A Refreshable and Portable E-Braille System for the Blind and Visually Impaired

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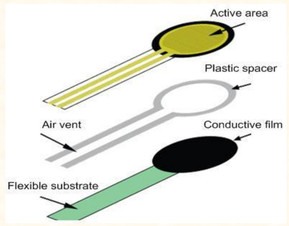
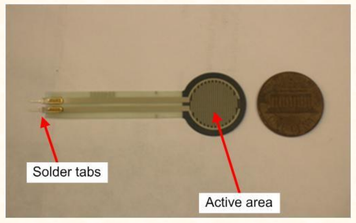
Overview

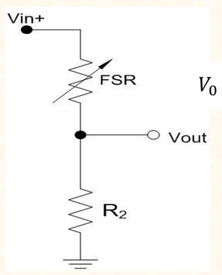
- Braille is a communication system to assist the blind and visually impaired.
- Present an approach to measure fingertip forces while identifying Braille characters.
- Implement a force sensory feedback in the device to measure the force developed on the fingertip.
- Introduce a preliminary design for the device.
- Build a prototype for the device and evaluate its functionality and integrate its components

Force Sensing Resistor

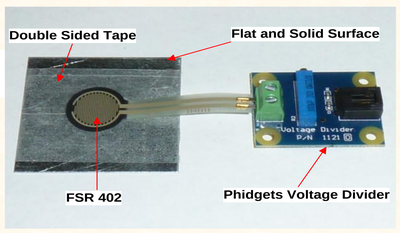




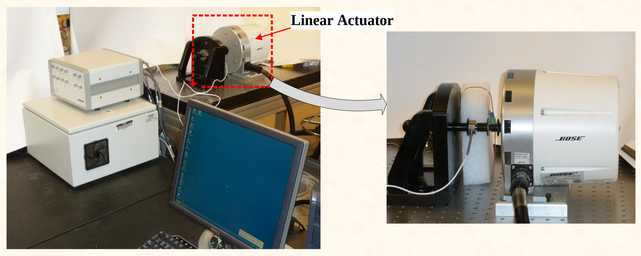
- The FSR is best used in a voltage divider circuitry.

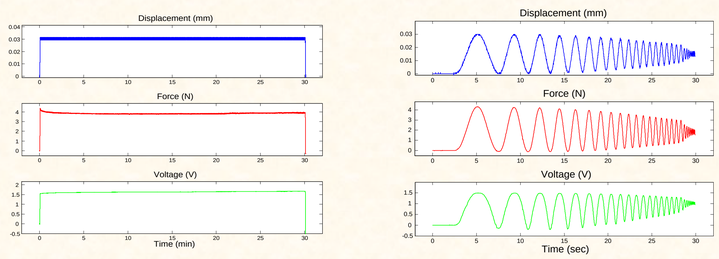


$$V_0 = \frac{R_2}{R_2 + R_{FSR}} V_{in}$$



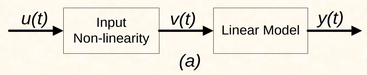
- The FSR's static and dynamic responses need to be identified.



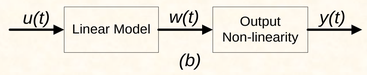


Experimental Setup

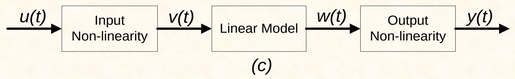
- Nonlinear systems can be modeled as cascaded blocks of a decomposed linear along with nonlinear element(s).



