



NYU

TANDON SCHOOL
OF ENGINEERING

REFRESHABLE BRAILLE DISPLAY

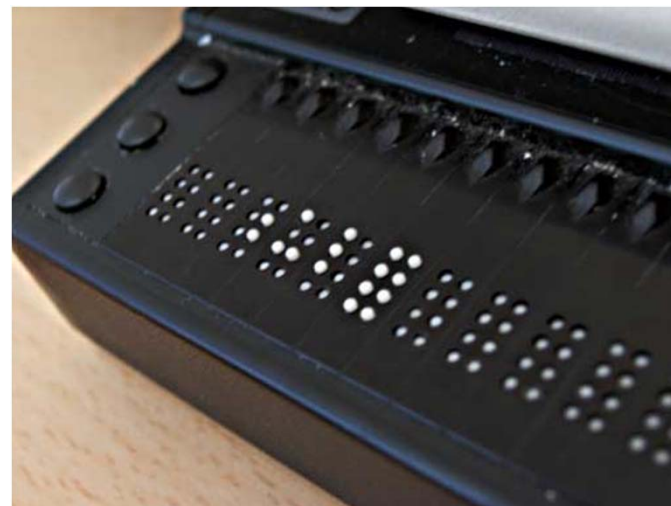
ADVANCED MECHATRONICS
MINI PROJECT 2
PROPELLER MICROCONTROLLER

HAIMING GANG
TANAYA BHAVE

What is a Refreshable Braille Display?

A refreshable Braille display or a Braille terminal is a device to display Braille characters using pins raised from holes on a flat surface.

Computer users who cannot use regular monitors due to visual impairment or complete blindness use it to read text output.








Why Refreshable Braille Display ?

For over two decades Braille Displays have cost between \$2000 to \$15000, which results to unintended discrimination towards the visually impaired.

There has not been any research in this area for a long time.

Shop for braille display on Google Sponsored ⓘ

 <p>Visio Desk</p> <p>\$3,995.00 baumusa.com</p>	 <p>VarioUltra 20</p> <p>\$2,395.00 baumusa.com</p>	 <p>Braille Sense U2 QWERTY</p> <p>\$5,968.00 Enablemart</p>
 <p>Perkins Braille Display 40</p> <p>\$2,706.00 Enablemart</p>	 <p>Perkins Products Mini Braille Display</p> <p>\$1,549.00 Maxi-Aids</p>	

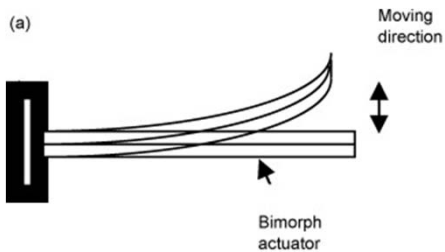
Recent Developments

Perkins School of Blind is working on a device for 20 refreshable Braille cells which has the potential of being manufactured for under \$500.

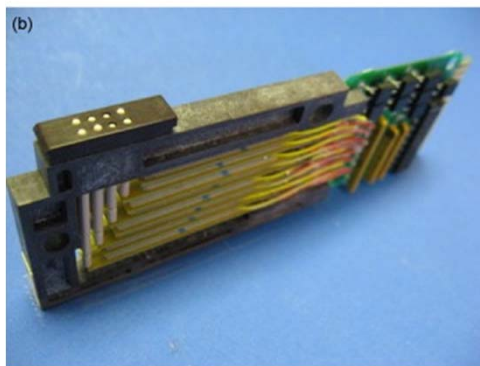
A Korean startup called Dot, has introduced a Braille watch and will soon be trying to go into mass production.

Two research students have tried to make a refreshable Braille display prototype, for \$200 for 3 Braille cells using ultra micro servo motors.

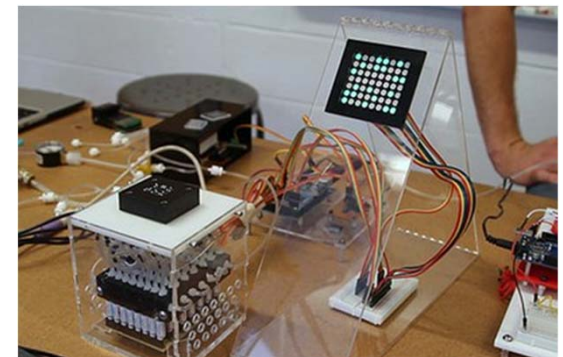




In a research project in the Pennsylvania State University, they are trying to use electroactive polymer for actuation of Braille cells.



