Work Completed:

This week, much work was done with the PVC piping. Much time was also spent in the University of Connecticut Machine Shop. Megan and Danielle went to the machine shop late last week to cut slits into the bottoms each of the pipes so that they could fit into one another. The cuts made were two inches deep and two inches wide. These cuts were made using the Milling Machine. Much help and guidance was also provided by Rich to ensure that all of our cuts were the same. On the three-inch diameter tube, cuts were made on both sides of both ends. The cuts on the top of the three-inch tube allow for the two-inch diameter pipe to fit in and rotate about an axis. Much time was taken to measure and plan these cuts since it was imperative that the pipe of the smaller diameter be able to fit into the pipe of the larger diameter. The cuts made at the bottom of the three-inch diameter tube will be utilized when the device is connected to the base. This will allow for a 180 degree rotation about the y-axis. No cut was made at the bottom of the two-inch diameter tube since that end of the pipe will be inside the three-inch diameter tube. The cut at the top of the two-inch diameter tube will allow for a joint connection with the gripping device.

Figure 1: PVC Tubing before any cuts were made
In last weeks meeting, a concern was posed regarding all the red lettering that appeared on the sides of each tube. This manufacture’s printing can be seen in Figure 1. Danielle took much time researching how to ameliorate this issue. The red printing made the tubes look tacky and would be an unprofessional way to present the device to the client. On-line, Danielle found a technique of removing all printing that appeared on the sides of the tubes. It was suggested that a brillow pad be used along with a powdered soap such as Ajax or Comet. The website also suggested using acetone for very stubborn markings. Danielle attempted this technique and found that it worked real well. The red paint was not easy to come off and took much aggressive scrubbing. Danielle scrubbed the pipes clean and they do not appear as any previous markings were on them. The cleaned tubes can be view in Figure 2. Danielle also found suggestions regarding the painting of these tubes. It was suggested that the Krylon Fusion brand spray paint, formulated for plastic worked the best. It was also decided amongst the group that the pipes should be spray painted before the entire device is mounted together. This will make the paint job appear much neater.

Yesterday, Danielle and Megan spent more time in the machine shop. The goal of the day was to be able to connect the pipes together and create a working hinge joint for the elbow. The first thing that was done was that four ¼ - inch holes were drilled in to the pipes using the Milling Machine using a ¼ - inch drill bit. Two holes were placed on the top two panels of the three-inch diameter tube and two other whole were made at the bottom of the two-inch diameter tube. The whole were made a ¼ of and inch since the steel rod purchased to be the point of rotation for each joint has a radius of ¼ - inch. The centers of each tube were found by using an indicator. It is very important to find the
centers of each tube accurately so that all drilled hole will be uniformly placed. If each hole is not uniformly placed, attaching the joint will be very difficult.

Once the holes were made in each tube, we noticed that we needed spacers to properly secure each joint. Rich suggested making the spacers in the machine shop. Rich provided Megan and I with a small cylindrical piece of silicon plastic. The plastic had a diameter of approximately ½ of an inch. This cylinder was first cut in half on the saw. This was done since we needed to make two spacers. Next, one plastic cylinder was then loaded in the lathe machine. The smooth side that had just been cut by the saw was placed inward. The center of the plastic piece was then found by touching it off with a pointed drill bit. Once the center was found, a ¼ - inch hole was drilled through its center using a ¼ - inch drill bit. Once this hole was made, the drill bit was then replaced by a sharp and pointed lathing tool bit. From measuring the two diameters of the two tubes and the excess space between, we found that each spacer needed to be .295 inches thick. Each cylinder was lathed until that desired thickness was reached. When the spacers were complete, the inside and out side edges were sanded while the lathe was spinning. Once all this was complete, the joint was then constructed. See Figure 3. The ¼ - inch steel rod does fit into the joint.

Figure 3: Completed Joint with both PVC tubes
Future Direction:

Next week, the metal pieces for the gripper will be constructed. They will be cut from the sheet of metal that were purchased last semester. The dimensions and drawings have already been created and calculated. It is important to finish making all the mechanical parts of the device so that the motors can be purchased. Once the gripping device is created for the arm, we will be able to have a better idea of the total weight of the device. This total weight will place a key factor in deciding which motors will be necessary to power out device. The PVC pipes will also be painted this week. It will be much easier to paint the pipes before they are mounted together. This will also make the device more visually pleasing to the eye.

Project Work:

The projected changed slightly this week since we created our own spacers. This was a very productive idea since it saved time and money. Creating our own spacers allowed us to tailor them specifically to the desired size needed for our elbow joint. This was a very good lesson for the future.

Total Hours Worked: 12 Hours