



# Digital Braille Watch

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# Overview

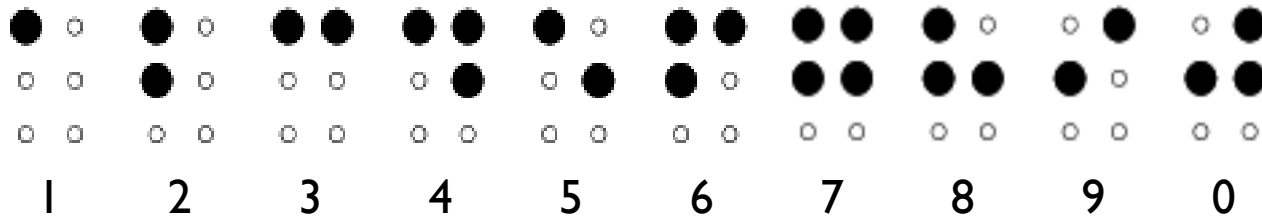
- Problem Statement
- Braille Background
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- Preliminary Designs
- Design Matrix
- Final Design
- Future Work

# Problem Statement

- Develop a Digital Braille Watch that...
  - Uses the standard Braille number system
  - Displays military time
  - Is silent, easy to read and accurate

# Braille Background

- Size standards
  - Each character consists of 3x2 grid
  - Dots at least 0.092 in. apart
  - Characters at least 0.245 in. apart
  - Distances should all be uniform
- Four characters needed to display time
- Braille numbers use only top 4 positions



# Current Methods

- Talking Watch
  - Disruptive
- Tactile Watch
  - Fragile
  - Difficult to read
- Haptica Braille watch
  - Idea developed by David Chavez
  - Just a concept, no design



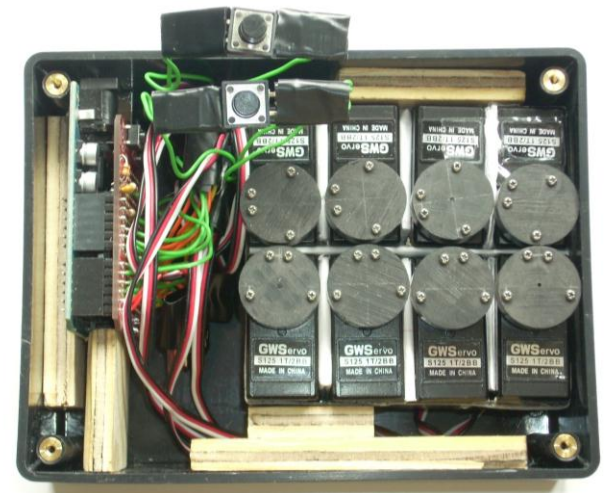
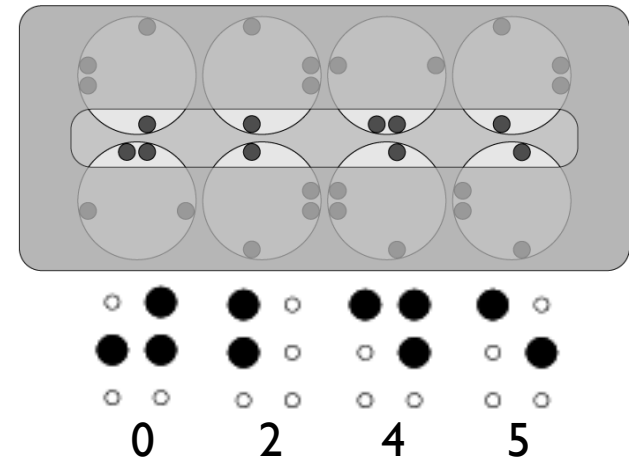
<http://watchluxus.com/braille-watches-by-auguste-reymond>



