The Joe-Kart

Team 5

Morgan Templeton
Marek Wartenberg
Michael Fitzpatrick
The Client

Joey Toce

- 6 years old
- 42 inches tall
- 35 lbs
- Suffers from Mixed-Type Quadriplegic Cerebral Palsy with a second diagnosis of Global Apraxia
- Lives in Southington, CT
Disability Limitations

- Severe motor planning issues
  - Requires more repetitions to learn simple patterned movements
- Difficulties with balance and proprioception
- Cannot sit, stand or walk without assistance
- Poor trunk strength
- Kicks legs when excited
Purpose of Project

- Provide client with alternate source of recreational mobility
- Increase time outdoors and out of wheelchair
- Paternal bonding
  - Father builds and races cars
- Teaching tool for motor control development
- HAVE FUN!!!
Specific Requirements

- **Battery powered**
  - Limits harmful emissions
  - Limits power
  - Governs top speed

- **Dual controls**
  - Remote
  - Dashboard buttons

- **Left hand oriented**

- **Kill switch override**

- **Custom Seat**
  - Trunk support
  - Leg Straps
  - Head restraint to prevent whiplash

- **Paint it orange**
Seat and Chassis

- Made of Steel
- Independent front suspension
- Approximately 5x3x3 ft
- Low center of gravity
- Roll cage for safety
- Seat
  - On adjustable track
  - 5 point harness
Steering and Control

- Remote controlled steering
  - Use pulse width modulation (PWM) to send signals to on board microcontroller
  - Dual single-axis thumb sticks

- Dashboard buttons
  - 3 buttons controlling forward, left and right
  - Must be continuously depressed
  - All buttons send power to motor

- Power steering using gear motor
  - allows for more responsive steering
Software

- Controls mechanical systems via electronic interface

- Primary control loop
  - Controls normal function of kart
  - Detects which control system is in use

- Emergency control loop
  - When kill switch is activated this loop shuts down the kart
Mechanical Output

- DC motor will power rear wheels through specified gear reduction
- Signals to the motor are controlled by DC speed controller
  - Takes output from microcontroller and converts signal to PWM to govern speed of motor
- Braking controlled by H-bridge
- Proposed top speed near 10 mph
Division of Labor

- Morgan
  - Electrical design
    - Interface with mechanical system
  - Software controls

- Marek
  - Mechanical design
    - Chassis and seat
  - Software controls

- Mike
  - Mechanical design
    - Drive train, steering
  - Software controls
# Budget

<table>
<thead>
<tr>
<th>Parts</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Frame</strong> (steel, suspension, axle, wheels, bearings, seat, harness)</td>
<td>$1200</td>
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<tr>
<td><strong>Control systems</strong> (gear motors, device controllers)</td>
<td>$650</td>
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<td><strong>Drive train</strong> (motor, sprockets, chain)</td>
<td>$300</td>
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<tr>
<td><strong>Electrical Components</strong> (remote control, receiver, battery/charger, wiring)</td>
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<td><strong>Miscellaneous</strong></td>
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<td><strong>Shipping</strong></td>
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Conclusion

- Safety is number one priority
- Provide client with a fun means of mobility that will last for a long time
- Dual methods of control allow for immediate use along with novel way to practice motor control skills
- Design to meet the special needs of the client due to his disability
Questions???