Swish Slash Swoosh Super Savage Sword-Swinging Simulator 2023

ver 2.23α (Final Release)

ECE532 - Final Demo

Gavin Gu
Nick Tran
Harry Hopman
Samuel Zheng

Presenter: Harry

Overview

GOAL: Create a interactive and fun sword-swinging slasher game that relied on accelerometer data to track player movements.

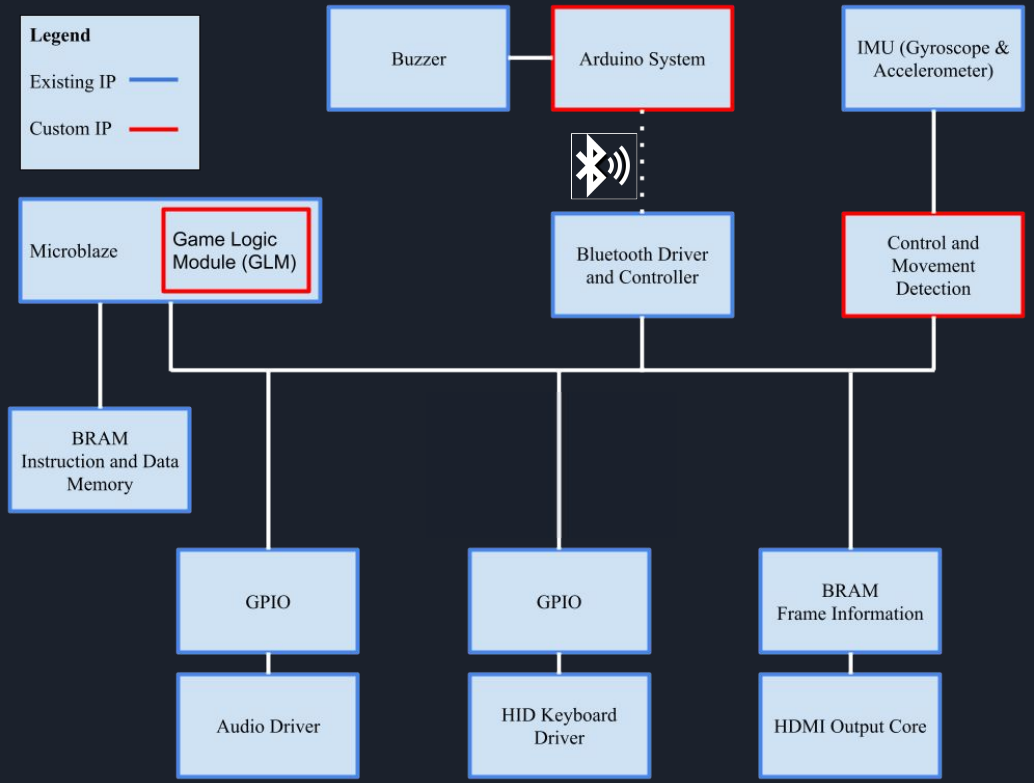
Integrate:

- Accelerometer
- Visual Display
- Wireless Haptic Feedback
- Audio Cues
- Keyboard

