Work Completed

The direction for week three dealt with designing and ordering parts for a universal paintbrush/marker wrist attachment. The idea behind the design was to build a devise that could be worn by our client which would be lightweight and would provide range of adjustability as far as the type of paintbrushes and markers the design would accept. Also, the design would provide adjustability in the position of the marker once it was placed in the device.

The core of universal paintbrush/marker wrist attachment is a R.E.D. impact wrist guard. This wrist guard was chosen for this design because it is lightweight, will not rotate around the wrist like a glove would, and the structural members in the wrist guard which are used for protection can be used to mount the device which will hold the paintbrush/marker. Connected to the wrist guard will be the mechanism to allow the client to rotate his paintbrush/marker to any desired angle. This will be accomplished using a 1-5/8” round piece of PVC with a 9/16” hole cut through the center. The top of the PVC will have notches (see Figure 1). Rotating about the center of the PVC will be a hollow tube made of aluminum, which will hold a paintbrush/marker in place. The hollow tube will allow the use of many different size paintbrushes and markers. The drawing utensil will be held in place by two wing nuts, threaded into the top of the hollow tube (see Figure 2).

The hollow tube will also double as a device to keep the drawing utensil in a static position. Two extrusions, one on either end, will be placed on the bottom of the hollow tube. These extrusions will fit into the notches machined into the PVC. A spring loaded bolt will run through the center hole of the PVC and attach to the bottom of the aluminum holder (see Figure 2). When the holder is pulled away from the PVC, the spring will provide force to keep the unit whole; however, it will allow the holder to rotate around the cent of the PVC to any desired angle. Once the desired angle is reached, the holder
will be released and the force of the spring will pull it back on the PVC. The extrusions on the bottom of the holder will lock into the notches on the top of the PVC and keep the paintbrush/marker in a static position (see Figure 3).

Figure 3: Paintbrush/marker holder with threaded hold for wing nuts and extrusions on the bottom.

Sometime was also spent during week three finalizing the design for the arm support system. Stanley Supply and Services produces a ball-joint system which would work perfectly for our design (see Figure 4). The Stanley Vise Bases Ball-Joint Positioner is a ball joint system that can be thread mounted and has a locking mechanism. Our arm support design can then be modified in order to incorporate this versatile motion mechanism. We also needed to find a way to mount the arm support system to Tom’s wheelchair. A company called GTX offers a mechanism which would allow us to perfectly mount the support to the wheelchair (see Figure 5). The GCX PRC post/rail clamp will likely be implemented to provide a quick solution to mounting the 80/20 frame to an arm on the wheelchair. This will allow for easy attachment and removal of the device.

Figure 4: Stanley Vise Bases Ball Ball-Join Positioner.  

Figure 5: GCW PRC post/rail clamp.
**Future Work**

Next week, the necessary dimensions need to be examined so that cutting can begin on the stock material. Once cutting is complete, each of the parts can be interfaced with the 80/20 stock in order to create a multi-axial arm support, which can then be tested empirically and adjusted so that it provides optimal positioning. The dimension for the design will be retrieved from Patty Mitchell so that the design can be sufficiently interfaced with the wheel chair, and the necessary ranges of motion can be covered. We should also receive the ball joint and clamp parts. The 80/20 material will be cut to proper lengths and threaded so that it can be interfaced with the proper joints. The aluminum extrusion will be cut at the machine shop, and the extrusion components will be attached to the device. After this step it will be interfaced with the wheelchair and cushioned to provide comfort.

We will also begin construction of the universal paintbrush/marker wrist attachment. We plan to notch the PVC which will be accomplished using the template below (Figure 6). We then will begin analyzing different spring-bolt combinations to see which will work best for our design. We will also begin construction on the holder unit. Two holes will first be drilled into the holder, and then they will be tapped so wing nuts can be used to lock a paintbrush/marker into place.

![Figure 6: Template drawn to scale used for notching the PVC.](image)

**Project Review**

Over the course of this past week, we have made significant progress with our project. As far as the arm support system, two important components were found and will be ordered which help tie the support system together. The ball-joint adds to the infinite adjustability of the support system, and the GTX post clamp provides a fast, sturdy way to mount the support system to Tom’s wheelchair.

The paintbrush/marker wrist attachment device was designed and parts were ordered during this week. This design meets the set specifications and will provide a
solution to Tom’s issue of attaching a drawing utensil to his wrist. Overall, this week the project has progressed in a positive direction.

Figure 7: Updates to timeline.

**Hours Worked**

Noah: 12.00  
Dan: 14.66  
Melissa: 11.5