

DYNABRAILLE

DYNAMIC BRAILLE DISPLAY

University of Houston
Cullen College of Engineering
Electrical and Computer Engineering
2016 – 2017 Capstone Design

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PURPOSE

Dynabraille's purpose is to provide those who are **blind or visually impaired** with an **independent** way to access information where it is unavailable in **braille**.

WORLDWIDE POPULATION

39 MILLION
legally blind
246 MILLION
visually impaired

BRAILLE LITERACY IN US

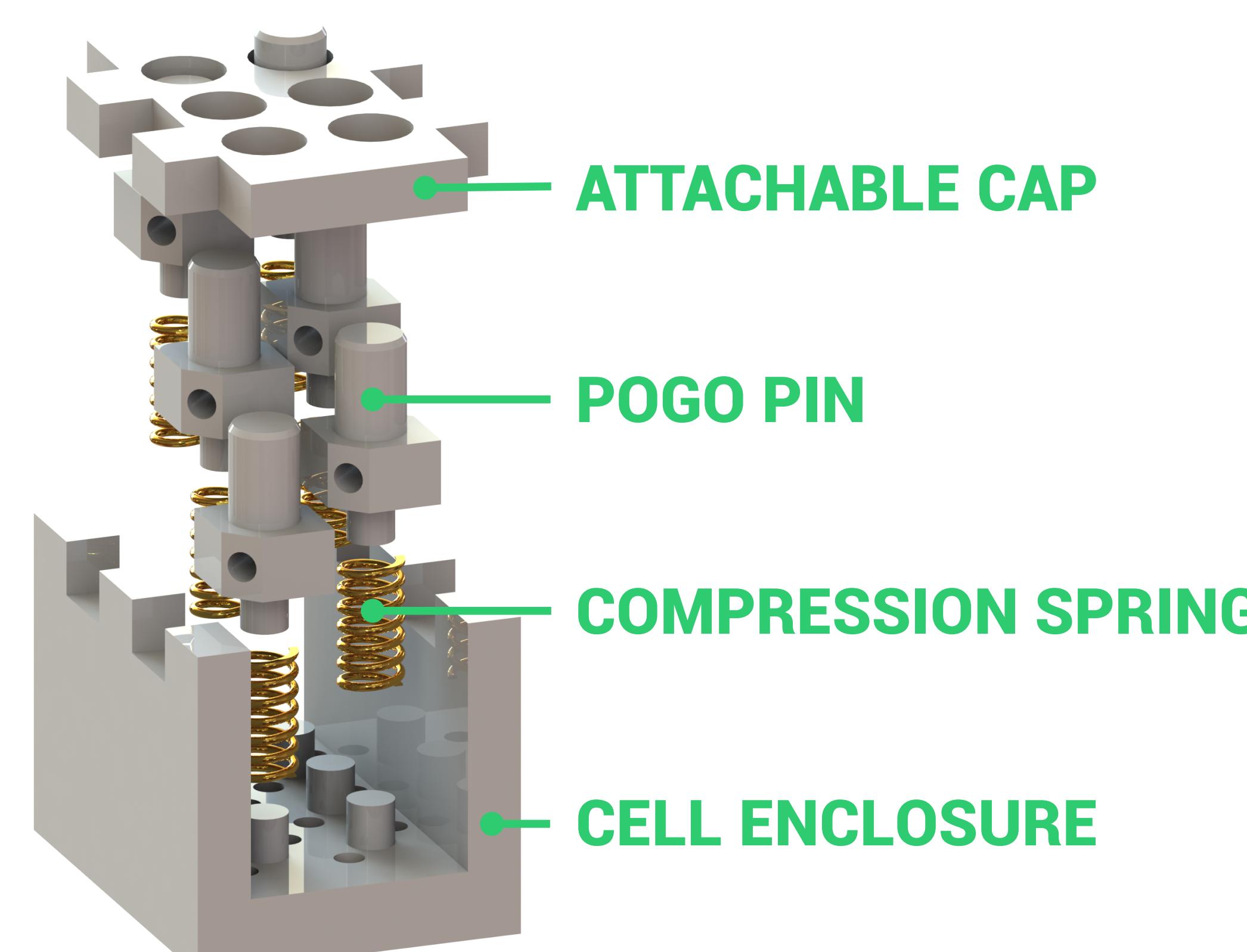
<10%
<10%
of legally blind **adults**
are braille readers
of legally blind **children**
are learning braille

ABOUT BRAILLE

Braille is a tactile language for blind and visually impaired people. Characters are represented by patterns of raised dots that are felt with the fingertips.

