Digital Braille Watch

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Overview

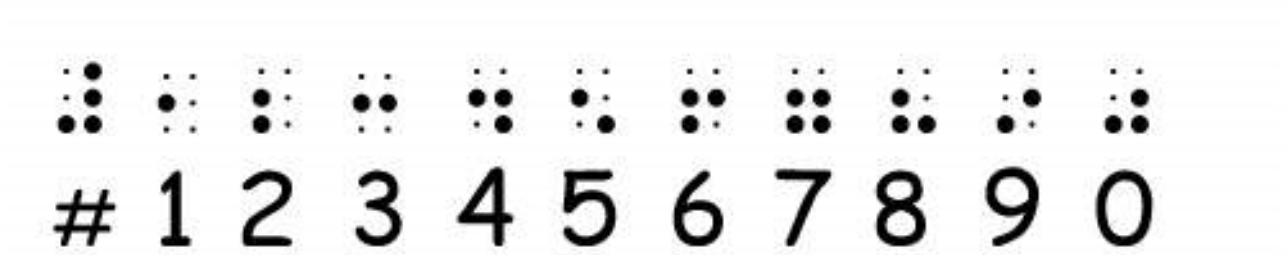
- Problem Statement
- Background Information
- Preliminary Designs
- Design Matrix
- Final Design
- Future Work

Problem Statement

- Develop a digital Braille watch that…
  - Uses standard Braille numerals
  - Displays military time
  - Is silent and easy to read
  - Is accurate and reliable

Braille Basics

- Preferred written method for visually impaired
- Size standards
  - Each character consists of 3x2 grid
  - Dots > 0.092 in. apart
  - Characters > 0.245 in. apart
  - Distances should be uniform
- Numerals only use bottom 4 positions
  - Four characters required for time display



http://www.dotlessbraille.org/AboutBraille.htm

Current Methods

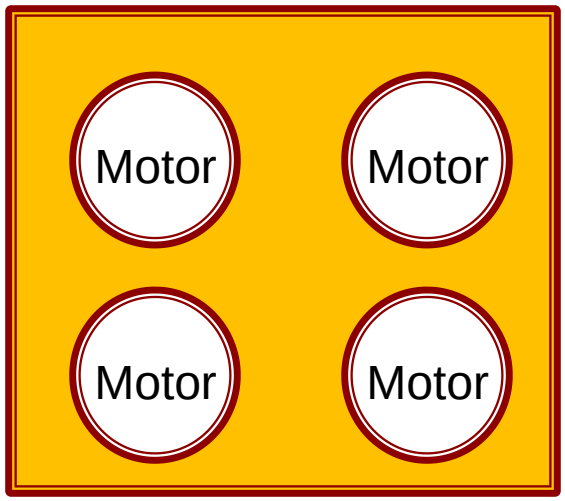
- Audio watch
  - Disruptive
- Tactile analog watch
  - Difficult to read
  - Fragile
- Haptica Braille watch
  - Designed by David Chavez
  - Just concept, no mechanism

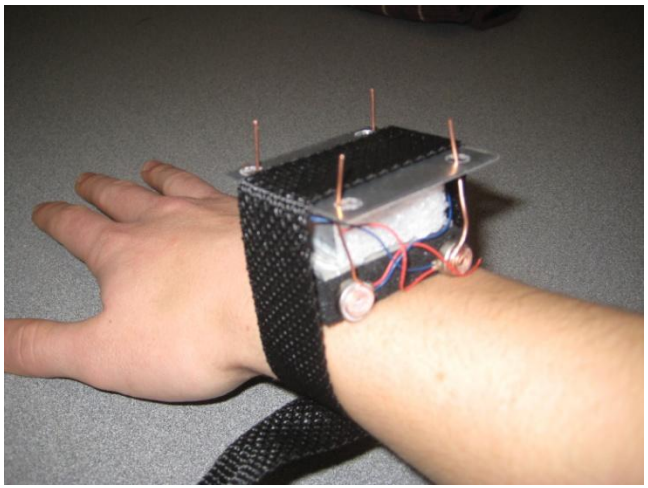
http://www.independentliving.com/departments.asp?dept=134