Vertical and Horizontal Swing

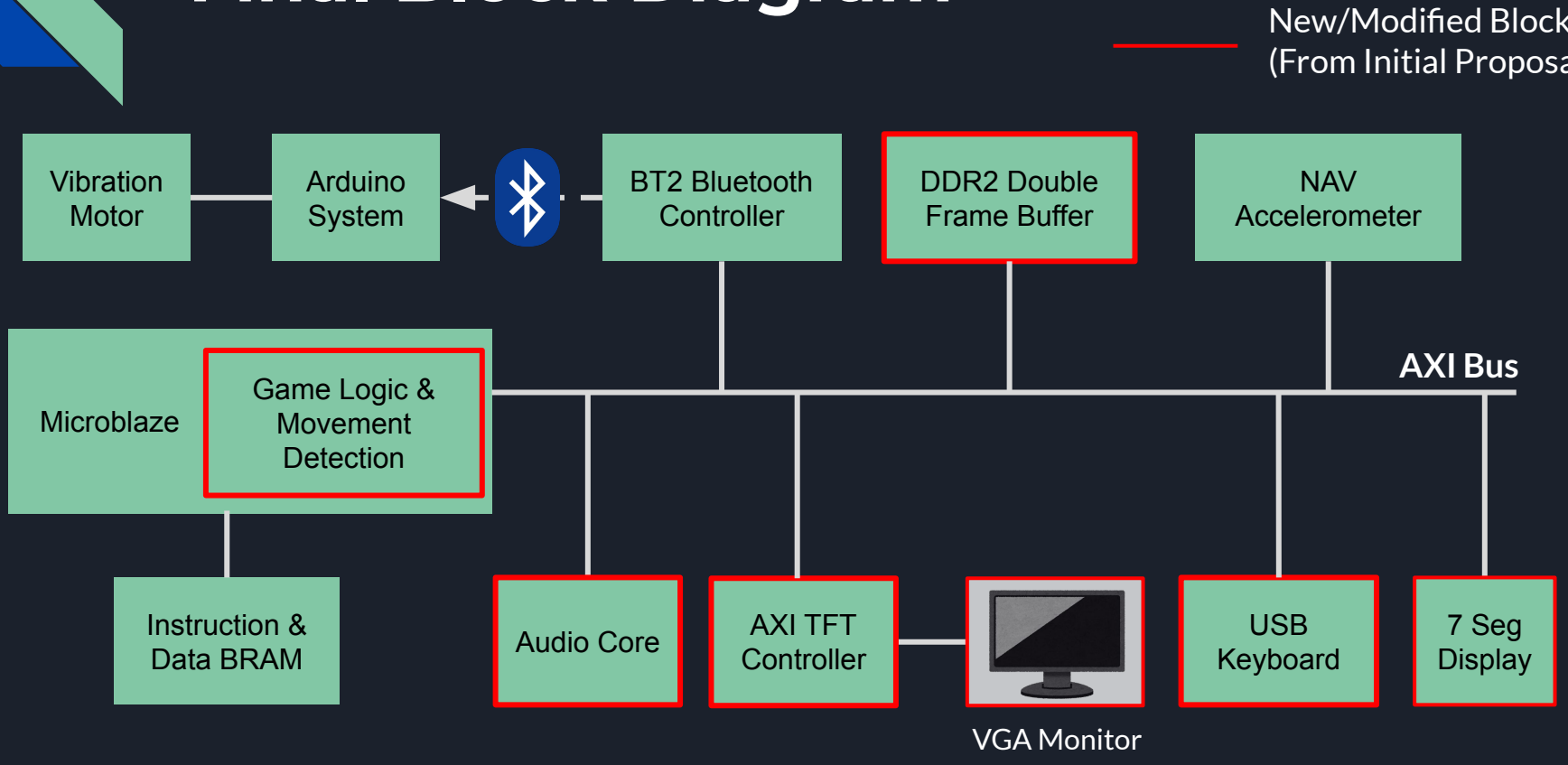
Presenter: Sam

Initial Block Diagram



Presenter: Sam

Final Block Diagram

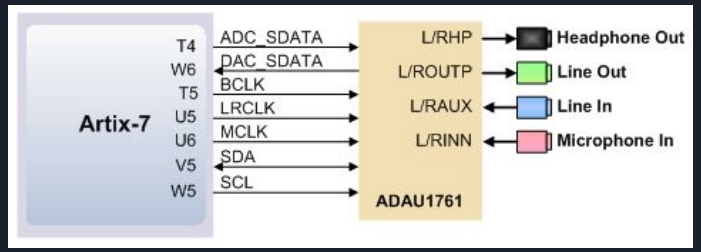


Presenter: Nick

Switch from Nexys Video to Nexys 4 DDR

HDMI™
HIGH-DEFINITION MULTIMEDIA INTERFACE

VGA



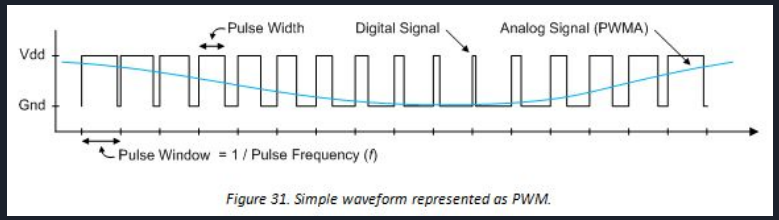


Figure 31. Simple waveform represented as PWM.

- Broken, outdated demos
- Lack of documentation
- Huge Complexity Jump

- Simpler Interfaces
- More Documentation
- Previous Experience

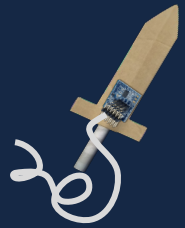