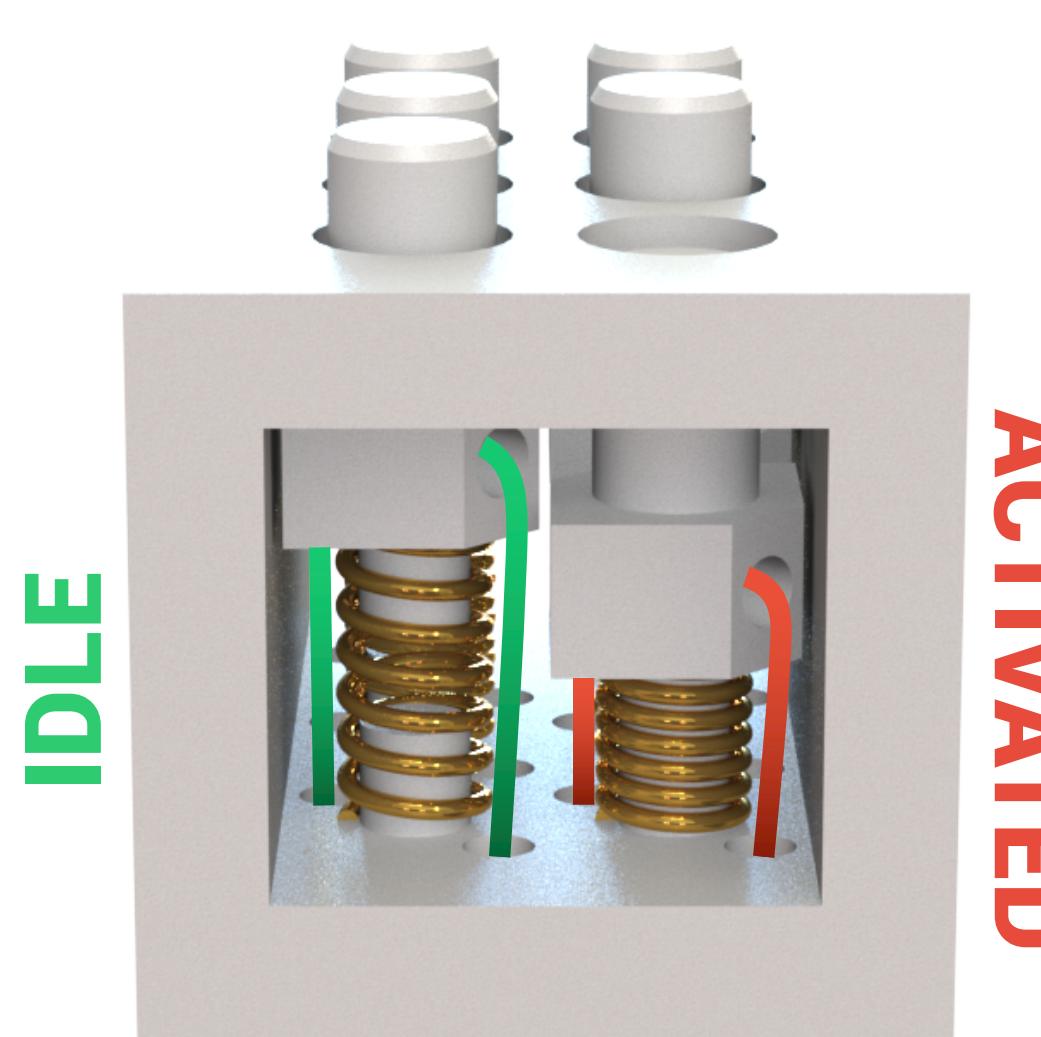
ELECTROMECHANICAL BRAILLE CHARACTERS

Electromechanical cells were engineered to produce refreshable braille. The designs comply with the standards set forth by the Americans with Disabilities Act (ADA).