In University of Michigan, they are trying to develop a full page display of Braille cells, using Pneumatic pumps and valves for each cell. Currently the size of the device is huge and the cost is around \$5000 per line. The researchers aim to reduce the size of the device and bring the cost of the device under \$1000.



Principle of Actuation

A solenoid consists of a coil and a movable iron core. When current flows through a wire, a magnetic field is set up around the wire. If we make a coil of many turns of wire, this magnetic field becomes many times stronger, flowing around the coil. When the coil of the solenoid is energized with current, the core moves to increase the flux linkage by closing the air gap between the cores. The movable core is usually spring-loaded to allow the core to retract when the current is switched off. The force generated is approximately proportional to the square of the current and inversely proportional to the square of the length of the air gap.

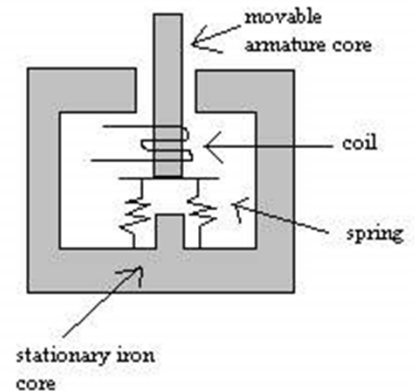
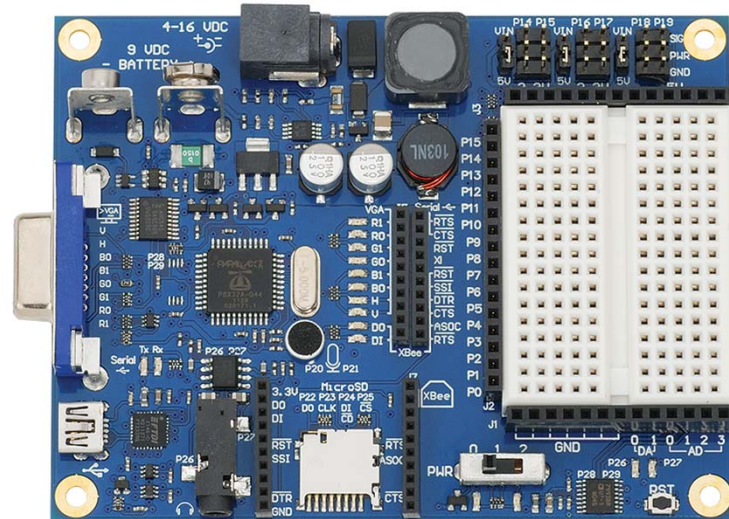


Fig. 1 A solenoid.

Components

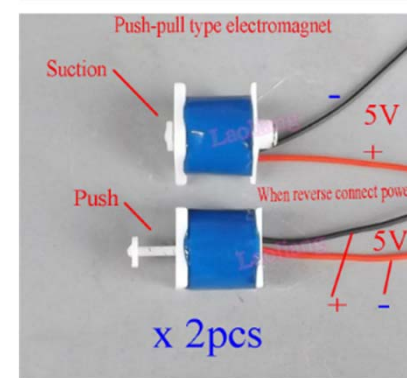
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Solenoids:

We used Mini Solenoids to control the pins of each alphabet. Each alphabet in braille has 6 control points. We used 12 solenoids for 2 alphabets.

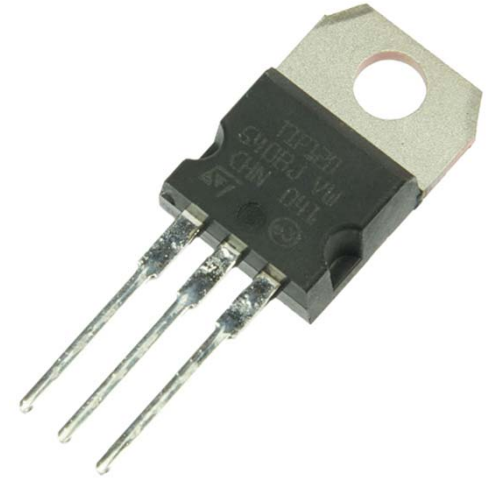


EMI Shielding Tape

We wrapped all the Solenoids with EMI Shielding tape to control the magnetic interference among the solenoids.