Presenter: Nick

Code/Block Originality

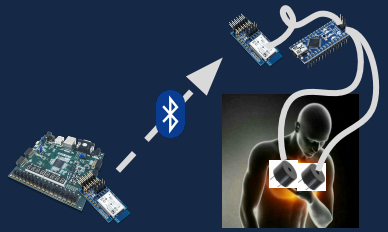
Original

Audio Core

Draw Function Library



Motion Detection Algorithm



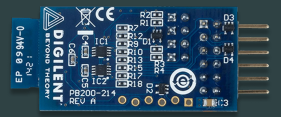
Arduino Buzzer System

Borrowed / Modified

AXI TFT

PMOD NAV

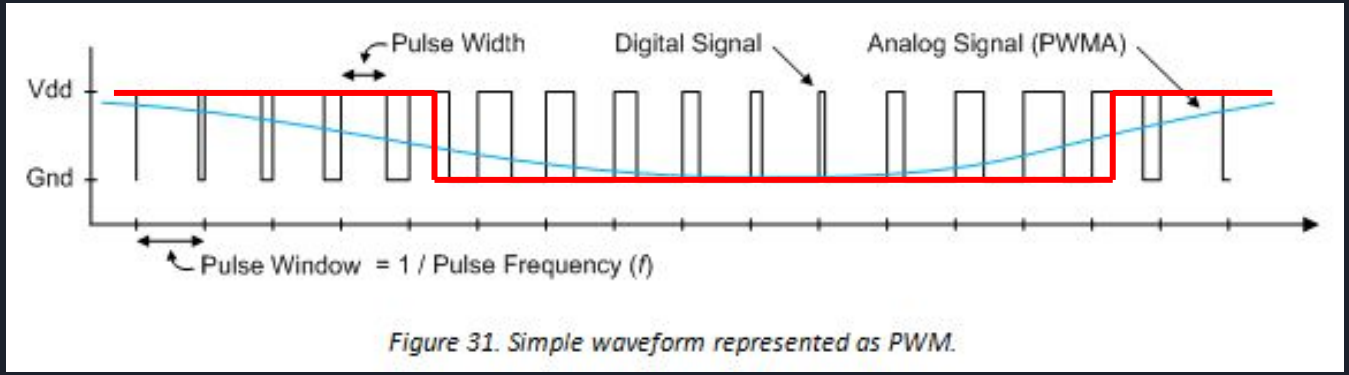
Keyboard



PMOD BT2

Custom Audio Core

- Each note encoded as 16-bit value, stored in ROM block
- Decode this value to get variables needed to play note as PWM wave
  - Frequency, duty cycle, etc.
- Songs and SFX are sequences of these notes w/ duration



