The Versatile Painting Solution
Week 1: January 16, 2006 to January 22, 2006
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Work Completed
The previous design for the automatic paint brush left too many questions unanswered. It was a working design using a linear actuator; however, the set up and cleaning process for the design required too much work from the client. The design met all the project specifications, yet did not make the painting process for the client any easier. Due to this, our team decided to come up with a new design for the automatic paint brush but the design for the support system was kept the same.

From December 16, 2005 to January 17, 2006, we had winter break and were unable to work on our project in the senior design lab. During this time, I spent some time contacting companies and speaking with my father, who is an engineer, about new ways to design the automatic paint brush. Although we did come up with many ideas, none of them seemed to tackle the problems we faced with our optimal design. Upon returning to school on January 17, 2006, Christopher Liebler made a suggestion on how to alter our design for the better, which was the building block for our current design.

For the past week, we have spent hours on the redesign of our automatic paint brush. The previous design used a linear actuator to force the paint out of pre-filled tubes onto a paint brush. This is where many of the problems stemmed from. First, tubes would have to be filled with acrylic paint and then inserted into the specific location. When these tubes were empty, they would have to be cleaned, and then refilled. These steps seem to cause more hassle than good. The idea Chris proposed involved creating a system where the tube of acrylic paint could be inserted into the design, and when empty, could then be thrown out. This would minimize the paint filling procedure drastically.

Paint tubes would not have to be filled, and when empty, they would not have to be cleaned and refilled. Instead, tubes that were empty would be thrown out and new tubes could be inserted into the design.

With a new idea came a new design. The new design we came up with as a group used a rotary motor connected to a lead screw system. This system would be turned into a roller-type system to force paint out of the acrylic paint tube. The lead screw would have a roller attached to the end of it. The roller would ride along the acrylic paint tube, and when a button is pressed, the motor turns, moving the lead screw, causing the paint to be forced out of the tube onto a paint brush.

During the past week, our team reviewed many different products to find which product would be best for our current design. We found a company called Excitron Corporation, located in Superior, Colorado. Excitron specializes in stepper motors and lead screws for many different applications. I contacted Excitron on Friday, January 20, 2006, and spoke with a technical support assistant named Vern. I explained our project and design to Vern and he suggested different stepper motors as well as different drivers and lead screws. We come up with a complete package which included a power supply, a stepper motor drive, a stepper motor, and a lead screw. This system would be a fully functional system when connected, minus a large push button which would activate the system.

Figure 1: Steppe gear motor with controller 24mm dia.

Future Work
During the next week, we need to start by drastically modifying our current timeline. Our current timeline included many different steps based on our previous design. The new design incorporates different features, so different tasks need to be set up. Once the next tasks are assigned, we can begin work on the project.

All preliminary testing will be done during this week. We first need to test the forces required to move paint out of the acrylic paint tube. Our gear motor can be set anywhere for 25 to 50 oz-in of force, therefore, we need to have a better idea of how much force we need. We also need to test different methods of how to mount the lead screw in different types of material to try and achieve the lightest more comfortable unit we can design.

Preliminary testing will also start on our support system. We will need to begin the support system by first establishing a way to attach the support system to the wheelchair. Once we have attachment points, we can then build our support system around that.

Finally, we will place orders for other materials we will need for our design. As the weeks progress, we may find other little things we need, in which case, we will need to place orders for them. In the next week, we will be placing orders for raw materials for our support system.

Project Review
The redesign of our project has left us at a stand still. While most other groups are currently working with materials on their designs, we are a few steps behind them still placing orders for our designs. Once we receive the materials we now have placed orders for, we will be able to catch up to the position we should be in. It is better that we redesigned the automatic paint brush at the beginning of the manufacturing stages rather than close to the end when we realized the design didn’t work out very well. Although we haven’t completely progressed in the direction we should have, we did make some positive leaps in the right direction. The new design uses a gear motor controller, so we do not need to write a program for a microprocessor and micro stepping driver ourselves. This will eliminate a great deal of time being spent on writing a program, and this time can now be spent on the manufacturing and testing phases of the project.

Hours Worked
Hours spent on the project for Week 1: 6