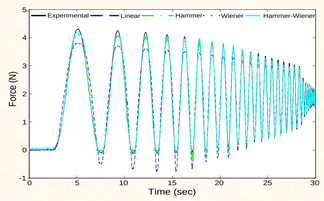
Hammerstein model

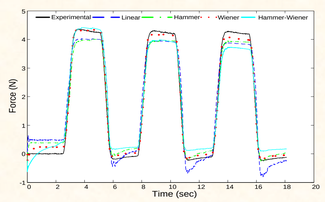


Wiener model



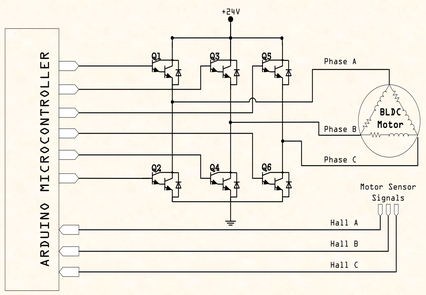
Hammerstein-Wiener model





Prototype and Circuit Design

Device Prototype

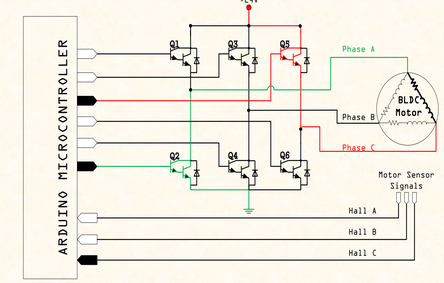


BLDC Control Circuit

BLDC Truth Table

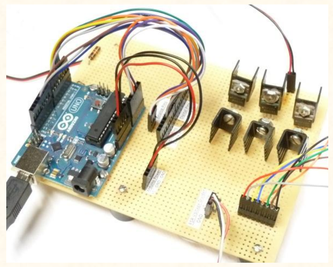
Hall A	Hall B	Hall C	Motor Rotation	High	Low
0	0	1	CW	Q_1	Q_6
0	1	0	CW	Q_5	Q_4
0	1	1	CW	Q_1	Q_4
1	0	0	CW	Q_3	Q_2
1	0	1	CW	Q_3	Q_6
1	1	0	CW	Q_5	Q_2
0	0	1	CCW	Q_5	Q_2
0	1	0	CCW	Q_3	Q_6
0	1	1	CCW	Q_3	Q_2
1	0	0	CCW	Q_1	Q_4
1	0	1	CCW	Q_5	Q_4
1	1	0	CCW	Q_1	Q_6

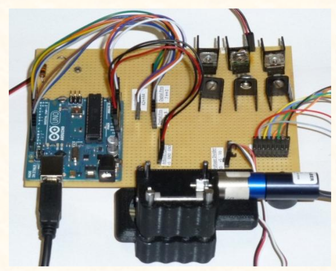
Prototype and Circuit Design



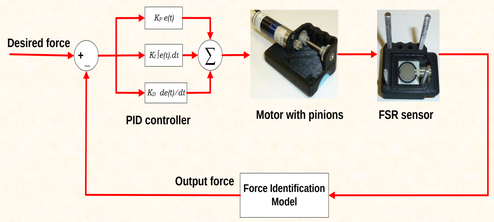
BLDC Control Circuit

Hardware and Control Design

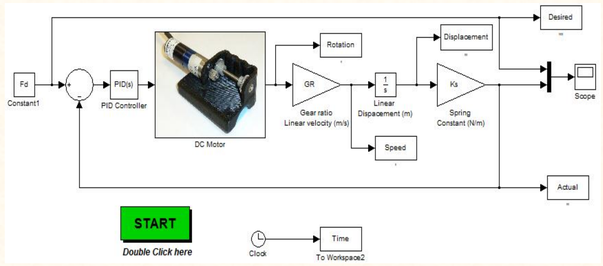




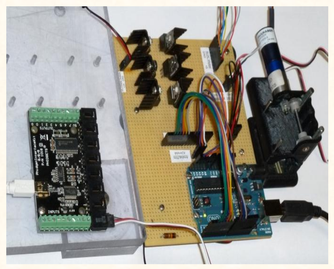
Arduino Board is used to control the Commutation

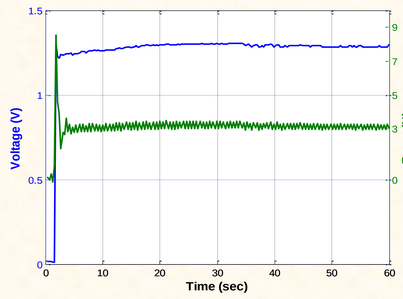


Conventional PID Loop



Simulation Model





Real Time Signal Tracking