Work Completed:

Progress of the fabrication of the easel was continued during the past week. The cardboard prototype is almost finished. We were able to help cut cardboard pieces to scale of the actual parts to help model the moving parts and correct positions of each piece of the frame. The pivoting motion of the carriage was modeled using cardboard slabs reinforced with tape. Two mock pins made of small pencil parts acted nicely to help model the tilting functions of the easel. Both front and back and tilting motions have been successfully completed with the prototype. A slight delay in our progress with the cardboard model was due to the lack of having our ordered actuators. Their dimensions will certainly influence the ultimate scheme of how the easel will look and function. This hindrance was avoided by developing models for the actuators as well. Dimensions taken from the Fergelli auto website were correctly used to make Styrofoam replica’s of the actuators at full extension. They were then integrated successfully into the cardboard prototype.

Another design alteration that was conceived was offsetting the tilting actuator. Since the device must be collapsible, positioning the tilting actuator directly behind the vertical channel piece of the swing arm frames would result in a conflict of proper closing. By offsetting the actuator to the side of the channel piece and attaching to an aluminum bracket, the device will collapse all the way to the base.

Another important addition to the project made came from the demonstration of the 80/20 parts showcase. More ideas and brainstorming came on how we will make the easel face itself be manually adjustable. One of the main concerns facing the project is its failure to work in an environment outside the lab. Our wheelchair model, table dimensions, etc. will allow the easel to function properly. However, these details change in different environments. The height of the table which will be used at Passionworks® has not been included to the list of specifications. By attaching the easel face to 80/20 tracks along a bracket attached to the last motion of the easel, the device is more compatible for any type of table or chair dimensions.

As far as the joystick is concerned, a call was placed to PQ-Controls (the manufacturer of the joystick) and we found that it is possible to have a joystick made that uses microswitches capable of carrying up to 3amps of current. This joystick will be configured exactly as the original one with the toggle switch on top, but be digital instead of analog. One option that needs to be decided is whether the joystick will travel 20 degrees or only 10 degrees. This will need to be based off the capabilities of our client.
The engineer on the phone also mentioned that it might be possible to donate the joystick to our group since the project is academic based.

Also, the actuators ordered a few weeks ago arrived. Initial testing showed that they are well suited for the job and their speed and strength are ideal for the project. They are small enough to fit on the easel and should work just as planned. A picture of the actuators being tested with the power supply can be seen below.

Lastly, our group took a trip to Frank’s father’s welding shop over the weekend in order to cut some more material to continue work on the project. A number of aluminum pieces were measured and cut for the vertical frame of the easel that will handle the tilting mechanism. We did not weld any pieces together so as to allow us to readjust anything that did not fit with the base.
Future Work:

Over the next week, plans are to assemble the easel to enough degree where the actuators can temporarily mounted and fully tested. We have brought up two grinders to the lab so that the material can be cleaned up, de-burred, and welds ground down if necessary in preparation for the final product. Another piece of aluminum tracking from 80/20 is expected to arrive later in the week which is necessary to provide for the carriage and base to be joined together and allowing them to slide. Brackets must be fabricated to mount the carriage to the urethane slides used on the 80/20 extrusion. A few additional notches must be made to the frame to allow it to collapse properly and some additional strengthening of an actuator mount may be necessary. In addition, an email will be sent to the joystick manufacturer with the exact specifications of what we would like and some information will be gathered as far processing time and shipping.

We will also be contacting a representative from Passionworks to gain some additional details about our client. His degree of dexterity and range of arm motion are crucial parts of the overall design, as they will be the basis for positioning of the easel. They will also be necessary to adjust the range of motion of the easel to ensure that it can not cause harm to the client or any other users.

Project Review:

The objectives of our project are being fulfilled nicely. With the arrival of the wheelchair, we saw it fit perfectly between the clamping arms. As mentioned earlier, the tilting actuator is going to be offset to the side of the channel piece of the pivoting arms to allow full collapsing features for the project. After contacting Passionworks® we also found out that our client only has one arm. However, this important detail does not effect our project greatly. We already removed one of the actuator movements, reducing the number of switches to six. Using a joystick similar to the one attained in the lab, (four positions; front, back, left and right, with two more switches controlled from the top of the joystick) Harry should have no trouble using the one joystick as opposed to the original two joystick set-up. Passionworks® has also requested a separate switch for Harry to turn the device on and off along with the key switch accessible for the supervisors.