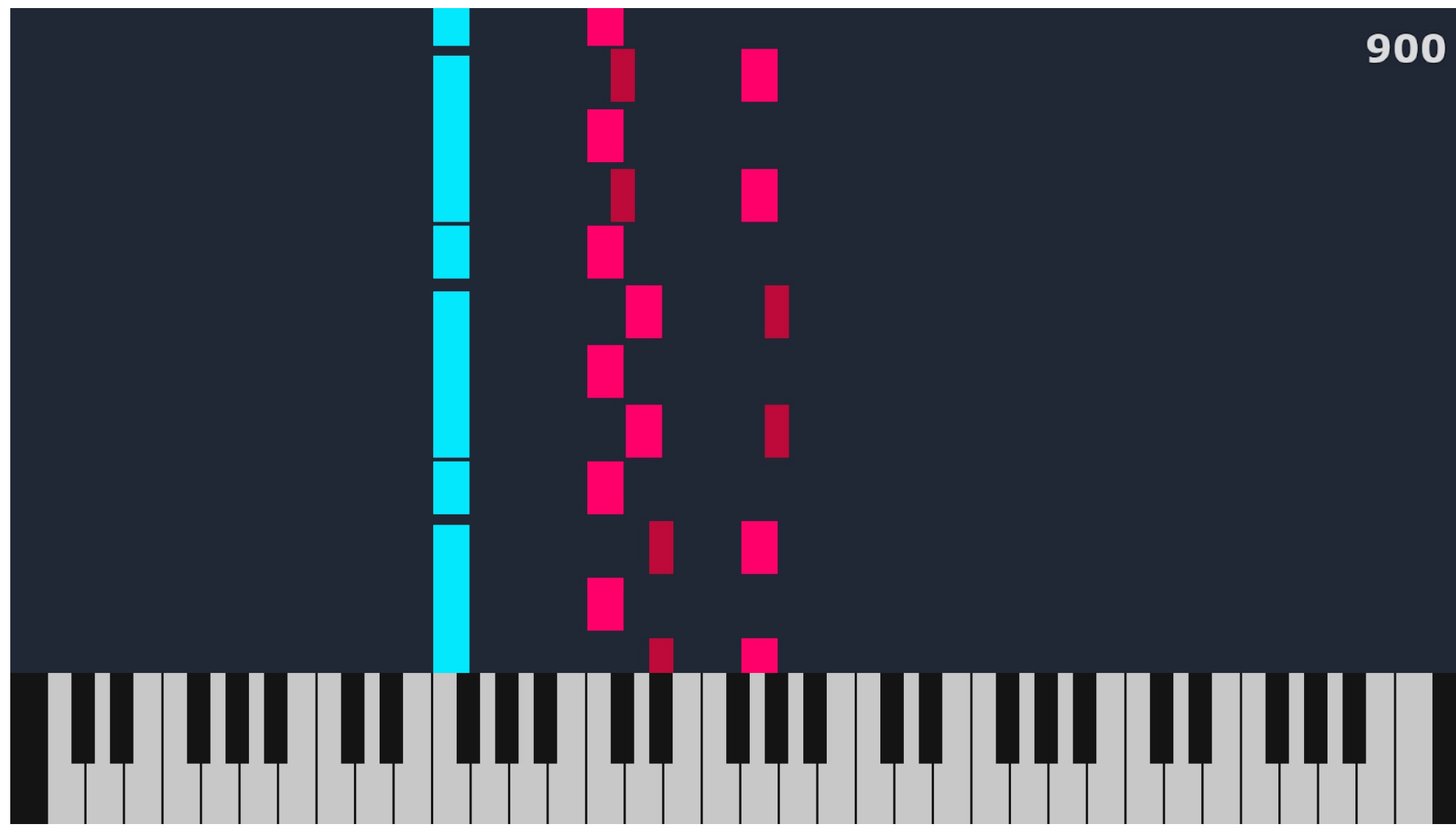


## GUI Application



### Display

- Projects the current played notes on to keyboard
  - Includes next sets of notes
  - Length of note matches with delay
  - Left hand = Blue
  - Right hand = Pink
- Process MIDI data received, and outputs score for user
  - Displayed on top right and updates whenever user plays correct note

