Team Upstart: Refreshable Braille Reader

Objective

- General Need For Product
  - Current Braille readers are computer aides, not large enough to read a book
  - Existing technology prohibitively expensive, books too cumbersome / difficult to maintain

Customer requirements

- Standard Braille format
- Multiple lines
- Fast actuation time
- Lightweight
- Audio capabilities
- Robust

CTQ Engineering characteristics

- Decibel level
- Weight
- Strength of casing material
- Actuation frequency
- Size
- Thickness

Estimation of Market Size

- Between state legislation and public libraries market estimate is 26,000 units

Concept Generation

Thermo Pneumatic

- Simple actuation
- No moving parts
- High force

Thermal Contrast

- Easily controlled
- Re-invents Braille
- Fast, cheap actuation

DEA / Actuating Plate

- Small
- Portable
- $2000
- 18 characters

Design

Operation of Product

1. Solenoids lower actuating plate
2. DEAs move into place locking pins
3. Actuating plate is raised

DEA actuation

- Small
- Portable

Dynamic Scanning

Calendar mechanisms

Prototype and Testing

Prototype Results

- Intuitive orientation, interface, controls
- Actuation of DEA

PDP Process Summary

- Surveyed customers to identify Current Refreshable Braille deficiencies
- Generated, selected concept for cheapest, largest Refreshable Braille display
- Tested intuition of interface, efficacy of 2 mechanism system
- Prototyped proof of concept

Test Results and Future Work

Future Work

- Research remaining hardware
- Develop electronics, circuitry
- Create and integrate software

Process Reflection

- Product addresses need in Braille community
- DEA technology maturing, can enhance capabilities

Weightings

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<th>Strength of Material</th>
<th>Thickness</th>
<th>Decibel Level</th>
<th>Size</th>
<th>Actuation Frequency</th>
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Strengths

- DEA
- Thermal

Weaknesses

- Small
- Portable
- $2000
- 18 characters

Key Innovation

- Actuating plate compensates for low force Dielectric Elastomer Actuators

Sacrificed Characteristics

- Sound
- Electronics
- Programming

Customer Requirements

- Low Cost: $600-$900
- Fast Actuation Speed: (1 Hz)
- 300+ Braille Cells
- Portable Size: 9.5" x 7"