

Learning Device for the Visually Impaired

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Problem and Motivation

- Braille is an essential tool for the visually impaired to learn as quickly and efficiently as possible
- Braille learning is taught in many programs and nonprofit organizations, but many times Braille practice and learning lacks in the home environment
- Customer discovery sessions at the Center for the Visually Impaired (CVI) helped reveal a lack of tools in the market that solve the problem in the home environment

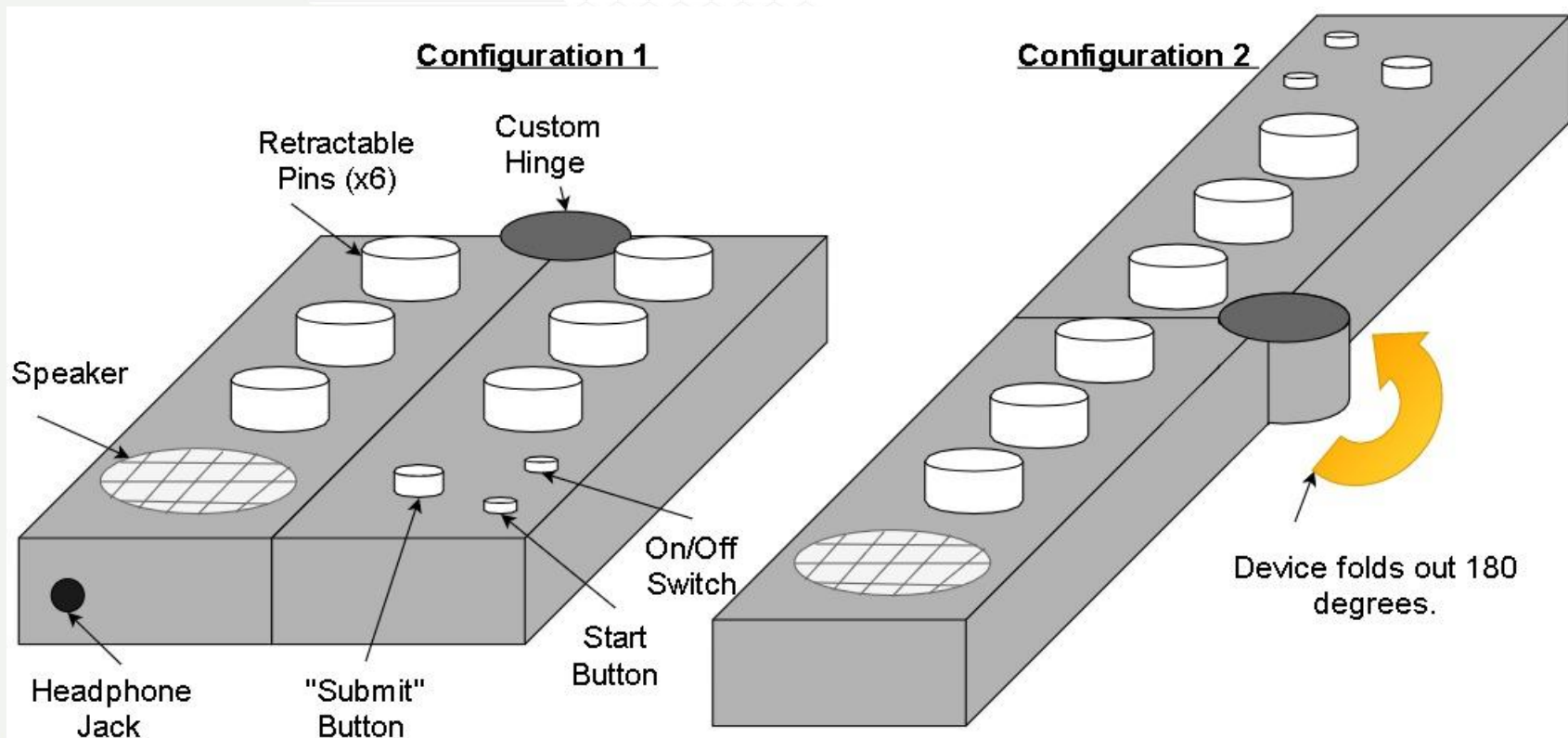
Solution

- Create a screenless device for children or newly impaired to learn how to type and read braille outside the classroom
- The device will have the capability to teach lessons using auditory cues to assist the using in reading and typing each letter
- As the user progresses, they will begin to form words, until the user is decisively fluent in recognizing and using the characters