http://www.tuvie.com/haptica-braille-watch-concept/

Design Option 1: Vibrating Dots

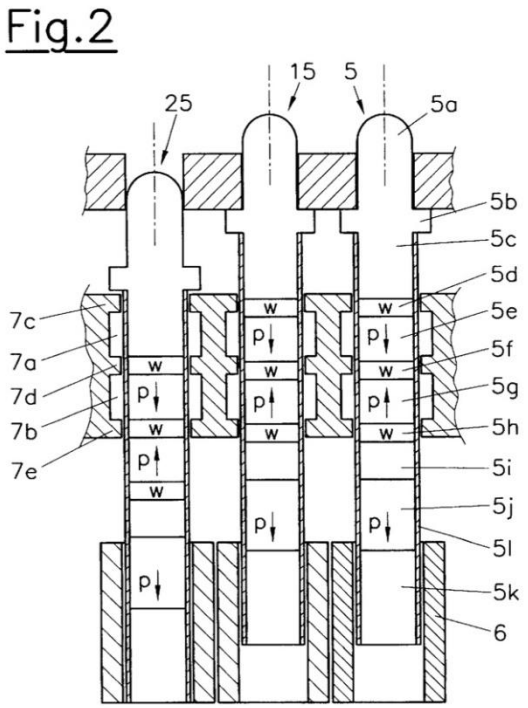
- Four vibrating dots
- Pros
  - Lacks moving parts
  - Feasible
  - Scalable
- Cons
  - Difficult to read
  - Power inefficient
  - Client does not approve





Design Option 2: Actuating Dots

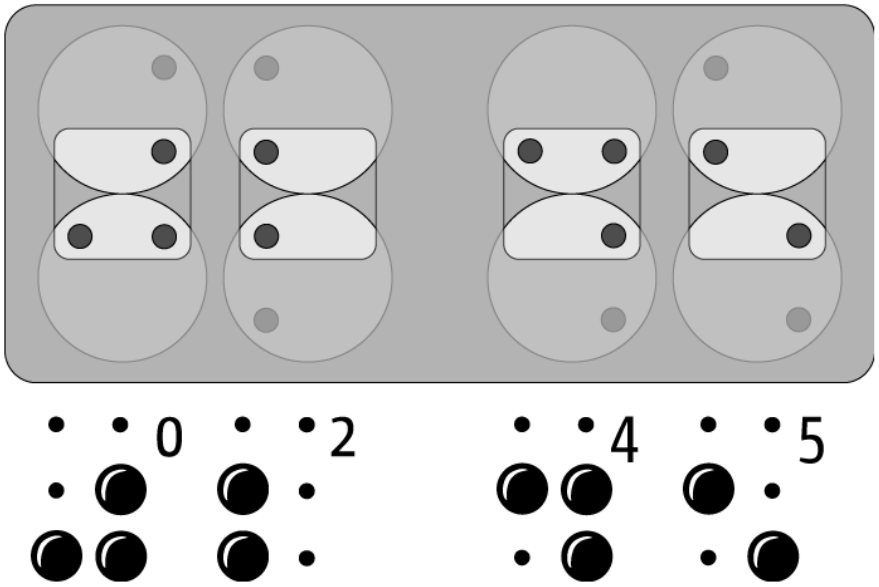
- Each dot attached to actuating mechanism
- Pros
  - Proven method
  - Easy to read
- Cons
  - Many moving parts
  - High power consumption



Litschel, Dietmar, and Christoph Schwertner. Divice for Representing Relief Items. Caretec GmbH, assignee. US Patent 6109922. 2000.

Design Option 3: Rotating Disks

- Eight rotating plates form display
- Pros
  - Less moving parts
  - Power efficient
  - Easy to read
  - Aesthetically pleasing
- Cons
  - Prototype larger than watch-size



Design Matrix

Weight	Design Aspects	Vibrating Dots	Actuating Dots	Rotating Disks
0.05	Prototype Cost	8	6	7
0.15	Aesthetics	4	7	9
0.25	Ergonomics	3	8	9
0.05	Safety	10	9	9
0.10	Durability	9	6	8
0.15	Accuracy	7	10	10
0.15	Design Simplicity	9	4	7
0.10	Scalability	8	6	7
1	**Total**	**6.35**	**7.10**	**8.45**

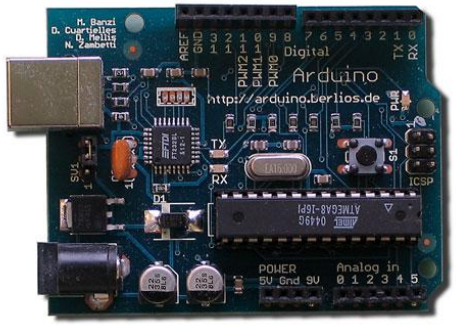
Scale: 1 – 10 (1 poor, 10 excellent)

Rotating Disks: How will it work?