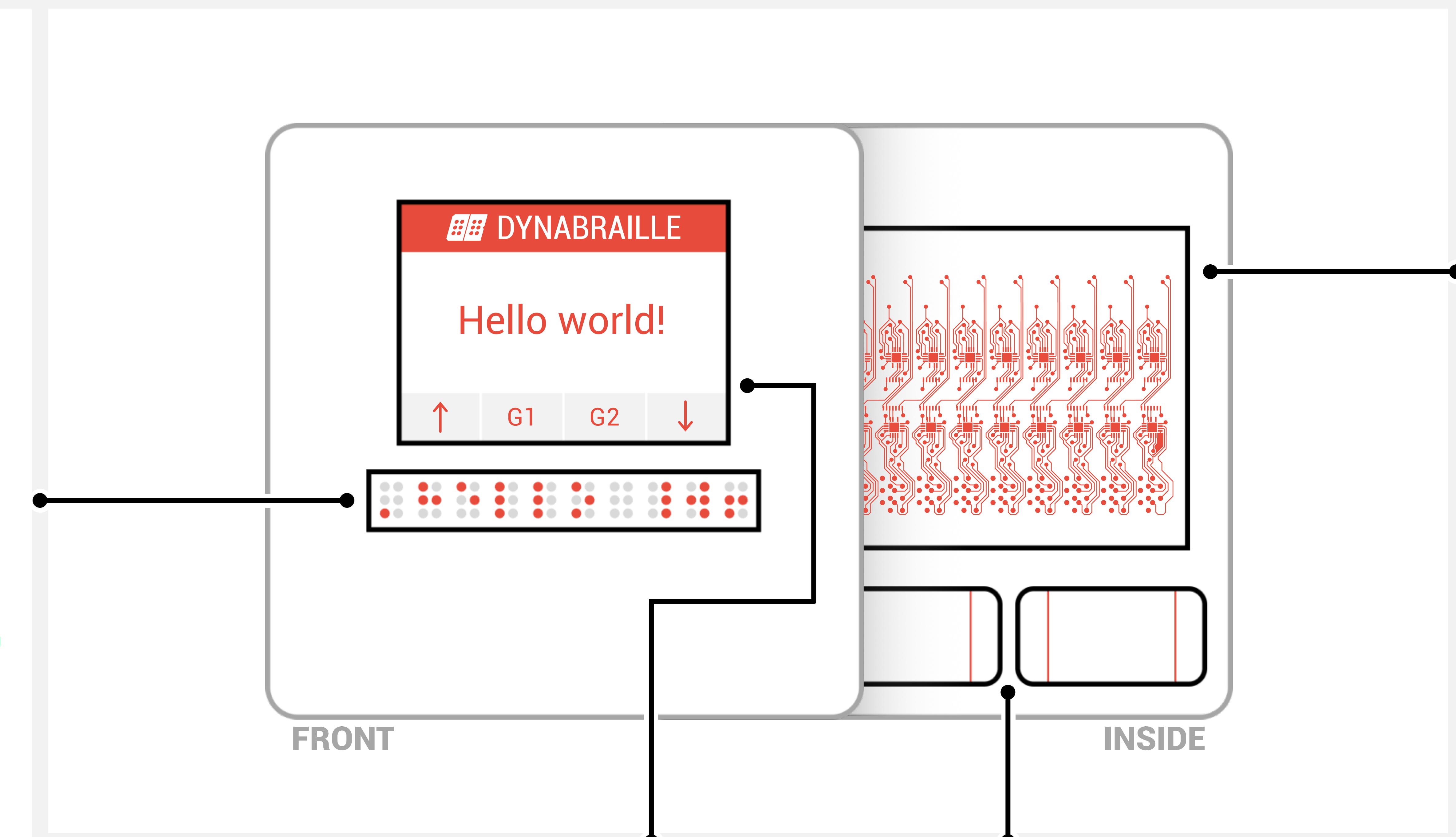


NITINOL MICROACTUATION

Nitinol's chemical composition allows it to contract when heated. Wire is threaded through the pogo pins of the braille cell to enable lowering of individual pins.



COMPOSITION $\text{Ni}^{28} + \text{Ti}^{22}$ **ACTIVATION CURRENT** 200 [mA]



EMBEDDED SYSTEM

MCU TI MSP432 LAUNCHPAD
WIFI CC3100 WIRELESS BOOSTERPACK
LCD KENTEC QVGA DISPLAY BOOSTERPACK

BATTERY POWERED

To charge without causing a chemical imbalance, batteries can be reconfigured from series to parallel via a TPDT switch.

