

Bravilliant

E-Book & Learning Tool for the
Visually Impaired

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The Problem

Braille Statistics



- **Today only 10 percent of blind children are learning Braille.**
- While audio devices are useful sources of information for blind people, only Braille offers complete command of written language.
- The number of legally blind US children has increased due to several factors, including advances in medical care for premature infants.
- Most blind children (85%) attend public schools where few teachers know Braille.
- America would never accept a 10 percent literacy rate among sighted children.

Use Case

Problem:

- Paper braille text clunky and hard to find
- Electronic braille readers are extremely expensive (~\$2000+)

Both are NOT accessible for reading and learning proposes!

Solution:

- A small form factor braille e-reader made out of cheaper components
- That double duties as a learning guide with audio feedback
- Open source and DIYable in a family garage

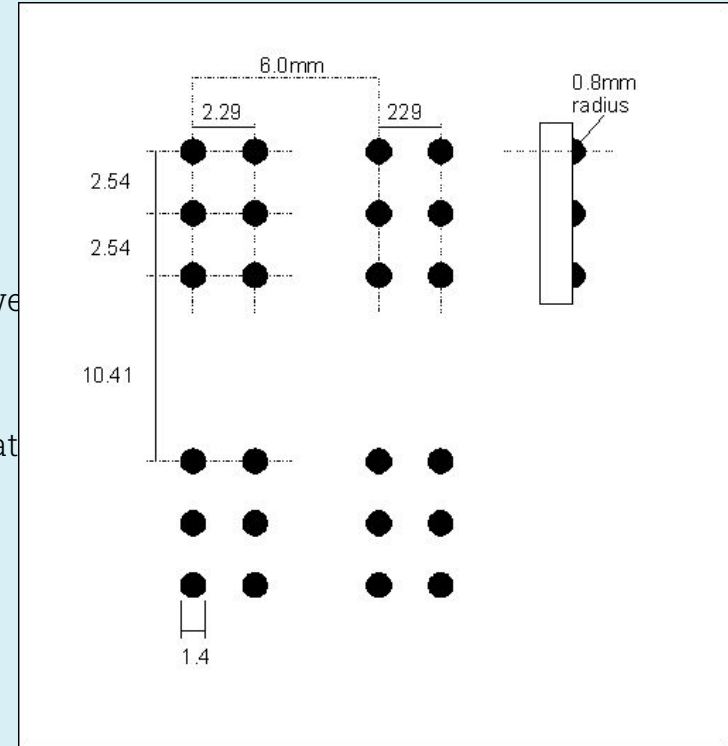
ECE Areas:

- Hardware & Software Systems

Use Case Requirements

Product:

- Portable form factor < **12" x 8"**
- Braille printed on any physical buttons to operate device (power switch, previous/next word buttons)
- Resolution to support displaying **10 braille cells** (characters) at a time; one word at a time
- Cost < **\$600**



Use Case Requirements (cont.)

Performance:

- Refresh rate < **250 ms/word** (240 wpm - average reading speed)
- Rechargeable battery > **1 hr battery life**
- **100% accuracy** of English text to braille encoding algorithm
- **>95% accuracy** of producing physical braille pin patterns

Technical challenges

The Impossible Triangle?

Response time,

Resolution,

Cost

Previous Solutions:

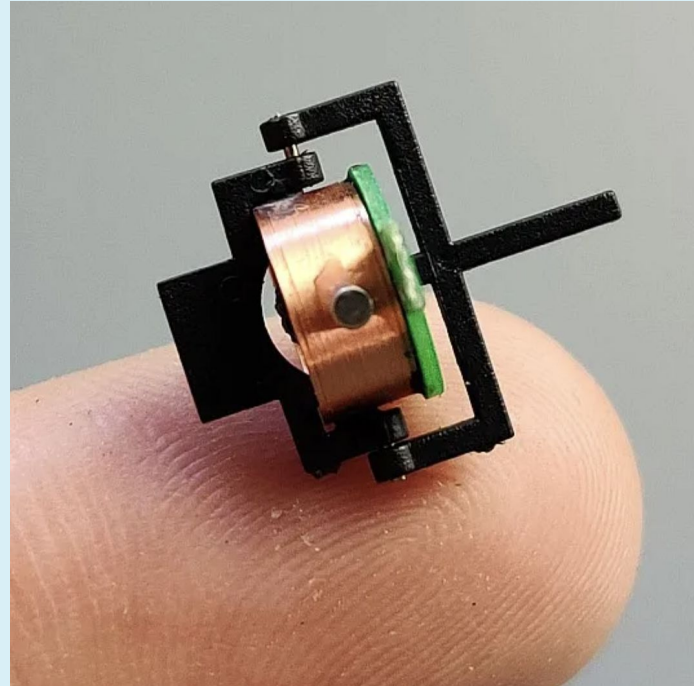
- Piezo Actuators
 - Very small and fast, extremely expensive (~\$2000 min)
- Linear / Servo Motors
 - Cheap, but slow and clunky

