Painting Solutions for Limited Mobility
Weekly Report #9
Wednesday March 22nd – Wednesday March 29th

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Team #1
BME 291
29 March 2006

Work Completed:

➢ Fiberglass arm rest completely cushioned
➢ Aluminum mounting bracket machined with countersinking screw holes
➢ Attachment of mounting bracket to post
➢ Focus on Minimizing weight of device

During the weeks of March 22nd to March 29th the individual sections for the positioning systems have been completed. The prototype is ready for initial testing, even though there is still one impending parts order. The fiberglass arm rest has been coated with a foam cushioning and covered with a cloth. New design plans have been added to minimize the overall weight of the device. Certain heavy parts such as the aluminum bracket will be milled to their minimal size in order to reduce as much weight as possible.

The following supplementary 8020 parts were ordered to replace the current joint system and implement stronger interface between articulating arms. These parts include:

-- 4 x 4185 (machining cost seperately)
-- 2 x 4197 0 degree Pivot Nub
-- 8 x 3280 Double Economy T-nuts w/ screws
-- 4 x 3785 1/4X20 Economy T-nut and 4 3/4" screws for these slots

Future Work:

Friday March 31st, the articulating arm will be constructed using the 0 degree pivot nubs and 3” arms. Since the screw holes for the pivot arms have already been countersunk the duration of assembly time should be short. Friday, the complete prototype will be constructed.

The prototype needs to be tested to ensure that it is optimal for its application. The support will be attached to a template wheel chair that serves for a model for Tom’s actual chair. The template chair is more simplified than the actual chair Tom uses, however the device is designed to be implemented on a variety of chair sizes.

The major tests include stability, durability, and positioning. If there is more positioning available, the device will have greater the functionality. Ideally, each
articulating arm would be able to swivel 360 degrees, but using the current bolt system, only about 345 is available. The supplementary parts will be swapped with the bolt system and the joints of the articulating arms will have an increased strength, decreased friction, and will have a full 360 degrees of rotational movement.

Testing will begin Friday March 24th and the results will be recorded to determine the effectiveness of the design.

Lastly the PVC cross section also needs to have the brush mounted to it and be tested to ensure its stability and functionality. This will be tested by attaching the brush to a test subject and observing the ease of use at each brush angle setting.

Work for the Next Few Weeks:

- Purchase 2.75” bolts and nylock nuts
- Create the fiberglass model using fiberglass composite and polyester epoxy
- Machine the model to optimum size and application
- Cushion support using foam
- Machine Aluminum face plate
- Add second hinge
- Interface clamp
- Construct paint brush attachment
- Incorporate spring locking mechanism in PVC cross section
- Testing of Prototype
  - Strength
  - Application
  - Durability
  - Ease of Use
- Minimize Weight of Device

Project Review:

The initial construction of the device should be completed by the end of this week. The second part of the design process will be entirely testing and troubleshooting. The goals for the testing process will be to provide the most durable and helpful device possible. In this case, the positioning system should provide as many different positions as possible, while reducing the chances of failure due to fatigue and wear that could be caused during use.

Although the design indicates that it can provide positioning at any painting position, this will need to be tested empirically to determine whether the positioning is optimum. If testing indicates a lesser rate, there is still time for improvements to be performed on the design to increase functionality. Plans are already under consideration to make the device more adjustable and stable.
Updates to Timeline:

- Obtain a template wheel chair
- Interface clamp with post
- Creation of swivel joints
- Minimization of Weight
- Prototype Testing

Updated Timeline:

<table>
<thead>
<tr>
<th>Task Name</th>
<th>Resource Names</th>
<th>Start</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interface Fiberglass Mold w. Arm</td>
<td>Mellisa</td>
<td>Fri 3/31/06</td>
</tr>
<tr>
<td>Assembly of Arm</td>
<td>Noah</td>
<td>Fri 3/31/06</td>
</tr>
<tr>
<td>Minimization of Weight</td>
<td>Dan</td>
<td>Thu 3/30/06</td>
</tr>
<tr>
<td>Milling of Aluminum Bracket</td>
<td>Melissa</td>
<td>Thu 3/30/06</td>
</tr>
<tr>
<td>Testing</td>
<td>Dan</td>
<td>Fri 3/31/06</td>
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<tr>
<td>Strength</td>
<td>Dan</td>
<td>Fri 3/31/06</td>
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<tr>
<td>Durability</td>
<td>Noah</td>
<td>Fri 3/31/06</td>
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<tr>
<td>Ease of Use</td>
<td>Dan</td>
<td>Fri 3/31/06</td>
</tr>
<tr>
<td>Optimization</td>
<td>All</td>
<td>Fri 3/31/06</td>
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</tbody>
</table>

*Changes Made to Timeline:*

- Added Testing Phases
- Steel Bracket Changed to Aluminum
- Possible Milling of Aluminum bracket to reduce weight

Hours Worked:

<table>
<thead>
<tr>
<th>Date</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thursday 3/23</td>
<td></td>
</tr>
<tr>
<td>Friday 3/24</td>
<td>1:00 Pm – 5:00 Pm</td>
</tr>
<tr>
<td>Sunday 3/26</td>
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<tr>
<td>Monday 3/27</td>
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<tr>
<td>Tuesday 3/28</td>
<td>7:00 Pm – 9:00 Pm</td>
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<tr>
<td>Wednesday 3/29</td>
<td>9:45 Am – 1:45 Pm</td>
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Hours total = 10 hours