COMPOSITION	CAPACITY
LI-ION	4400 [mAh]

RESULTS

- ✓ LINEAR ACTUATION 1[mm]
- ✓ GRADE 1&2 TRANSLATION
- ✓ WIRELESS DATA TRANSFER
- ✓ CURRENT PROPAGATION
- SIMULTANEOUS ACTUATION

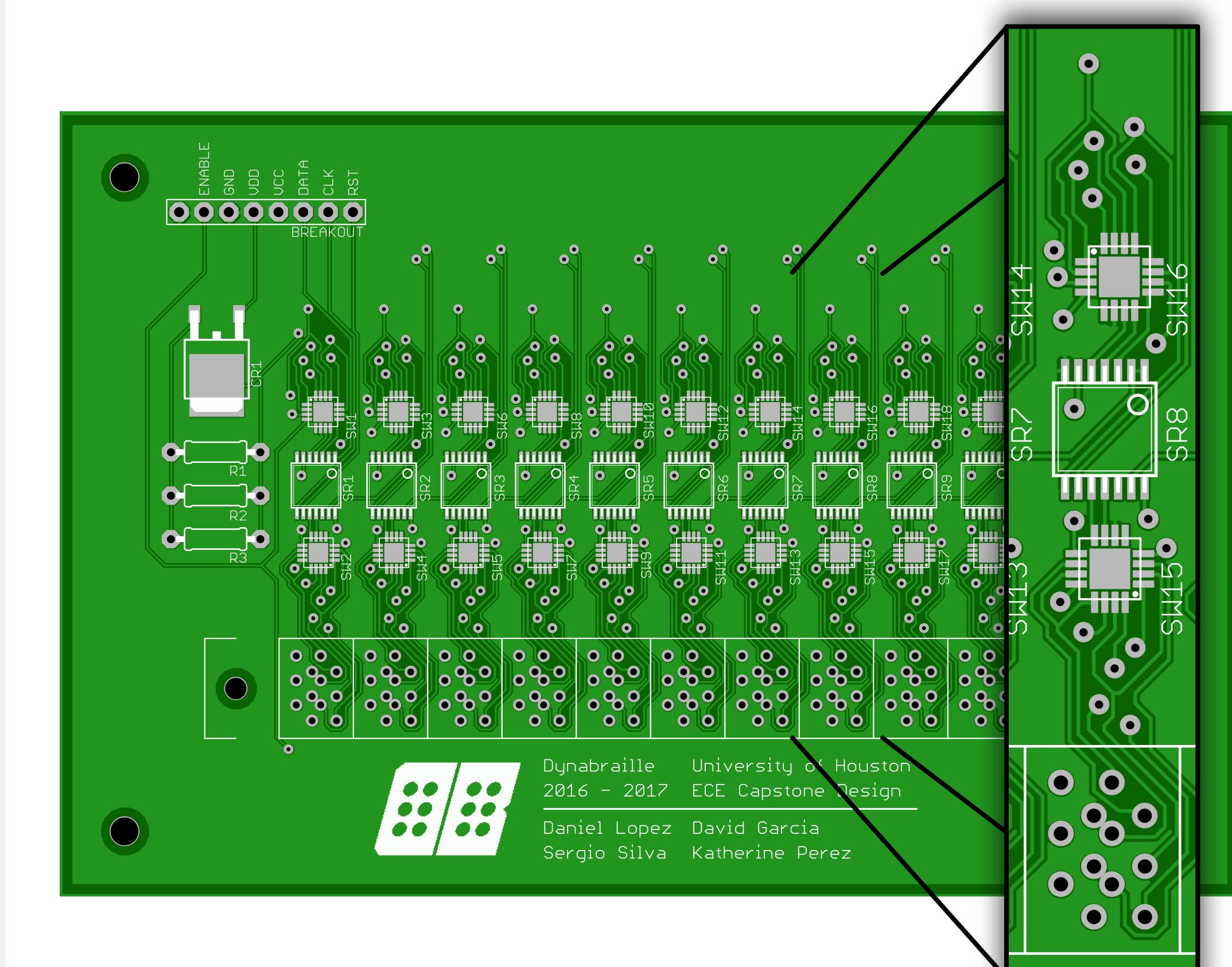
At high frequencies, the MOSFETs within the SPDT analog switches produce a current drop. Lowering the switching frequency produces proper current output, but adversely increases the time in which the braille dots are lowered. Further analysis must be performed to find ideal conditions that would produce the desired simultaneous actuation effect.

CUSTOM CIRCUIT BOARD

To enable the propagation of current, a two-layer PCB was designed and created. Because the scale had to match the dimensions of the braille characters, surface mount devices were implemented.

SMD COMPONENTS

- 3x SPDT ANALOG SWITCH**
- SIPO SHIFT REGISTER**
- CURRENT REGULATOR**



COMPANION APP

With multiple language support and an intuitive user interface, the software application allows users to configure Dynabraille with custom information.

PLATFORM	LANGUAGES SUPPORTED
macOS	G1 66 G2 13