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

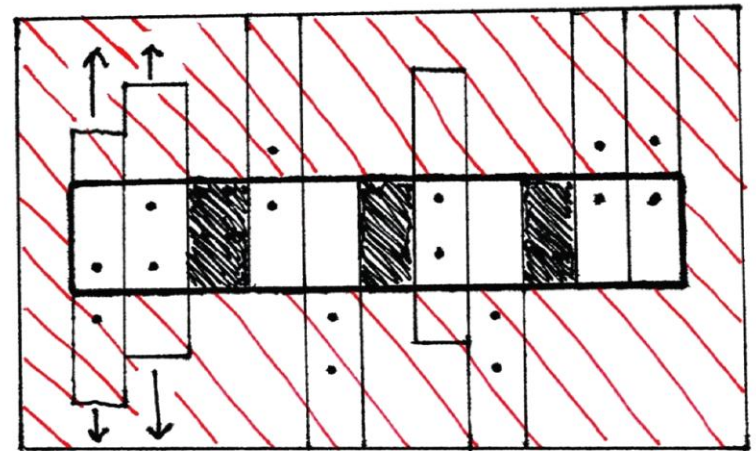
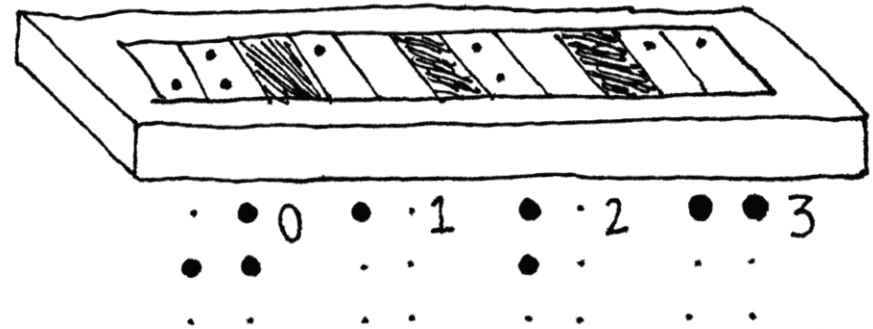
# Design Option I: Rotating Disks

- Eight disks rotate to display the time
- Pros
  - Met client requirements
  - Multiple functions
  - First existing Digital Braille Watch
- Cons
  - High power consumption
  - Large size
  - Lacks precision



# Design Option 2: Sliding Plates

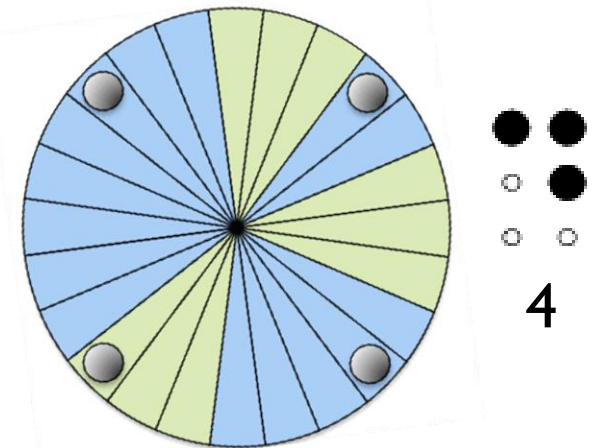
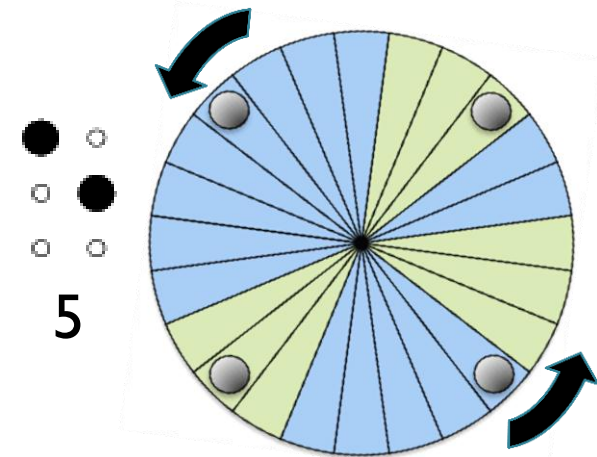
- A pair of sliding plates make up each digit, providing one, two or no dots as necessary
- Pros
  - Small size
  - No ambiguity in dot placement
- Cons
  - Eight moving parts
  - High power consumption



