Freely Adjustable and Accessible Keyboard with Mouse Pad for Client with Cerebral Palsy

Sponsored by the National Science Foundation

Team 6:

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Outline

- Introduction
  - Background
  - Problem
  - Solution
  - Previous work done by others
- Project Description
  - Design
- Budget
- Conclusion
- Acknowledgements
Client Background

- Sam from Hampton, CT
- 10 year old 5th grade student
- Athetoid Cerebral Palsy
  - Non-verbal
  - Requires electric wheelchair
  - Typing is primary means of communication
**Athetoid Quadriplegia**

- Permanent damage of cerebellum or basal ganglia
- Affects all limbs
  - Involuntary Movements
  - Difficulty in Preciseness
  - Difficulty with speaking and other motor functions
Problem with Standard Keyboard

- Horizontal position
  - Affects positioning of client’s hands

- Proximity of the Keys
  - Multiple keys hit at a time
  - Damage to the keys (not durable)

- Not portable (PS/2 connection)

- Keyboard slides on desk
  - Low coefficient of friction

- Slows down speed and efficiency of typing
Problem with Standard Mouse

- Difficult to grab
- Requires fine movements of hands and fingers
- Highly sensitive
Solution

- **New Keyboard Design**
  - Allow Sam to type faster and with greater ease
  - Increased the accuracy of typing
  - Reduce stress on hands and fingers
  - Increased friction to prevent slipping

- **Mouse with Mouse Pad**

- **Allows client to navigate computer independently**
Patent Research

FrogPad™

- Sits horizontal to surface
- Small Keys
- Multiple characters per button - not user friendly
Project Design
Project Design cont’d.

- Cherry MX Switches
  - High Durability
  - Lifetime: $10^9$ Operations
  - PCB Mountable

- Diodes
  - Eliminates ghosting
  - Prevents unwanted key repetition
    - Iiiitttt woooouulddd lookkk lilke thhhiiss
Project Design cont’d.

- PCB
- Designed around position of hole pads for Cherry MX Switches and Diodes
Project Design cont’d.

- PCB
  - 13.5 x 5.7 inches
  - Mounting all electrical components
Project Design cont’d.

- Keyboard Control Board
  (PI Engineering)
  - 128 possible switches
  - Connects to CPU through USB
  - Connects to PCB via female header receptacle

Diagram provided by PI Engineering
Mouse Pad
- 7 Cherry MX Switches
- Allows client to navigate computer
- Highlighted by orange LEDs and 101 Ω resistors controlled by external switch
Project Design cont’d.

- External Design
  - PVC casing
  - Rubber Bottom
  - Lift Supports
Available budget is $750 provided by the National Science Foundation

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<th>Price Per Unit ($)</th>
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Conclusion

- Accessible Keyboard and Mouse Pad
  - Faster, easier means of communication
  - Less strain on clients arms
  - Portable for classroom transport
  - High wear resistance - long lasting
  - LED backlit Mouse Pad
  - Custom built within budget
Acknowledgements

- Dr. John Enderle
- Bill Preuhsner
- Serge and Rich (Machine Shop)
- Miriam Kurland and all of Sam’s Team