## Haptic Glove(s) Sub-System



### Haptic PCB

- Atmega328P Microprocessor
- HC-08 Bluetooth Component
- Haptic Motors

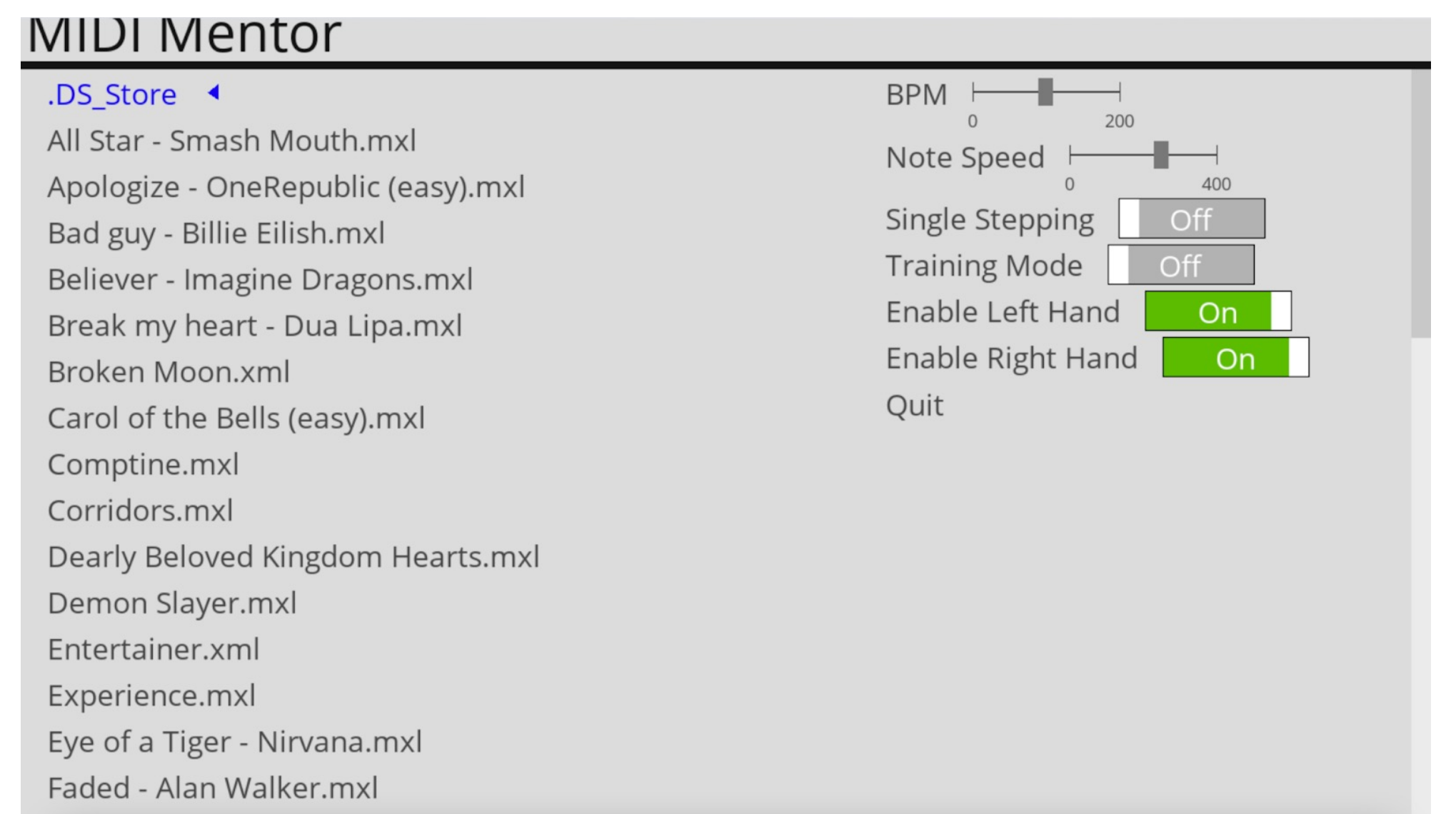
#### Functions:

ATmega328P receives transmitted data over Bluetooth and drives the corresponding GPIO pin(s) to turn on Haptic motors according to the finger generation

## Costs

Part	Development	Production (1000)
Haptic Vibration Actuator	\$12.00	\$12.00
HC-08 Bluetooth Components	\$9.98	\$8.40
Voltage Regulators	\$2.80	\$2.54
Resistors (220Ω, 1kΩ, 100kΩ, 10kΩ, 2kΩ, 68kΩ)	\$5.30	\$0.96
Lithium Polymer Batteries	\$15.90	\$15.90
Atmega328p	\$9.33	\$7.74
1N4001 Diode	\$15.00	\$12.00
P2N2222AG NPN Transistor	\$3.36	\$1.10
JST to Wire Cable Connector	\$0.30	\$0.13
Capacitors (0.1uF, 22pF, 0.47uF, 1uF, 4.7uF)	\$10.15	\$2.73
16 MHz Clock	\$0.54	\$0.29
Micro USB Connector	\$4.10	\$2.78
LEDs (WS2812B LED)	\$7.52	\$7.52
FTDI Serial Converter Cable	\$19.95	\$15.96
PCB(s)	\$30.08	\$16.63
3D Printed Circuit Housing	\$5.00	\$4.50
<b>Total</b>	<b>\$146.31</b>	<b>\$123.31</b>

## Display Menu



### Selection Menu

- Allows users to control song, speed and mode
- Sends Fingering Data to Haptics via Bluetooth
- Sends MIDI note number data to Led Strip via FTDI Converter Cable
- Left column contains list of song available to play
- Right column contains controls to mode and speed
- Speed
  - Beats Per Minute (Tempo)
  - Note Speed
- Mode
  - Single Stepping ( Play by note )
  - Training mode ( Play by measure )

## LED Sub-System



### LED PCB

- Atmega328p Microcontroller
- USB to Serial Cable
- LED Strip

#### Functions:

- Receives converted Note Numbers (36 - 96) (from pitch (A0 - C8) values) from python via serial communication
- C++ code receives ASCII value then turns on LED number accordingly
- Lights up to indicate which notes to press
  - Left hand = Blue
  - Right hand = Pink

## Testing Results

