Team braillebook

Richard Lam
EE, ‘16
Team Manager

Raveena Kothare
EE, ‘16

Steven Golonka
EE, ‘16

Faculty Advisor: Professor Dennis Goeckel
Introduction

braillebook

The Braille Tutor

“Only a quarter of blind Americans of working age actually have jobs, and it is surely no coincidence that almost all of them can read Braille.”

- Today, 10% of blind children are taught Braille
  - Compare to 50% in the 1950s

- Braille texts are expensive
  - Costs several times more than ordinary books
  - Electronic refreshable Braille displays cost $2000-$8000

braillebook: A Learning Tool

- User will be able to read the displayed line of Braille and compare it to the output of the text-to-speech output

- Market competition:
  - BraillePen 12 Touch: 12 cell display, bluetooth keyboard, compatible with text to speech software, $1150
  - Smart Beetle 14-Cell Braille Display: compatible with popular screen reader software, audio prompt for menu, $1200
  - Brailliant BI 40: 40 cell display, compatible with screen reader software, $2995
System Overview

- Computer
- Arduino
- Motors
- User Interface Peripherals
- Mechanical Display

Department of Electrical & Computer Engineering
Current System Block Diagram

PC User Interface
- GUI
- Text State Machine
- Tx (USB Type A)

Microcontroller
- Rx (USB Type B)
- Display State Machine
- Text-to-Braille Algorithm
- Disk Rotation Algorithm

Scheduler
- Text-to-Speech Driver
- Button Driver
- Motor Driver
- Rx/Tx (TTL)

Mechanical Display System
- Motor Drivers: H-bridge Circuit
- Rctational Motor
- Linear Motor
- Set and Hold Mechanisms

Department of Electrical & Computer Engineering
Proposed CDR Deliverables

- Fully functional electromechanical display
  - 20 characters
  - 7 buttons
    - On/Off, Menu, Yes, No, Previous Line, Next Line, Read Line

- Functional GUI
  - Can take in text file input and load corresponding display code onto device

- Device meets size requirement
  - No larger than 50x15x12 cm

- Device stores information for 1 text file

- Will not be fully packaged
Today’s Demonstration

- Fully functional electromechanical display
  - 20 characters
  - Buttons for: Previous Line, Next Line, Read Line

- Functional GUI Executable
  - Can take in text file input and load appropriate instructions onto device

- Device exceeds one dimension of size requirement
  - 77x13x12 cm

- Device can load text files

- Is not be fully packaged
Proposed FPR Deliverables

- Fully functional electromechanical display
  - 20 characters
  - Buttons for: Previous Line, Next Line, Read Line
  - Switch for: Power ON/OFF

- Desktop Application
  - Line refreshes in 5 seconds

- Fully packaged device

- Production cost: <$400
Disk Rotation Algorithm – Explained

- Setting characters from left to right
  - Algorithm calculates number of rotations for each disk
  - Rotation of a given disk affects all disks to the left of it
  - Final positions of disks are achieved once rotation of rightmost disk is complete

- Example with four sided disk below:
  - Orient all dots at top
Disk Rotation Algorithm – Explained

- Setting characters from left to right
  - Algorithm calculates number of rotations for each disk
  - Rotation of a given disk affects all disks to the left of it
  - Final positions of disks are achieved once rotation of rightmost disk is complete

- Example with four sided disk below:
  - Orient all dots at top
**Disk Rotation Algorithm – Explained**

- Setting characters from left to right
  - Algorithm calculates number of rotations for each disk
  - Rotation of a given disk affects all disks to the left of it
  - Final positions of disks are achieved once rotation of rightmost disk is complete

- Example with four sided disk below:
  - Orient all dots at top
Disk Rotation Algorithm – Explained

- Setting characters from left to right
  - Algorithm calculates number of rotations for each disk
  - Rotation of a given disk affects all disks to the left of it
  - Final positions of disks are achieved once rotation of rightmost disk is complete

- Example with four sided disk below:
  - Orient all dots at top
Disk Rotation Algorithm – Explained

- Setting characters from left to right
  - Algorithm calculates number of rotations for each disk
  - Rotation of a given disk affects all disks to the left of it
  - Final positions of disks are achieved once rotation of rightmost disk is complete

- Example with four sided disk below:
  - Orient all dots at top
Disk Rotation Algorithm – Explained

- Setting characters from left to right
  - Algorithm calculates number of rotations for each disk
  - Rotation of a given disk affects all disks to the left of it
  - Final positions of disks are achieved once rotation of rightmost disk is complete

- Example with four sided disk below:
  - Orient all dots at top
Disk Rotation Algorithm – Explained

- Setting characters from left to right
  - Algorithm calculates number of rotations for each disk
  - Rotation of a given disk affects all disks to the left of it
  - Final positions of disks are achieved once rotation of rightmost disk is complete

- Example with four sided disk below:
  - Orient all dots at top

![Diagram of disk rotation algorithm](image)
Disk Rotation Algorithm – Explained

- Setting characters from left to right
  - Algorithm calculates number of rotations for each disk
  - Rotation of a given disk affects all disks to the left of it
  - Final positions of disks are achieved once rotation of rightmost disk is complete

- Example with four sided disk below:
  - Orient all dots at top
Demo Videos
Demo Videos
Demo Videos
Questions & Discussion
Thank You