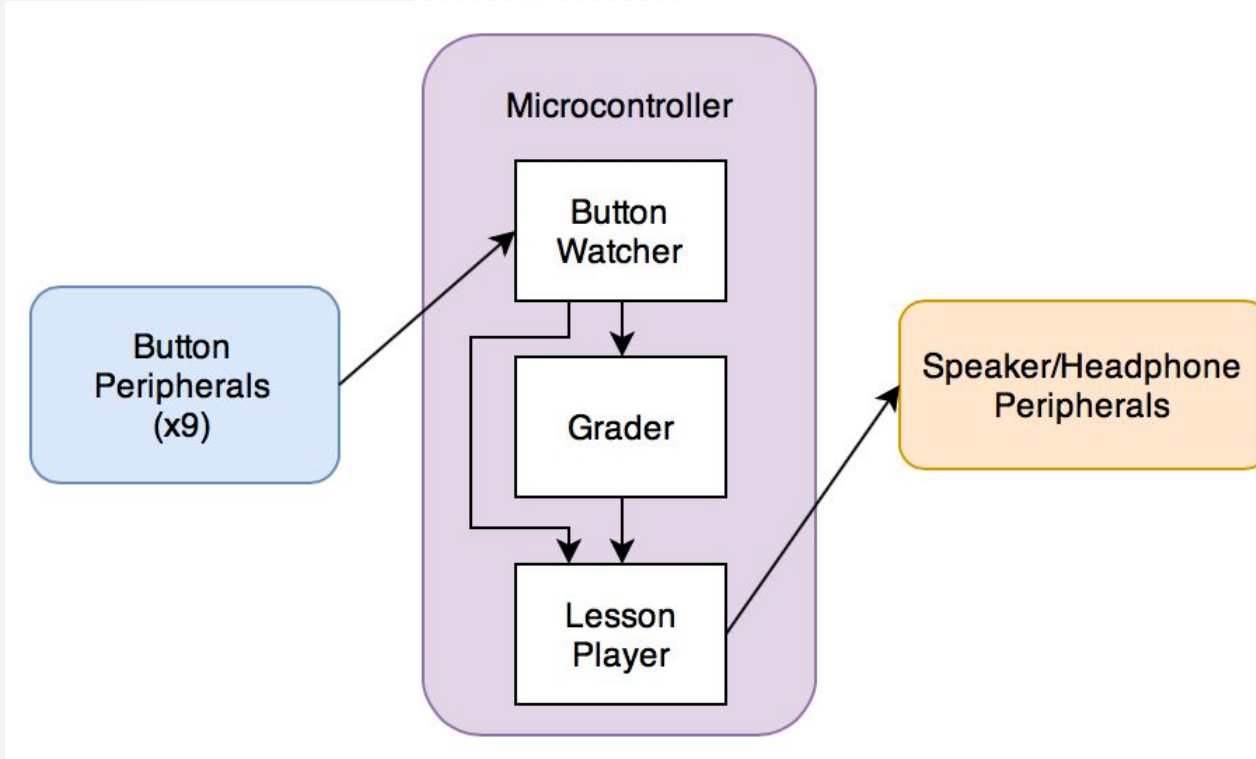
Goals for the Scope of this Project

- At minimum have the device recognize at least 2 typed letters
- Have the device communicate with the user through a speaker or a headphone jack
- Have the device's battery last long enough to survive a day's worth of classes before needing to recharge
- Have the child friendly casing for the device functional with the electronics stored within

Envisioned Design

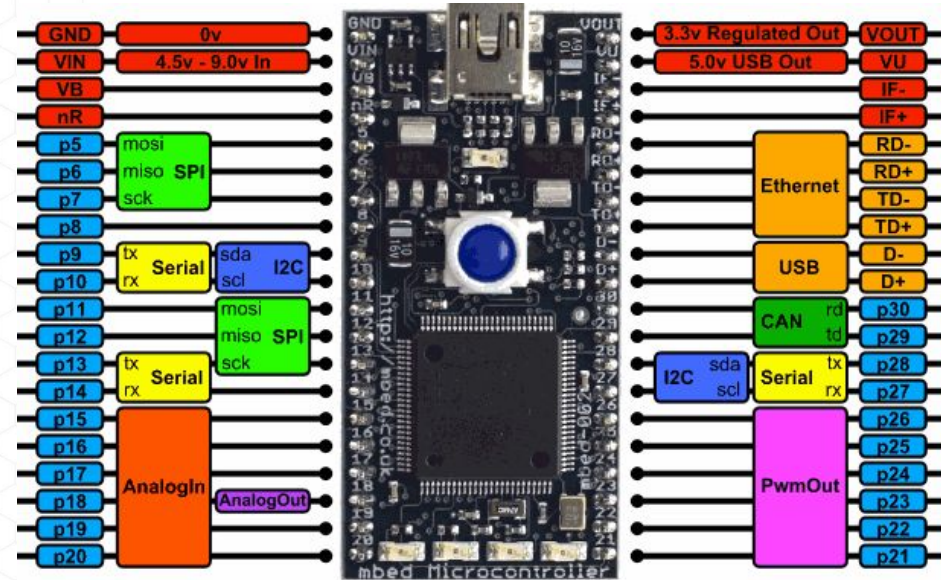


Architecture



Design Tradeoffs

- Smaller battery to allow for more compact design
 - Shorter lifespan
- Choosing Mbed over Arduino and Raspberry Pi
 - Size requirements, more compact design requires a smaller microcontroller
 - Mbed supports more software libraries



