NEUROTOUCH

Team: Mazen Aljawi, Brooke Deans, Christina Gibbs, Matt Harlow, and Brendan Souvenir

Clients: Dr. Martin, Dr. Maughan

Faculty: Dr. Shrestha, Dr. Schiele, Dr. Joyner
PROBLEM

What is currently being observed in the operating room?

1. Judgement call
2. Lack of quantifiable tool to detect mechanical properties
MECHANICAL PROPERTIES

Stress, $\sigma = \frac{\text{Force}}{\text{Cross-Sectional Area}} = \frac{F}{A_0}$

Strain = $\frac{\text{Elongation}}{\text{Original Length}} = \frac{\Delta L}{L_0}$
MODULUS OF ELASTICITY

\[ E \equiv \frac{\sigma(\varepsilon)}{\varepsilon} \]

(Tensile Test)

NeuroTouch
DESIGN HISTORY

Early Fall
Late Fall
Early Spring
Current Model

NeuroTouch
DEVICE: NeuroTouch

- T-SHAPE
- LASER SENSOR
- PCB
- LOAD CELL
- SPRING
- ROD
DEVICE: NeuroTouch 2.0

Updated Features

- More Ergonomic
- Less Material

NeuroTouch
FORCE SENSOR: Load Cell

- Operating Range: 0 – 4.5lbf
- Approximate Pressure: 2 lbs
- Accuracy:
  - Linearity: 0.5%

NeuroTouch
LASER SENSOR

- Relative Displacement: 1 mm
- Accuracy
  - Linearity: 0.15%
ELECTRICAL SYSTEM

1. SPEED:
   - Continuous analog, 80 SPS serial interface*
   - Alternating data input

2. NOISE:
   - Data forth SCM5B modules

3. COMPUTATION:
   - Arduino Uno
TESTING: Polymers

1. Texture Analyzer
2. Agarose vs. Gelatin

NeuroTouch
NEXT STEPS

1. Software
   • Finalize Arduino code

2. Hardware
   • Finish wiring and transportation casing
   • Machine NeuroTouch 2.0 for Expo

3. Testing
   • Finish polymer testing with NeuroTouch 1.0
   • Test on sheep brain
EXPO APRIL 28

Thank you
End of presentation
## Budget

Current cost to make a new device: $1500

<table>
<thead>
<tr>
<th>Item</th>
<th>Price</th>
<th>Quantity</th>
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</thead>
<tbody>
<tr>
<td><strong>STRUCTURAL</strong></td>
<td></td>
<td></td>
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<tr>
<td>PLA Filament Spool-Amazon</td>
<td>$16 (provided by NIML)</td>
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<tr>
<td>Raw Aluminum</td>
<td>$40</td>
<td>1</td>
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<tr>
<td>Rod Stainless Steel</td>
<td>Free</td>
<td>1</td>
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<tr>
<td><strong>HARDWARE</strong></td>
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<tr>
<td>Ultrasonic Sensor (Balluff Analog Output)</td>
<td>$350-(On loan)</td>
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<tr>
<td>Laser Sensor (OPT Short Range) CMOS Series</td>
<td>$629 (On loan)</td>
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<tr>
<td>Load sensor (Honeywell FSS Series)</td>
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<td>1</td>
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<tr>
<td>Voltage Regulator</td>
<td>$25</td>
<td>1</td>
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<tr>
<td>Accessory PCB</td>
<td>&lt;$50 for multiple</td>
<td>3-5</td>
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<tr>
<td>Main PCB</td>
<td>Included in above</td>
<td>3-5</td>
</tr>
<tr>
<td>Voltage Scaling Components</td>
<td>$24.49</td>
<td>3</td>
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<tr>
<td>ADC1: ADS1252</td>
<td>$29.28</td>
<td>2</td>
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<tr>
<td>ADC2: HX711</td>
<td>*Free, on loan from UI</td>
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<tr>
<td>5B modules</td>
<td>$129</td>
<td>2</td>
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<tr>
<td><strong>SOFTWARE</strong></td>
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<tr>
<td>Arduino Uno</td>
<td>24.95 + shipping and tax (On loan)</td>
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<tr>
<td>Polymer Testing Equipment</td>
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<tr>
<td><strong>Budget</strong></td>
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<tr>
<td>Cost for current System</td>
<td>$716.24</td>
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<tr>
<td>Current Remaining Balance</td>
<td>$2745</td>
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Budget = $3000
DATA

Orange: Load Cell Indenter

Blue: Laser Sensor Relative Displacement
DATA: Determining Modulus of Elasticity