Head-Mounted & Arm-Mounted Art Design System

Team 1:
Nemi Kotadiya
Becky Lussier
Sirisha Muppidi
Client Contact:

Brooke Hallowell, Ph.D., CCC-SLP, F-ASHA
College of Health and Human Services
Grover Center
Ohio University
Athens, OH 45701

(740) 593-1356

hallowel@ohio.edu
Introduction

Summary.
Background.
Project Goals.
Summary

- Purpose
- Unique device
- System Components
- Existing products
- Budget analysis
- Goal
The Passion Works® Studio
- Located in Athens, Ohio

Mission:

“Passion Works will be a premier art studio that supports collaborations between artists with and without developmental disabilities”

Requesting more available resources to help individuals with limited motor abilities

The proposed art design system will help its respective user to depict various squiggle designs.
Stacey

- **Stacey has both cerebral palsy and hydrocephaly**
  - Cerebral palsy:
    - Is a condition that results from brain damage
  - Hydrocephaly:
    - Is a buildup of cerebrospinal fluid in the ventricles of the brain, which can compress and damage the brain

- **Physical constraints:**
  - Head weight
  - Limited motor functions & range of motion

- **New design will be:**
  - Comfortable
  - Functional
  - Durable
  - User friendly
Goals

- Low-cost
- Versatile
- Adjustable & comfortable headpiece component to cater to head sizes of all circumferences
- Lightweight hand or wrist component
- Compatible art utensil holder for numerous supply girths:
  - Markers, paint brushes, colored pencils
- Aesthetically pleasing
- Simple maintenance
- Easy storage
- Create fun, artistic patterns with simple brush to canvas contact
Inspiration

Current Market

- > 500,000 people in the US have some form of cerebral palsy
- > 1 in 1000 births are affected by hydrocephalus.
  - As many as 75% of children with hydrocephalus will have some form of motor disability.
- No products are available in the current market
  - Parts available, not whole product
- Prior devices created to aid artist were awkward and ineffective
Technical Considerations

- Electrical
- Environmental
- Mechanical
  - Center of mass
  - Range of motion
  - Spring kinetics
  - Corrosion resistance
  - High strength to weight ratio
  - Easy storage
  - Adjustability
  - Durability
  - Lightweight
  - Good weatherability
Components

- **Head mounted system:**
  - Adjustable headpiece
  - Extension arms

- **Arm mounted system:**
  - Comfortable wrist element
  - Extending antenna port

- **Interchangeable components:**
  - Motor
  - Rechargeable battery
  - Adaptable utensil holder
Preliminary Design

Component Breakdown.
Head Mounted Art System

- **Crane:**
  - Very light, durable, strong mechanical properties
  - Corrosive resistant material
  - Large freedom of range (springs)
  - Harbor for the adaptable utensil holder

- **Head Piece:**
  - Varying head circumferences
  - Sturdy
  - Flexible material

- **The adjustable crane docked in strain minimizing location on helmet**

- **Potential Hazards:**
  - No sharp corners
  - No exposed wires
Head Mounted Art System

- Adaptable Utensil Holder Port
- Extension Arm
- Adjustable Head Piece
- Chin Strap
- Adjustable Head Piece
- Chin Strap
Arm Mounted Art System

- Wrist Element
  - Durable
  - Comfortable
  - Fastening components
  - Freedom of range
  - Ductile
  - Breathable
  - Water resistant
  - Easy maintenance

- Antenna dock
  - Secure point of attachment
Extending Antenna

- Antenna
  - Increase accessibility of artists drawing surface to the respective art utensil
  - Large range of motion
  - Electronic antenna
  - Change length depending on the users preference
Adaptable Utensil Holder

- Adaptable art utensil
- Mounted to both head and hand mounted art devices
  - For head:
    - Docked at the end of the crane
  - For hand:
    - Attached to the end of the extendable antenna
- Rotator / Fastener
Electrical Components

• 2 Motors
  – A motor that has the following specifications is ideal for this project:

  • Operating range: 6 - 15V
  • Nominal voltage: 12V
  • Speed: 100 rpm
  • No load speed: \( \leq 500 \) rpm
  • No load current: \( \leq 9.5 \)mA
  • Outer diameter: 27.7mm
  • Shaft diameter: 2.3mm
  • Body length: 32.6mm

• Rechargeable battery
Budget

- Total project budget: $750 USD with the aid of the National Science Foundation

- The target estimated cost: $400.00 cost
Forecasted Component Pricing Ranges (USD)

- Headpiece: $50 – 100
- Lamp Arms: $20 – 30
- Wrist Guard: $15 – 35
- Motor: $10 – 20
- Rechargeable Battery & Wall Mount: $40 – 60
- Antenna: $30 – 60
- Springs: $10 – 15
- Aluminum Stock: $50 – 80
- Shipping & Handling: $60 – 100

Net estimated costs: $285 – 500
Conclusion

• **The Head & Arm Mounted Art Design System**
  • Caters to unique client with cerebral palsy and hydrocephaly
  • Custom designed yet adaptable to multiple users
  • User friendly
  • Resilient
  • Durable
  • Estimated project cost ≈ $400

• **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**
Thank You!

Any Questions?