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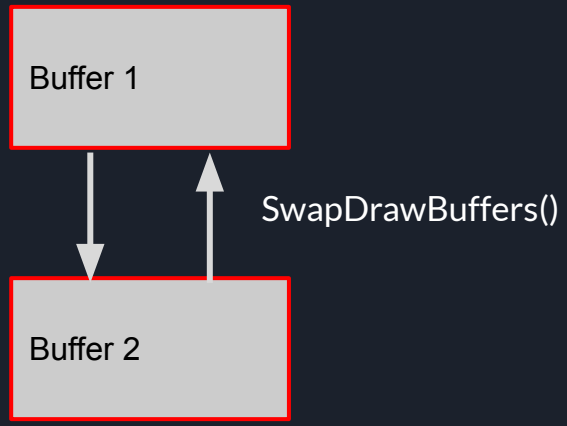
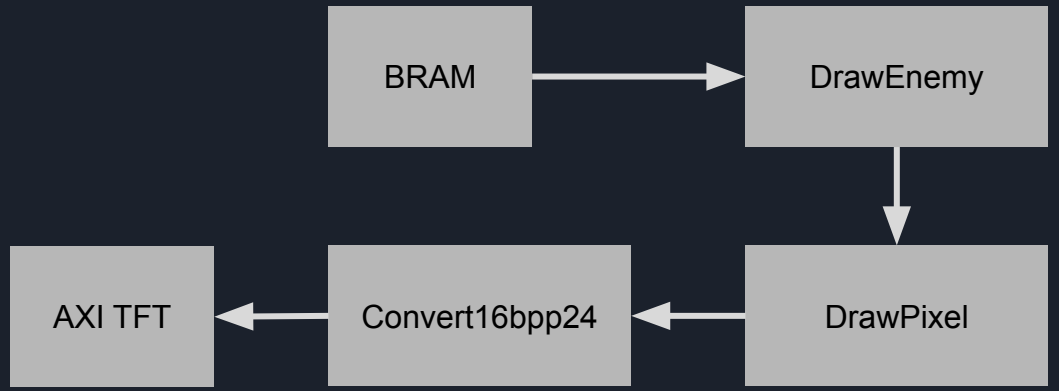
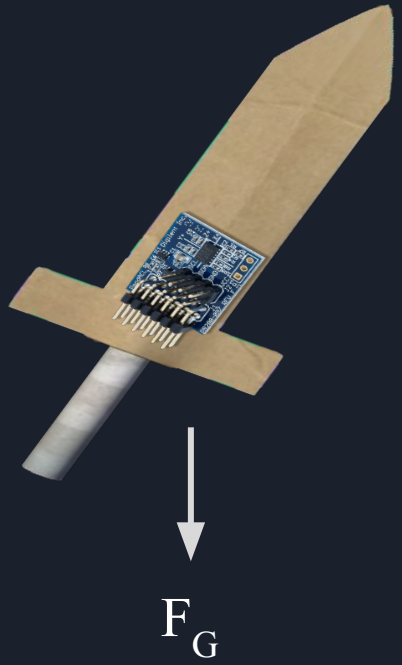
Draw Function Library