Transistor:
TIP120- NPN Transistor

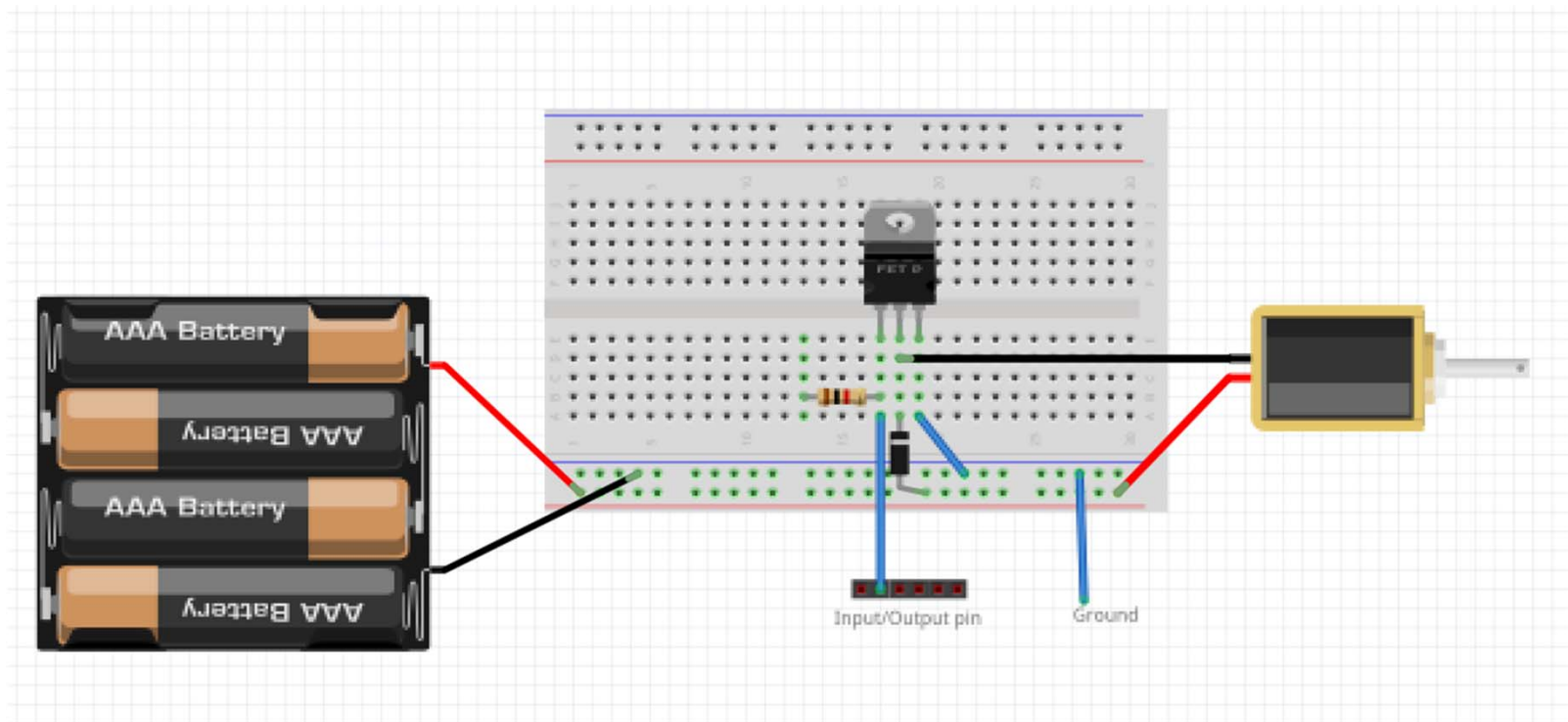


Rectifier Diode :
1N4001

Previous Scope

- Fit the Braille cells to standard size.
- Add a card reader and convert text files to Braille.
- Integrate with an Audio outlet.
- Optimize power source.

Circuit Diagram



Scope

- To be able to connect with phones or laptops to read text files.
- Add buttons to be able to choose a file from the SD card or navigate through the pages.

Cost for the display

Components	Quantity	Cost for 1(in \$)	Total(in \$)
Microcontroller	1	89.99	89.99
Solenoids	12	1.16	13.92
Jumper Wires	90	-	5.85
Magnetic Shielding tape	50m	-	11.5
Text to speech module	1	50	48.99
Magnetics	24	-	11
Transistors	12	0.725	8.7
Diodes	12	0.226	2.71
		Total:	192.66

References:

- A compact electroactive polymer actuator suitable for refreshable Braille display Kailiang Ren a, Sheng Liu a, Minren Lin b, Yong Wang a, Q.M. Zhang a,b,* a Department of Electrical Engineering, The Pennsylvania State University, University Park, PA 16802, United States b Materials Research Institute, The Pennsylvania State University, University Park, PA 16802, United States Received 5 April 2007; received in revised form 18 October 2007; accepted 29 October 2007 Available online 13 November 2007
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THANK YOU