IPRO - 320 - Design of a Digital Braille Watch

Illinois Institute of Technology
Fall 2001
Team Structure

Professor Albert Wang – Faculty Advisor

Physical Design Team
Peter Krzyzanowski
Zac Cohen
Kibok Song
Wendy Lau
Tamara Brooks

Circuit Design Team
Wayne Tahara
Olesegun Subolo
Kayode Arole
Michael Yuan
Drew Johnson
Sohan D’Souza
Group Objective

Finish the watch design and construct a working digital Braille watch by the end of the semester
Physical Design Team
Physical Design Team Goals

- Conduct interviews to determine desired user features
- Find a suitable Braille Display Unit (BDU)
  - Meets circuit needs
  - User needs
- Design the watch casing
  - Meets user desired needs
  - Housing large enough to fit the BDU
Interviews

- Conducted interviews at the Chicago Lighthouse Foundation during three visits
  - Determined current Braille watches and their weakpoints
    - Talking Braille Watches
    - Analog Braille Watches
    - BrailleNote
  - Determined desired features for a Braille watch
    - Small, discrete, quiet
    - Readable Braille
    - Stable display
Braille Display Unit Research

- Researched many different BDUs
  - Piezoelectric Braille cell actuator
  - Miniature solenoids
  - Peterson
    - Electro-mechanical device
    - Small size: $0.5\text{ in} \times 0.25\text{ in}$
    - Low cost: estimated $5 once
    - In manufacturing
Chosen Braille Display Unit

- Robotron Mechatronic Braille Cell
  - Advantages
    - Low voltage: Requires 5V supply
    - Stepping motors hold pins in place with pressure
  - Disadvantages
    - Size: 1.9inx1.4inx1.2in
    - Too large for a wrist watch
    - High cost: $250
Watch Design

- Pager style casing, due to size of Robotron
- Motorola pager casings
  - Used to determine fit and button placement
- Watch sketches
- Design chosen
- Autocad drawings
- Manufacturing
  - Laser Manufacturing, Inc
Casing Design

Rubber covered around titanium body to protect mechanism from the sudden shock or impact.
Design Specifics

- Name comes from “sygan”, Korean for watch
- Logo consists of Braille “C” and raised letters “GAN”, which is how it is pronounced
- The metaphor of an owl was used
  - Owls have excellent vision even in the dark
  - Morphologic familiarity to user, device becomes a companion
Circuit Design Team
General System Overview

System Clock → Main Control

Main Control → Counter → MUX → Decoder

Decoder → Shift Register → Braille Display Unit
Circuit Team Goals

- Review, refine, and fix the design from the Summer 2001 team
- Finish the prototype circuit
- Finish the chip design for the final circuit
- Construct the MOSIS microprocessor circuit
Accomplished

- The design of the prototype was corrected
- The prototype circuit was completed
- The design for the MOSIS microprocessor was reviewed, but not yet sent out
Recommendations for Future Research

- Use Petersen BDU
  - Small size
  - Allows wrist watch design
Questions & Comments