The Not Yet Tested Solution:

- Electromagnetic Actuators
 - Cheap, small-ish, fast-ish

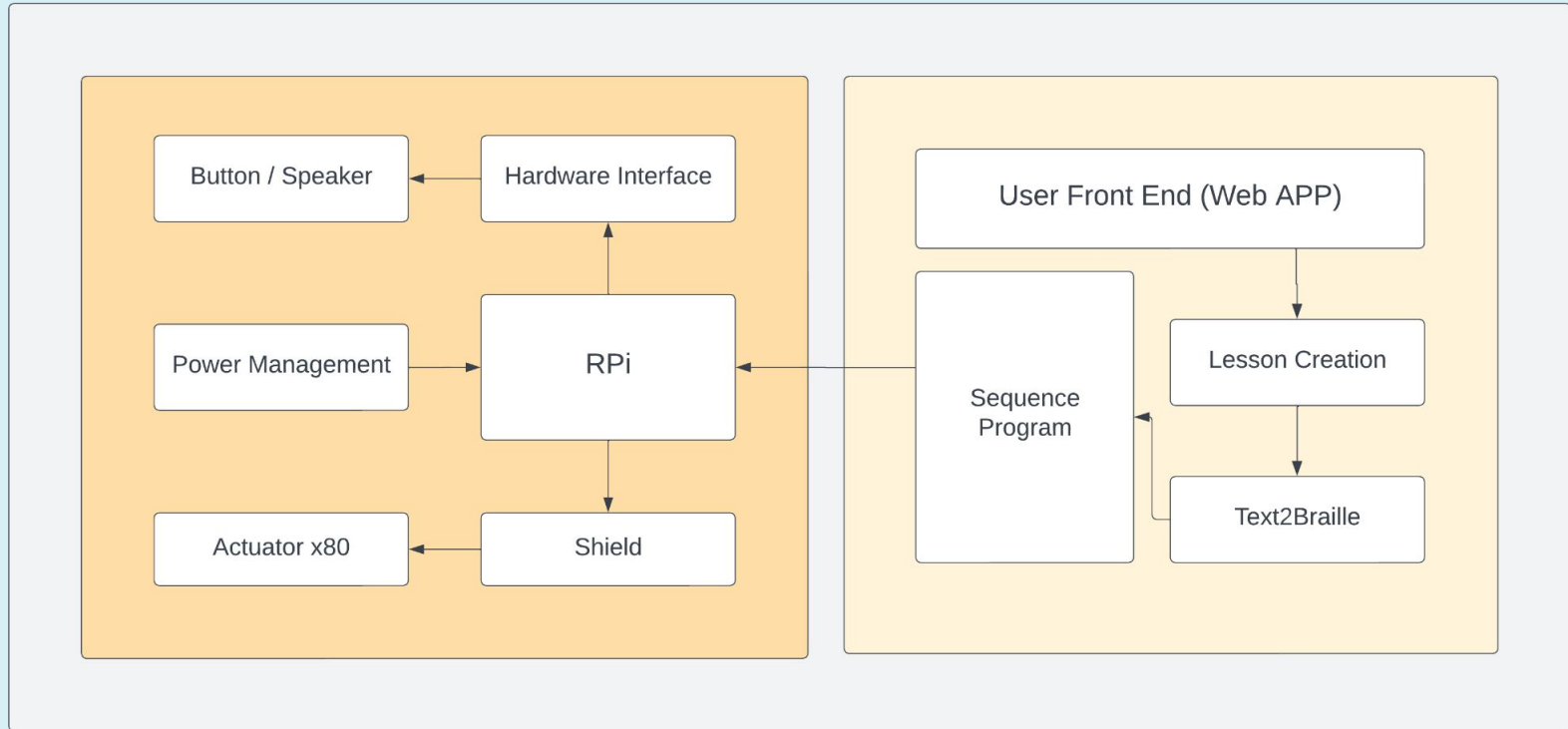
Solution Approach (Actuation)

- An array of miniature electromagnetic linear actuators...
- Off-the-shelf 6mm components readily available.
- Intended to fabricate custom versions optimized in accordance of our use case.

