All-Terrain Power Chair
Team 10

BME 4900 Final Presentation
Prince Alam
Marcus Chapman
Mathew Kozachek

Project for Nathan Lamb
Client Contact:
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Introduction

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Client Background

Nathan Lamb

- 11-year-old boy
- Lives in Stonington, CT
- Adventurous and playful
- Challenges:
  - Autistic
  - Cognitively and physically challenged
  - Spina bifida
    - Shunt in skull to drain fluid buildup
  - Paraplegic
  - Fidgeting
Purpose

Current Problem:
- Nathan can not enjoy all outdoor activities with his family and friends due to limitations of his current devices
- Most people find Nathan’s devices exhausting or hard to use

Intended Solution:
- Design Nathan an intuitive all-terrain power chair
  - Allows him to participate in more outdoor activities
  - Provides him more independence
  - Increases safety
Current Products

- Planet Mobility’s X4-Extreme 4-wheel-drive power chair
  - $16,995
- UConn’s ATPC X42 – Spring 2010
  - $4,400 (including estimated costs of donations)
- Both, as well as other similar products, utilize joystick control, oversized wheels, ergonomic seats, and suspension.
Design: Mechanical

- Frame/Chassis – lightweight and rugged
  - Aluminum 2”x2” square tube stock.
- Independent Four-Wheel Suspension
- Lever arms

Figure 1: Lower Frame + 4 lever arms
Design: Mechanical cont.

- Low center of gravity
- Wide wheel base
- Battery location
- Circuit location
- Modular seat mounting
- Joystick and controls mount

Figure 1: Lower body + seat
Design: Electrical

- Joystick – easy control
- Power supply – Three 12V Lithium ion Batteries
- Hall Effect Sensors – feedback for wheelspin
- Microcontroller – brains of the chair
- 4 Motors – 24V DC motors
- Audio Circuit
Design: Software

- Embedded C in microcontroller
- Feedback from wheels for four-wheel-drive system
Budget

- Allotted Budget: $2,000
- Total Spent: $218.50
- Projected Remaining Cost: $1399.50
- Remaining Budget: $1781.50

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<th>Total Price</th>
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Total Spent: $218.50
Completed work

- Created basic CAD design of final product
- Created Excel Spreadsheet with most parts that will be needed for the final product.
- Key electrical components ordered
Current work

- Programming microcontroller
- Assembling audio circuit
- Ordering motors
- Finalizing dimensions of overall chair to order proper amount of aluminum.
- Research suitable shock ratings for power chair

Figure 1: Audio circuit
Future work

- Order aluminum stock and other parts based on final CAD and dimensions
- Begin fabrication of complete frame and components
- Complete fabrication of all individual parts
- Implement electrical components
- Test all aspects of the power chair when completed
- Troubleshoot and solve any problems
# Division of Labor

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<thead>
<tr>
<th>Prince Alam</th>
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<th>Mathew Kozachek</th>
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</thead>
<tbody>
<tr>
<td>Frame fabrication</td>
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<tr>
<td>Mechanical fabrication</td>
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<tr>
<td>Audio circuit</td>
<td>Create CAD</td>
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<td>Joystick control</td>
<td>Program microcontroller</td>
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<td>Preliminary &amp; Final Testing</td>
<td>Preliminary &amp; Final Testing</td>
<td>Preliminary &amp; Final Testing</td>
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</table>
Conclusion

- Nathan is in need of a versatile power chair that will allow him to enjoy more outdoor activities
- CAD design is in the final stage
- Under budget
- Current tasks:
  - Programming microcontroller
  - Building audio circuit
  - Ordering additional parts
Acknowledgements

- Dr. J. D. Enderle – Guidance and funding
- Marek W. – Guidance and assistance
- Joe LaRosa – Power electronics
- N.E.A.T. Marketplace – Provided chair
- Machine shop – Tips for fabrication
- Nathan Lamb and family
Any Questions?