Overview

• Introduction
  - Client Background
  - Project Objective
  - Previous Work

• Optimal Design / Prototype

• Logistics
  - Budget
  - Conclusion

• References/ Acknowledgements

• Questions
Introduction

Client Background.
Previous Work.
Objective.
Client Background

- Passion Works Art Studio in Athens, Ohio
  - Program that assists artists with cognitive and physical disabilities
- Stacey, main client, has both cerebral palsy and hydrocephaly
  - Cerebral palsy - condition that results from brain damage
  - Hydrocephaly - buildup of cerebrospinal fluid in the ventricles of the brain
- Weight of Stacey’s head and restricted range of motor functions
  - Prevents her from drawing in the way that she desires
Previous Work Done by Others

- Past National Science Foundation sponsored similar projects
  - Adjustable pencil gripper - Binghamton U, SUNY, 1998
  - “Painter’s Aid” - Mississippi State University
  - Adjustable Easels
  - Previously used paintbrush attached to goggles
Project Objective

• The primary function is to aid Stacey in making artistic designs

• Specific objectives
  - Low-cost, versatile, and easy-to-store
  - Comfortable Weight
  - Promote client independence
  - SAFE device

• This project will significantly improve art capabilities of the client

• Separate devices for head and arm
Optimal Design/Prototype

Component Breakdown.
Head Mounted Art System

- Headpiece
- Gooseneck & Speedometer Cable
- Adjustable compass
- Motor
- Infrared Eyeblink Sensor
Arm Mounted Art System

- Wrist Element
- Gooseneck & Speedometer Cable
- Adjustable Compass
- Motor
Infrared Eye-Blink Switch

- An IR beam of 850nm hits the lens
- Refracted to the detector
- Artist makes purposeful blink for 1 second
- Detector senses specific case and processes in microcontroller
- System turns on or off
• Headpiece:
  - Adjustable circumference
  - Sturdy & strong
  - Chinstrap added for safety
Rotating Compass

- Reversible soft switch turns motor forwards and backwards
- Create Squiggle designs
  - Various diameters
Gooseneck & Speedometer Cable

- Rotating speedometer cable
  - Covered by gooseneck hose
  - Lined with mild lubricant to decrease friction
Adjustable Compass

- Lightweight Aluminum and Plastic
- Rotates about hose insert
- Reversible motor allows for various trajectories
Soft Switch

- Foam
- PVC Plates
- DPDT Switches
- Reverses the motor
  - Able to withstand forces applied from person with limited motor skills
Video
Electrical Components

- 2 Motors
  - Slow speed and high torque
  - DC reversible gear trains
  - Motor housing 1-13/16" L x 1-13/16" O.D.
  - Steel shaft
  - Diameter x 11/16" L
  - Weighs approx. 2 3/4 oz.
  - No-load drain Approximately 8mA at 12V
  - Continuous run, low temp

- Rechargeable AA NiMh batteries
  - 2500 mA hours
Circuit & Testing
Logistics

Budget.

Conclusion.
**Budget**

- **Total project budget:**
  - $1500 USD with the aid of the National Science Foundation

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<th>Items</th>
<th>Quantity</th>
<th>Total (w/ Shipping)</th>
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<td>Flexible Gooseneck Arm by Dyna Tran</td>
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<td>Tash Soft Switch  red</td>
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# Budget

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<td>High Torque Mini 12V DC Motor, 200RPM</td>
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<td><strong>TOTAL</strong></td>
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Conclusion

- The Head & Arm Mounted Art Design Systems:
  - Specially customized for Stacey yet adaptable to multiple users
  - User friendly
  - Resilient, Durable
  - Spent $1000 total
  - Learning experience for the whole team

- Utilizes biomedical engineering principles to help better the lives of individuals with limited motor skills and bring them to a whole new level of expressing themselves
The design process could not have been possible without the help of the following individuals and groups. We greatly appreciate your patience, time and kindness.

- National Science Foundation, for the funding and for the project
- Dr. Brooke Hallowell, for her representation of our client
- Dr. John Enderle
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- Dr. Martin Fox
- Dr. Northrop
- Dr. John Ayers
- James Macione
- Serge and Rich, Machine Shop
- Dr. Mei Wei
- Dr. Robert Magnusson
- David Kaputa
Thank You!

Any Questions?