Assistive Robotic Arm

Weekly Assessment #6
February 28, 2007- March 14, 2007

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Grippers

- Components were sanded down to decrease the width
  - Increased mobility and decreased friction between pieces
  - Used the belt sander to complete gripper pieces

BEFORE

AFTER
Grippers

- Machined the hand plates for the grippers
  - Used band saw and belt sander
- Machined slot in hand plates for the spoon
  - Used Milling machine and 1/16” end mill
The torque of the arm system was calculated with the equation below:

- The weights of each segment were measured and recorded in the table below.
- If the load is 1.5 lbs, the calculated torque at the shoulder is 93.335 lbs*in.
- If the load is 2.5 lbs, the calculated torque at the shoulder is 125.33 lbs*in.

Torque Equation:

\[
5''(W_{\text{joint}}) + 7.5''(W_{\text{upper arm}}) + 11.5''(W_{\text{joint}}) + 22''(W_{\text{lower arm}}) + 25''(W_{\text{motor}}) + 28.5''(W_{\text{grippers}}) + 32''(W_{\text{load}})
\]

<table>
<thead>
<tr>
<th>Name</th>
<th>Weight (g)</th>
<th>Weight (lbs)</th>
<th>Length of part (inch)</th>
</tr>
</thead>
<tbody>
<tr>
<td>grippers</td>
<td>178.1</td>
<td>.3918</td>
<td>7</td>
</tr>
<tr>
<td>joints</td>
<td>32.05</td>
<td>.0705</td>
<td>-</td>
</tr>
<tr>
<td>Lower arm</td>
<td>315.7</td>
<td>.6945</td>
<td>13</td>
</tr>
<tr>
<td>Upper arm</td>
<td>530.8</td>
<td>1.167</td>
<td>12</td>
</tr>
<tr>
<td>Gripper motor</td>
<td>213</td>
<td>.4686</td>
<td>-</td>
</tr>
</tbody>
</table>
Motors

- Gripper Motor given to Asma by Dr. Fox
- Purchased High Torque motor
  - Cost $186
  - Budget remaining: $408.55
  - 6.7 RPM, 1/15 hp, 162 lbs in torque
Gripper Motor

- IRF9530 MOSFETS are used to run small motors
  - Used because reversible operation in drive stage
- FET pairs in a shape of H
- With pulse modulation different combinations of current results in flow in either direction

![Diagram of IRF9530 MOSFET dimensions and case style](Image)
Motor Circuit

- The test circuit was created in Dr. Fox’s lab
  - This was to make sure that the circuit was free of bugs and there were no problems/conflicts with the external H bridge and the pulse width modulation
  - Speed of the motor regulated by potentiometer
Testing the Gripper Motor

- Tested the small motor with the gears attached to the top
  - This will be used to open and close the hand plates on the gripper at the same speed and distance away from the origin
  - Found that a 30 mA current needed to run the motor at the desired speed
Elbow Joint

- Inserted a long screw in the elbow joint
  - This allowed for the pulleys to be put in place
  - Now the joint is held together with the screw, lock washer and nut
Future Work

- Attachment of hand plates to grippers
- Coating hand plates with plastic to provide friction
- Pulley system inside of the arm
- Circuit for base motor
- Create Keypad
- Once motors and keypad completed the microcontroller code needs to be adjusted
Hours Worked

- Asma: 13 hours
- Megan: 20 hours
- Danielle: 18 hours
33rd Annual Northeast Bioengineering Conference

- Held at Stony Brook University
- Participated in the poster presentation
Questions and Feedback?