JOSHUA’S JUMPER

- Final, completed device

Figure 1: Front View of Device
Figure 2: Side View
OVERVIEW

- Introduction
  - Client Background
  - Purpose of Project
  - Previous Work
- Project Overview
- Product Development
- Device Components
- Budget
- Acknowledgements
- Questions
THE CLIENT

• Joshua Bouchard
  • 10 years old
  • 32 lbs.
  • 48 inches tall
  • Has Cerebral Palsy
    • Minimal comprehension
    • Good lower body strength
    • Limited upper body strength and fine motor skills

Figures 3&4: Photos of Josh courtesy of Sue Bouchard
PROJECT PURPOSE

- Design a device that allows Joshua to jump and stand independently
- Make the jumper motorized so Josh can practice using controls in a fun manner for future wheelchair use
- Increase the amount of time Josh can be around his family without them having to support his body
PREVIOUS WORK

• Several “Baby Bouncer” products
  • Amby Baby Bed Accessory with Metal Cross Strut Frame\(^1\) (Figure 5)
    • Stationary structure
    • Not stable enough for Josh
  • Evenflo Johnny Jump Up\(^2\) (Figure 6)
    • Suspend from doorway
    • Would not have adequate upper body support
PREVIOUS WORK

• Walkers, such as the Rifton Large Dynamic Stander\textsuperscript{3} pictured in Figure 7, have too much structure
  • Josh requires less leg support and more upper body reinforcement
• The Universal Exercise Unit\textsuperscript{4} (Figure 8)
  • Utilizes bungee cords like this project
  • Ample leg freedom, but not enough upper body support
  • Immobile
PREVIOUS WORK

- NSF Project Jumping Apparatus\(^5\) (Figure 9)
  - Not motorized
  - Limited to one area (suspended from the ceiling)
- Exercise Device\(^6\) (Figure 10)
  - Patent 725876
  - Large and immobile
  - Utilizes similar suspension concept with harness
PROJECT OVERVIEW

- Specifications
  - Battery Operated
    - Two Motors and Speed Controllers
  - Dual Remote Control Operation
    - Parental Override for Supervision
  - Suspension System
    - Custom-fitted Harness
      - Supports upper body in proper position
  - Right Hand Oriented
  - Emergency Shut-Off
PRODUCT DEVELOPMENT

- Use of SolidWorks to create a visual representation of the device

Figure 11: Original design

Figure 12: Final design
• 80/20 Inc. Aluminum T-Slotted frame
  • Vibration proof
  • Strong, yet lightweight
• Dual platform
  • Upper jumping platform
  • Lower component housing
• Dimensions
  • 31 x 34 x 72 in
• Slotted bars for easy attachments
  • Wheels
  • Control Mount
  • Eye Hooks

Figure 13: 80/20 Inc. 1515 LS T-Slotted Profile
STEERING SYSTEM

- Donated by Miratron Inc.
- Dual transmitter system
  - Joshua’s control (Figure 14)
    - On/Off Switch
    - Joystick
  - Parental control (Figure 15)
    - Emergency stop
    - Joystick
- Receiver
  - R-4P Field Programmable Receiver
  - Sends PWM Signal to Speed Controllers

Figure 14

Figure 15
ELECTRONICS

- Two IFI Victor Speed Controllers (Figure 16)
  - Gradual Ramping
  - Max Speed
- Relay (Figure 17)
  - Safety Mechanism
- Centennial BCI Group 26 Sealed 12V Automotive Battery 550CCA (Figure 18)
  - Long-lasting
MOTOR SYSTEM

- Two 12V DC Motors (Figure 19)
  - NPC-41250
  - 34:1 gear ratio
  - 1/2" shaft diameter
  - 93 RPM
- Connected to 12 inch wheels via manufactured couplers

Figures 20 & 21: Coupler attached to wheel and motor
MOTOR ATTACHMENT

- ¼ inch thick Aluminum plates
  - Holes drilled to mount motor
  - Welded to the lower horizontal bars and back vertical bars
  - Attached to prevent torque on and movement of motor
  - Provides clearance underneath the device for wheels

Figure 22: Motor plate after welding

Figure 23: Outside view of plate with motor inside
CONTROL MOUNT

• VideoSecu Articulating LCD TV Wall Mount
  • Altered to fit control
  • Attached to frame via 80/20 bolts
  • Adjustable reach
  • Allows for the tilt of the control to adjust to Josh’s positioning
  • Pushes out of the way when not in use

Figure 24: Back of control attached to mount
Figure 25: Front View
SUSPENSION SYSTEM

- Custom-fitted SafetyWaze Harness
  - Waist and back D-Rings
  - Padded shoulders
  - Added waist and leg belt hooks
- Keeper and Knotbone Bungee Cords attached to frame via eye hooks and bolts

Figure 26: Harness suspended with bungees
Figure 27: Eye hook in 80/20 nut
SAFETY FEATURES

• Safety Strap (Figure 28)
  • Strap running from bottom platform and clipped to Josh’s harness to prevent jumping when moving the device

• Emergency Shut Off
  • Guardian’s control contains emergency stop to cut power

• Parental Override
  • Guardian control must be connected to use device

• Extra Brake System on 4 Small Wheels (Figure 29)
BUDGET

• Allotted: $2000
• Spent: $1716
• Donated Parts: $500
• Under Budget: $283
• Total Value: $2216
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QUESTIONS?

THANK YOU!