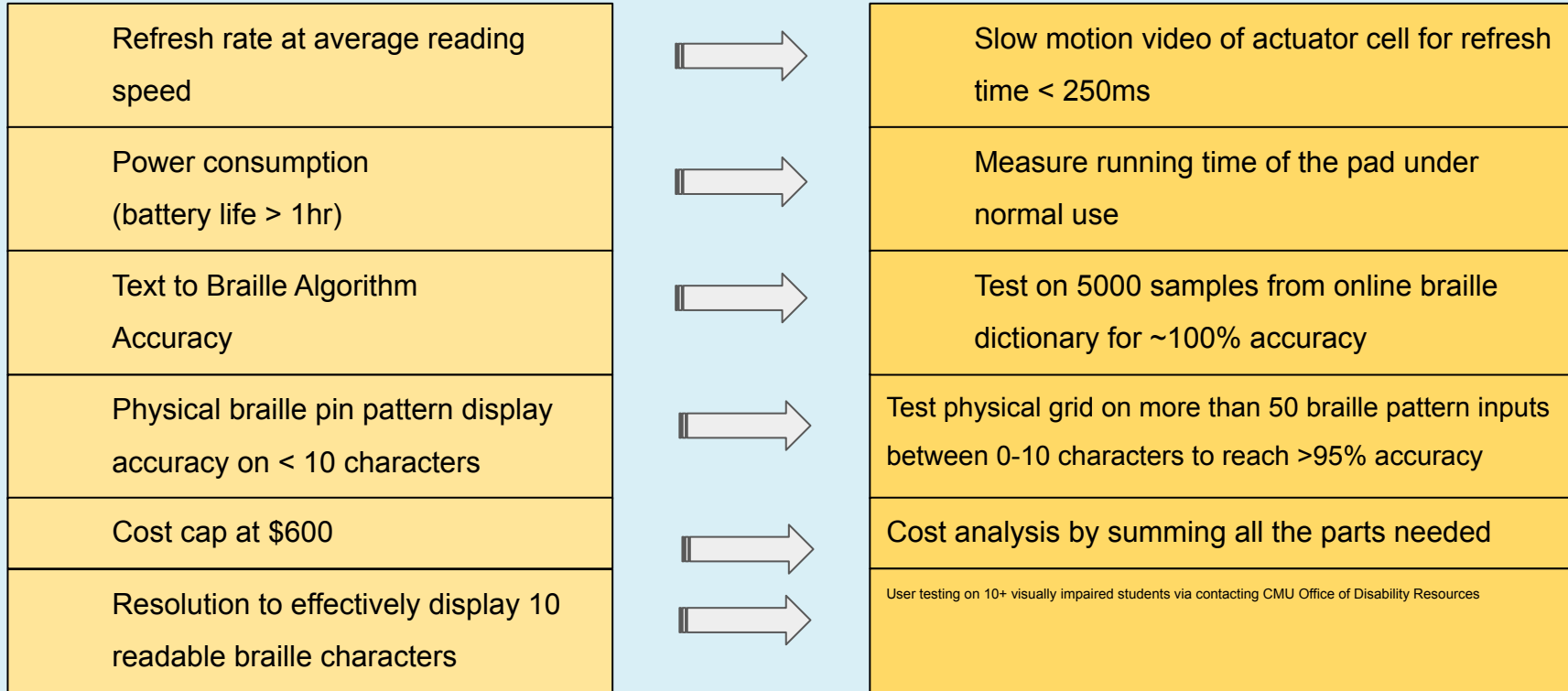


For reference only (Product on Aliexpress)

Solution Approach (System)



Testing/Verification Metrics



Division of Labour

<p>Software (Yujun Lee)</p>	<ul style="list-style-type: none">● Front-end (web app): UI for text data input from user + filtering on unidentified words● Text to grid parser for Raspberry Pi
<p>Hardware (Samay Sahoo, Ziyu Li)</p>	<ul style="list-style-type: none">● Speaker implementation - Samay● Electromagnetic Actuator grid - Ziyu● PCB design (power management, microcontroller, I/O buttons) - Ziyu● Product design - Samay
<p>Data Collection (All)</p>	<ul style="list-style-type: none">● Sequence of braille-translatable words● Braille patterns for actuator grid testing

Schedule