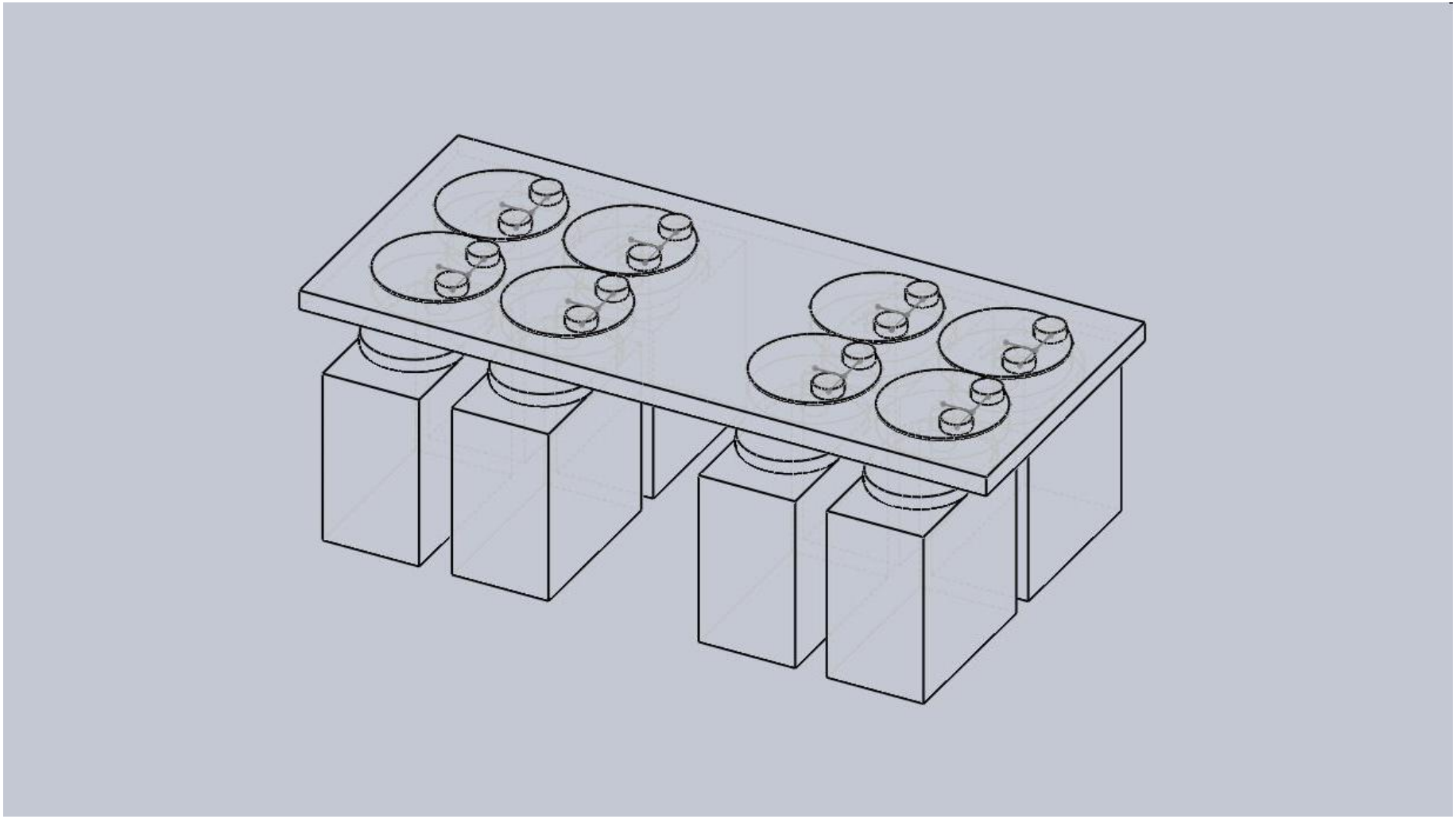
- Servos
  - Small and power efficient
  - Can provide desired rotation
  - Controlled by microcontroller

http://www.rctankcombat.com/archive/2007-03/jpg00016.jpg

- Microprocessor
  - Arduino Duemilanove
  - Easily reprogrammable
  - Thirteen output pins



http://www.mitchellpage.com.au/research/wp-content/uploads/2006/04/arduino_extreme_480.jpg



Future Work

- Order materials
- Work on circuitry and hardware specifics
- Assemble prototype
- Testing and adaptation
- Finalize prototype

Acknowlegements

- Holly and Colton Albrecht
- Dennis Bahr
- Fall and Spring '08 Braille Watch Design Teams

References

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