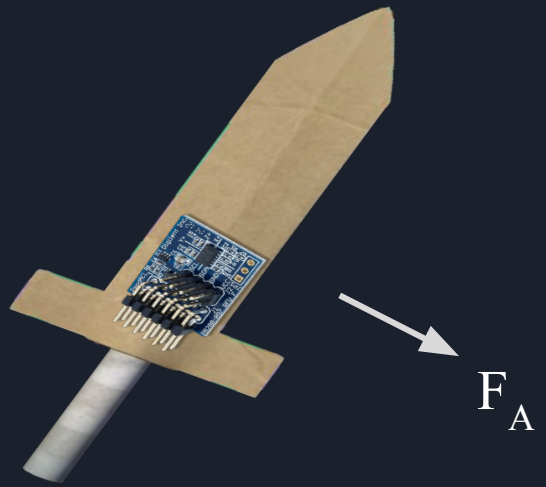


Presenter: Harry

Motion Detection Algorithm



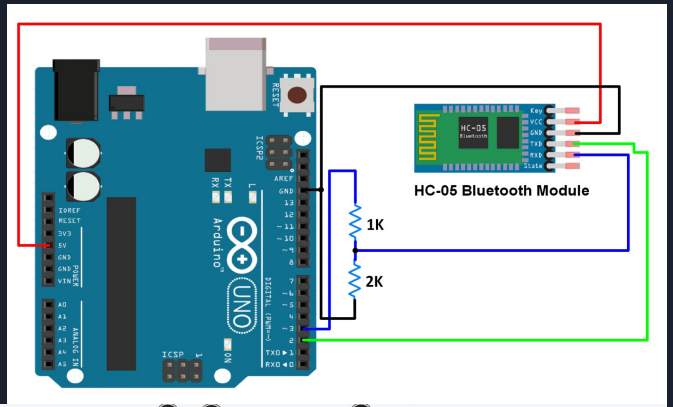
Use gravity vector to determine orientation for vertical and horizontal block



Align swing motion to accelerometer axes to determine vertical and horizontal motion

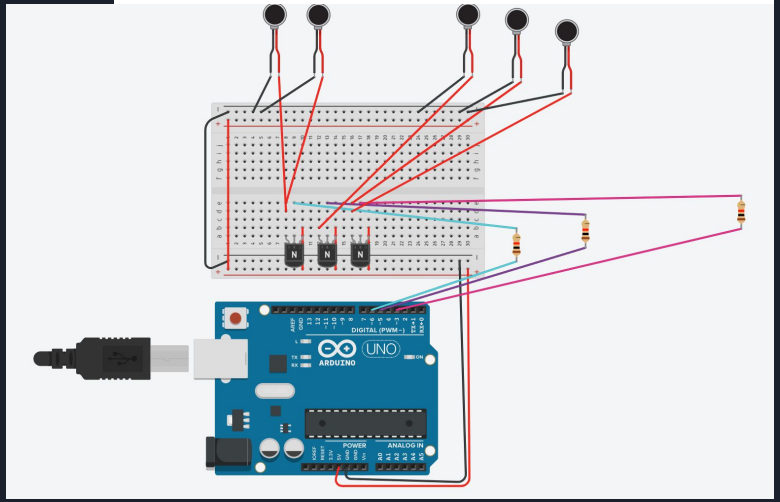
Presenter: Gavin

Arduino Buzzer System



Sequence of events:

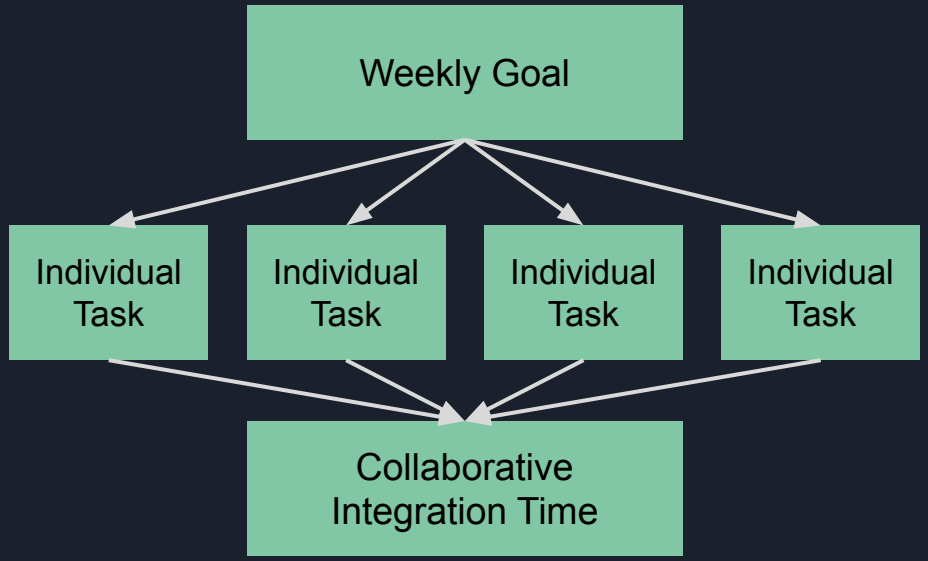
- PMOD BT-2 initializes as master
- When powered, auto connects to HC-05 slave address at specified 115200 baud rate
- Serial connection established, status LED on HC-05 slowly blinks
- HC-05 waits for BT-2 to send commands to activate vibration motors through Arduino based on vertical or horizontal slash



