A Novel Approach to Digital Media Accessibility for Visually Impaired People

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PROBLEM STATEMENT

Visually impaired individuals **lack adequate access** to digital literature (Wei-Haas, 2017).

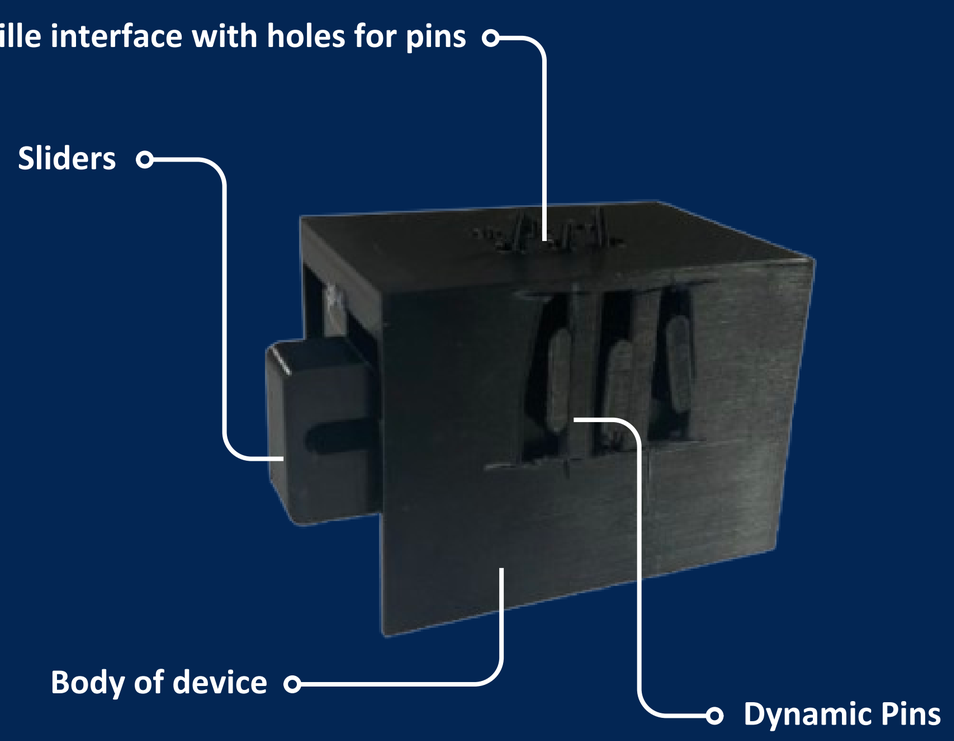
ENGINEERING GOAL

We aimed to create an **instantaneous** and **inexpensive** device that could convert online text to a ***physical Braille display***.

CURRENT DESIGN

The Braille Slider (Ver. II)

Level 1 Requirements	
1	The device produces accurate braille.
2	The device should efficiently change braille characters.
3	The device should meet the budget constraints set by the Massachusetts Academy of Math & Science.
4	The device should have an intuitive design.



METHODOLOGY

Brainstorm solutions for the problem

Seek advice from professionals in the field

CAD the device in Onshape

Test and assess the device for functionality

Build the prototype

DESIGN II

The Braille Slider (Ver. I)

Pros
- **Sliders provide stable braille configurations**

Cons
- **Lower durability**
- **Gears get stuck at edges**
- **Motor functionality low**

DESIGN III

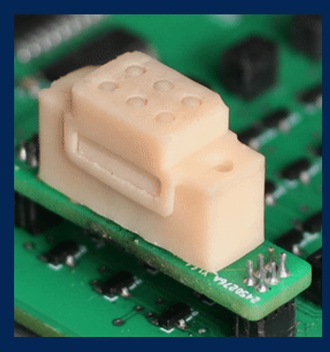
Rotational Braille Wheel

Pros
- **Compact**

Cons
- **Extra mechanisms needed**
- **Not precise**
- **Mechanism for keeping pins up needed**

DESIGN IV

Electromechanical Braille Cell



Pros
- **Extremely Compact**
- **Quick**
- **Reliable**

Cons
- **Very Costly**
- **Difficult to manufacture**

DESIGN STUDY I

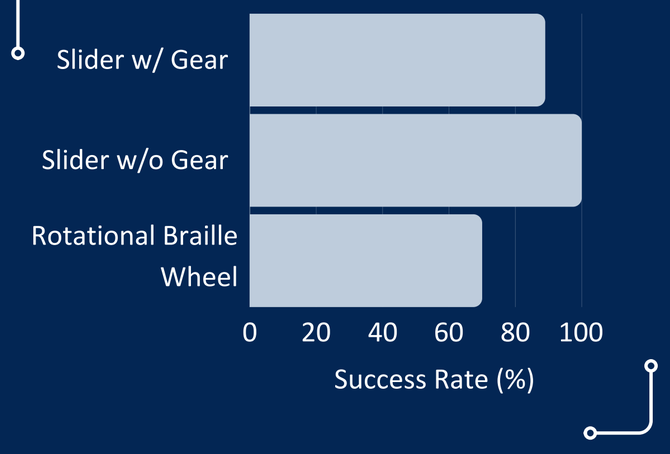
Optimal Braille Production Method

Purpose: To determine which design best displays all Braille characters

Independent Variable: Design type

Dependent Variable: Average success rate of displaying Braille characters

Conclusion: The slider without the gear produces the most accurate Braille display ($p < 0.005$)



DESIGN STUDY II

Gear Angles

Purpose: To determine at which angle the gear is needed to be held for the Braille slider to produce the most accurate display

Independent Variable: Gear angle

Dependent Variable: Ability of the Braille slider to successfully and smoothly slide within the device

Conclusion: The slider is best able to move when the gear is coordinated at a angle of 10 degrees above the horizontal

CONCLUSIONS & FUTURE WORK

- Adjusting the location of the axel and the size of the gear would significantly improve this device's accuracy, as seen in the results of the design studies.
- This device could be significantly descaled using a more fine-tuned 3D printer to create a further inexpensive and accurate mass-producible prototype.