the only problem is that both bearing plates are square and we need ours to be circular for the motor will be able to rotate it. Also this device was smaller than the one in dr. Fox’s office. This size should be better for Sam’s wheelchair. Since the material of the rotation device was thin it was a realistic assumption that it could be machined. While at the hardware store I bought washers and lock nuts for the gripper and three rods to place in the wrist and shoulder joints.

On Monday Danielle and I went to Mansfield supply to look at their selection of bearing devices. They did not have any new options so we traveled to Home Depot because they have cheaper prices and a bigger selection of PVC piping connectors. At home depot the first thing that we accomplished was to find materials for the posts which would support the bearing device. The material found was PVC tubing with a 3/4” diameter in a ten foot segment. We also bought caps to fit on either end of the pipe that had a level top. Eight caps were bought to go on either end of the base segments. Also we bought two pipe connectors that we will combine together to make the circular
rotation base which the arm will be attached to. We picked up some screws to put the
device together with.

Once we got back to the senior design lab, I first exchanged all the nuts on the
grippers with lock nuts. Also instead of having nuts as spacers, I exchanged each nut for
four spacers. Also I had to add spacers on the ends of each bolt to make up for the space
that the lock nuts leave.

After the gripper components were assembled properly, I took the ¾” tubing and
measured out 3” segment. Each of the caps that were purchased went down about an
inch on the tube when it was attached. On the top of four caps I found the center by
measuring the half way point of each measurement. Once this was complete I took the
piece of aluminum that we already had and I traced the connection top onto it. Finally I
measured 2” on the shaft that would be connected to the shoulder.

Once I finished measuring all the pieces I headed to the machine shop. First I cut
out all the 3” segments of PVC tubing with the band saw. The material was gripping the
blade a little weird, each time it felt like the material was going to kick back at me. I
tried to put as much pressure as possible when pushing it through. Next using the special
deburring peeler, I deburred each segment. Once that was finished, I took the lazy susan
and cut off the corners. Each corner was rounded off with tin shears. It was a little
difficult because the metal was very thick. Once I got it down to the point I wanted it to
be, I took the file and deburred it. Danielle made two spacers for the base joint and then
she cut out the circle for the lazy susan base out of the aluminum sheet with spacers.
These can been seen in Fig. 2, 3, 4 and 5.

![Machined spacers for the base](image1)

**Figure 2: Machined spacers for the base**

![Circular base plate](image2)

**Figure 3: Circular base plate**
After the machining was complete, I went back to the senior design lab. First I used the senior design lab drill press to drill the four holes out of the tops of the base of the pillars. These pillars were made by taking the PVC segments and putting a cap on each end. It took a bit of time to get all of the base pillars to be at even heights. This can be seen in Fig. 6. While I was drilling the tops, Danielle took the metal base circle and the lazy susan bearing device to the machine shop to rivet them together. By mistake she riveted it to the wrong side, so the stumps were upward where we were attaching the PVC connector. She used a file to file all the stumps down. She can be seen filing in Fig 7.
While Danielle was filing I took the upper arm and drilled a ¼ “ hole and drilled the same hole in the PVC connector. Once that was done I inserted the screw to make sure that the holes lined up. It was important that the spacers fit into the desired space and this is seen in Fig 8 and 9. Finally I took the round PVC connector and drilled holes in the metal plate where the preexisting holes were on the connector. This was difficult because the vice was too small to hold it so Danielle held it as I drilled holes. Finally I took the screws and connected the PVC connector to the metal plate, as seen in Fig.10 and 11.
Once that was complete we wanted to connect the motor to the power source and try to make the base move. We didn’t have much luck because the motor needed some rubber on the grippers to create friction so it could grade at the base and rotate it. This didn’t work so Danielle decided to take a trip to Olympia Sports to find gripping tape.

**Future Work:**
This next week the main goal is to get the movement of the arm up and running. We are in the process of finding a motor in which we can make the arm move in the up and down fashion. Also we will be traveling to Hampton Elementary school to measure the arm on Sam’s chair to see if we need to decrease the length of the lower arm. Finally we will be putting together the key pad and painting our assistive robotic arm.

**Project in Review:**
This week the only design change was to the motor that we were going to use. We found a motor with low current but the only problem is that the RPM is too low that it would not be able to perform the desired movements in a realistic amount of time. We are still searching for a motor that will work for our project.

**Hours Worked:**
15 hours