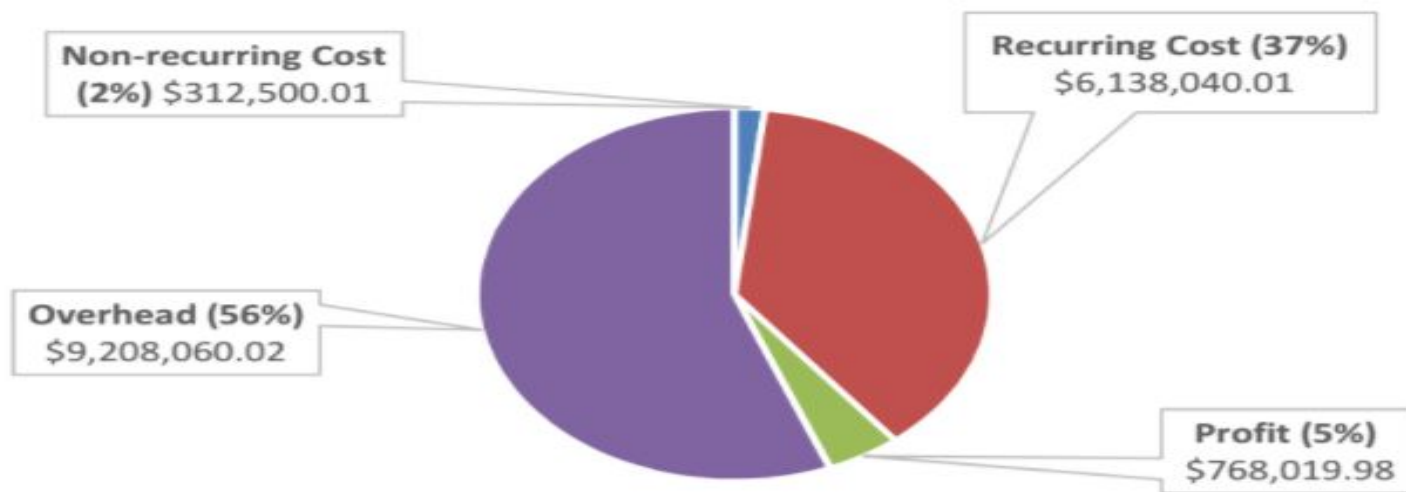
Mbed (2017). *mbed LPC1768*. [image] Available at: <https://developer.mbed.org/platforms/mbed-LPC1768/> [Accessed 28 Aug. 2017].

Cost Analysis

- Estimated cost of device
- Non-recurring cost
 - Research and development, production, packaging, marketing, sales, distribution and support
- Recurring cost
 - Redesign, engineering change order, parts, assembly, testing, packaging, etc.
 - Overhead allocation
- Profit

Cost Percentages

Four Year Period Analysis



Codes and Standards

- Unified English Braille Code, UEBC
- Standard Consumer Safety Specification for Toy Safety, ASTM F 963-11
 - Safe materials
 - No sharp edges
 - No loose parts
- Supports Expanded Core Curriculum (ECC) for schools in Georgia

Technical Specifications

Item	Specification
Size	6 in x 4.5 in x 2 in a folded position
Weight	700 grams
Supply Voltage	6V
Battery Life	4 hours of run time

Technical Specifications

- 32GB internal SD card for firmware and storage
- Stereo speakers for family interactions and 3.5 mm headphone jack for personal use
- Rechargeable batteries
- 6 large retractable buttons for user input
- 1 reset button, 1 submit button, and power switch
- Rounded edges for comfortable handling by children
- Large custom hinge designed to house all electronics internally

Testing

- Enable connection to a screen for development/debugging purposes
 - Hardware:
 - Hinge open/closes
 - Buttons are being read when depressed
 - Speakers are relaying feedback
 - Software:
 - All peripherals are cohesively working with the program
- Test the prototype device by running the program with the device out of sight

Project Demonstration

- Begin in the 3x2 format to teach the braille characters
- Then switch to 1x6 format to allow the user to input what they just learned
- A guest user will follow the instructions for a simplistic lesson without sight of the device (box or screen)
 - The lesson will teach them how to use the device as well as teach them to spell a simple word in braille such as “Mom” or “Dad”



Current Status/Issues

- Design: looking into actual parts with consideration for dimensions
 - Buttons: looking for larger latch buttons with the possibility of mechanical buttons
 - Hinge: wiring through the hinge so that the two parts are connected
- Cost: price per unit
 - Trying to reduce the cost of the unit itself
- Multidisciplinary Team
- CVI: contact with Heather re-established

Greater Vision

- Include all letters and language options other than English
- Create lessons to take the user from learning letters to typing complete sentences
- Have vocal recognition so that the user may give a vocal input for choosing a lesson
- Transmit information to and from an app via Wi-Fi so that a parent may pick lessons and view lesson reports

Questions?