# Design Option 3: Disk and Pins

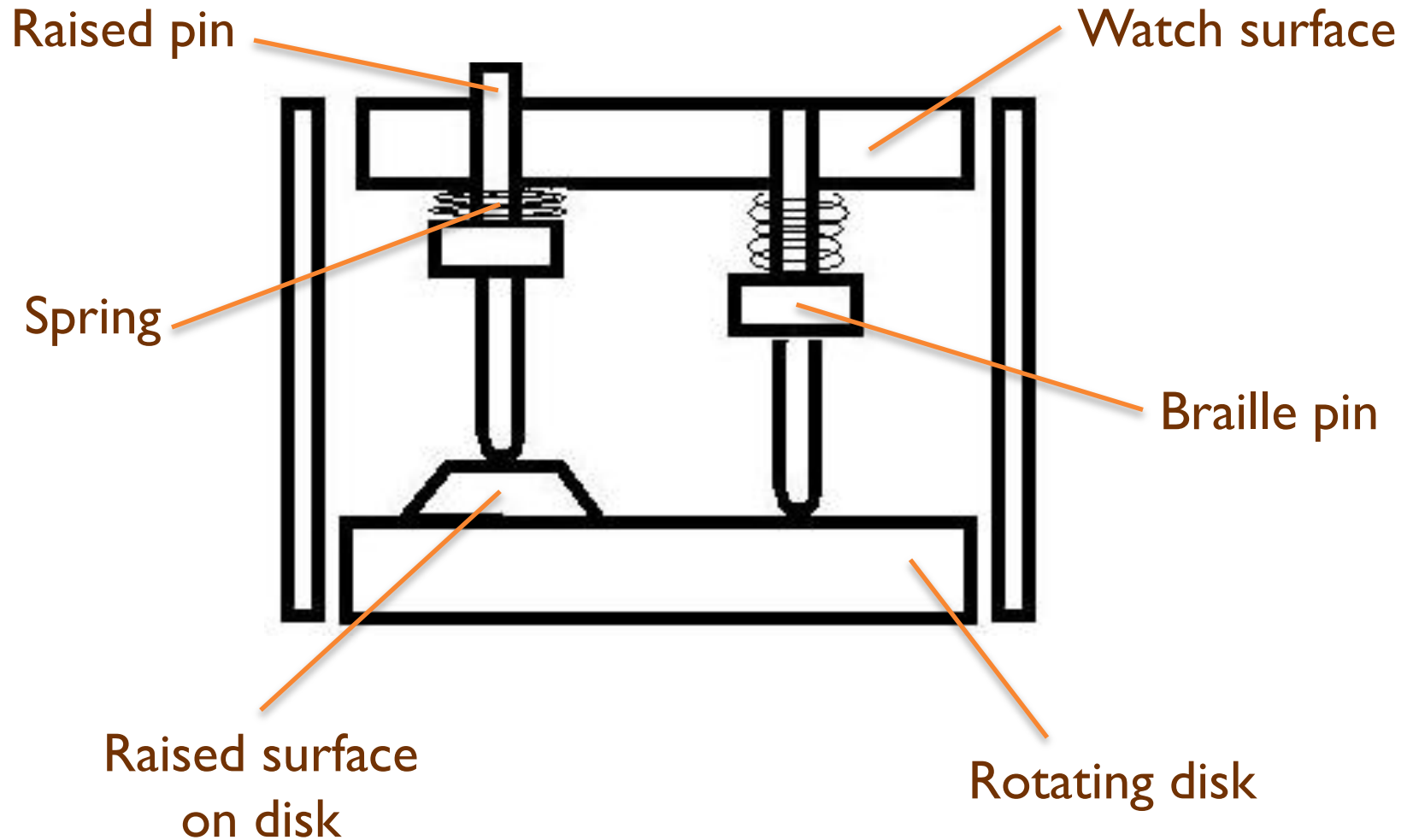
- Pins are raised or lowered based on the position of the disk below
- Pros
  - Low power consumption
  - No ambiguity in dot placement
  - Small size
- Cons
  - Little room for alignment error

- - Raised Surface
- - Recessed Surface
- - Braille Pin





# Disk and Pins (continued)



# Design Matrix

Weight	Design Aspects	Rotating Disks	Sliding Plates	Disk and Pins
0.05	Prototype Cost	6	7	9
0.15	Aesthetics	7	8	9
0.25	Ergonomics	7	8	9
0.05	Safety	9	9	10
0.10	Durability	8	8	8
0.15	Accuracy	10	10	10
0.15	Design Simplicity	9	9	7
0.10	Scalability	5	10	9
<b>1</b>	<b>Total</b>	<b>7.70</b>	<b>8.65</b>	<b>8.80</b>

# How will it work?

- Servos
  - Can provide desired rotation
  - Only 165 degrees of rotation required
  - Servos much smaller than those used last semester
- Microcontroller
  - Only need to control 4 servos
  - Arduino Mini
- Braille Pins
  - Thin plastic (ABS) rods



[http://www.robot-hk.com/products\\_m18.asp?lang=en](http://www.robot-hk.com/products_m18.asp?lang=en)



<http://www.robotshop.ca/arduino-mini-microcontroller.html>

# Future Work

- Finalize design
- Order materials
- Assemble prototype
- Testing and adaptation
- Finish prototype

# Acknowledgments

- Holly and Colton Albrecht
- John Puccinelli
- Spring 2010 Braille Watch Design Team
- Biomedical Engineering Department

# References

- <http://www.pharmabraille.co.uk/braille-alphabet.html>
- <http://watchluxus.com/braille-watches-by-auguste-reymond>
- <http://www.tuvie.com/haptica-braille-watch-concept/>
- [http://www.robot-hk.com/products\\_m18.asp?lang=en](http://www.robot-hk.com/products_m18.asp?lang=en)
- <http://www.robotshop.ca/arduino-mini-microcontroller.html>