Presenter: Gavin

Planning for Success

- Consistent meeting times
- Constant, quick communication
- Clear expectations on interfaces, library expectations



- Parallel workflows built around board usage

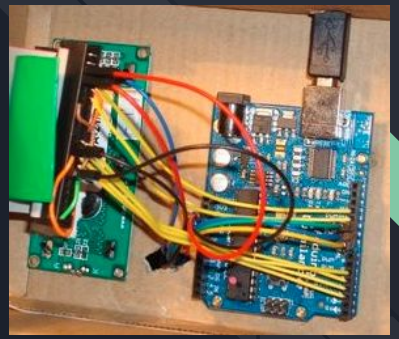
Presenter: Harry

Learnings

- Hands on experience designing around an AXI system
- Designing with large systems / multiple individual code blocks / multiple designers
- What Pulse Wave Modulation (PWM) is and how to implement in via square waves
- Learned how to pair a different bluetooth module to the PMOD BT2
- General hardware design debugging tips
    - Good idea to start over when encountering odd bugs
    - Debugging unpredictable issues
- Working as a team

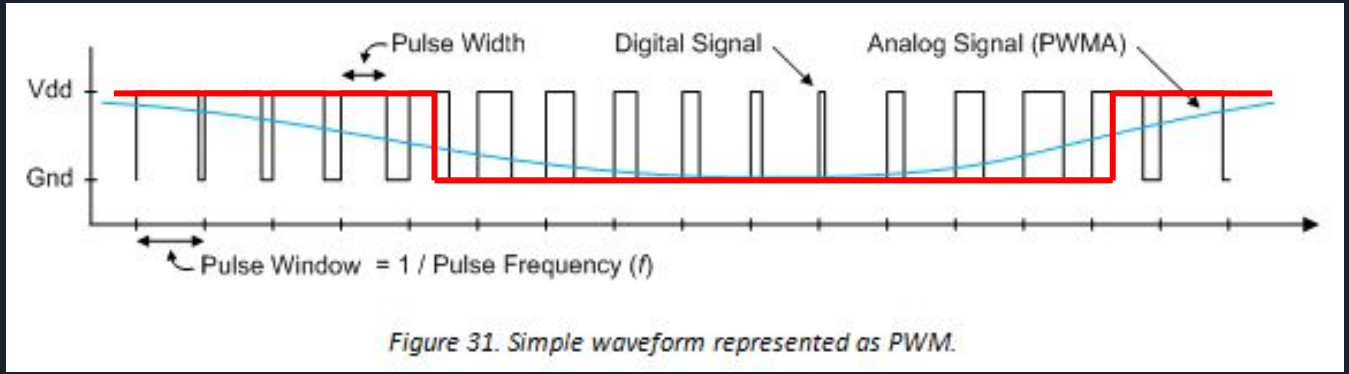
Demo

Prof. Anderson, please attach the device to your neck



Custom Audio Core

- Each note has individual frequency
- Duty cycle needs to slowly increase or decrease
  - Unique to each frequency (note)
  - Calculated beforehand and stored in ROM to avoid messy division during runtime
- Each song is a sequence of notes with a duration



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