Lawn Mower for Shane and Bed Rail Device for Sean

BME 4910 Final Presentation
Team 4
Randy Corriveau, Eric Nastuk, Ian Wallis
Shane Davis

- 20 years old from Columbia, CT
- Shane has cerebral palsy, and he uses a power wheelchair

Shane’s Needs

- Safe transfer from wheelchair to mower
- Comfortable operation of mower
Shane’s Lawnmower

- 42 inch mowing deck
- Hydrostatic transmission
- Step through
- Accessible hand controls

The Unmodified Mower
Modifications to Mower

- **Seat**
  - Transferring assistance
  - Armrests on either side

- **Drive**
  - Actuated
  - Allows for forward, reverse, and neutral to be joystick accessible

- **Steering**
  - Joystick operated
Transferring

- Customized platform
  - Made out of steel plate
  - Brackets for support
  - Plastic covering to encase mower deck height lever
Throttle/Break and Armrests

- Left: Image of brake actuator
- Right: Image of armrest hinge mechanism
Steering

- Steering motor
  - Mounted between the operator’s legs
  - 1:1 gear ratio from motor spindle to steering column
  - Experimentally determined force needed for steering operation
Programming and Control

- Arduino board receives joystick input and transmits to the actuator and steering motor components.

- Joystick
  - 8 bit analog joystick
  - Modified for our uses from old power chair.
Motor Controls

- **Linear Actuator Controller (LAC)**
  - Used as interface board between Arduino and actuators
  - Firgelli Automation
  - Calibrated for speed and extension

- **Steering motor**
  - Sparkfun H-bridge to control direction
Position Feedback

- Motor control – Feedback
  - Actuators have 10kΩ potentiometers to feed position to control boards
  - Turning motor has a 12-step rotary encoder to show position

Linear actuator potentiometer:

Rotary encoder:
Sean Stenglein

- 13 years old from Ashford, CT
- Sean has severe athetoid cerebral palsy, giving him limited control of his limbs, and spastic movements

Sean’s Needs

- Sean needs a bed rail and help from an assistant to safely get in and out of bed
- Current bed rail system is inadequate and he is in need of a new system
Bed Rail Device (BRD) for Sean

- Consists of 3 main parts:
  - Frame
  - Support section
  - Motor mount

- Purpose
  - To prevent Sean from falling out of bed
  - Simplifies bed transfer process
BRD Frame

- Made of aluminum from 80/20 Inc.
  - Joined together by corresponding corner brackets and joining plates
  - Five hinges
  - Will be covered in a medium cell foam and have a vinyl coating
BRD Motor Mount

- Motor Mount
- Inside view of motor mount
BRD Motor Control

- Multiple switches
  - User flips two toggle switches to control the railing’s movement
  - Motor’s direction controlled by an H-bridge
  - Push buttons to detect upward or downward position in order to cut power to the system
Allotted Budget for both projects: $1,750.00

Amount Spent on Lawn Mower: $650

Amount Spent on BRD: $712

Amount Spent: $1,362
Acknowledgements

- Dr. John Enderle
- Marek Wartenberg
- The Davis family
- The Stenglein family
- Matthew Person of Ellington Agway
- Serge Doyon, Peter Glaude, John Fikiet of the UConn machine shop
- Fred Wright: Team 6
- Brahmatej Meka: Team 3
- Stephen Elovetsky: Team 1
- Owen Search: Team 25
Questions?