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ECE 540/558 Final Project

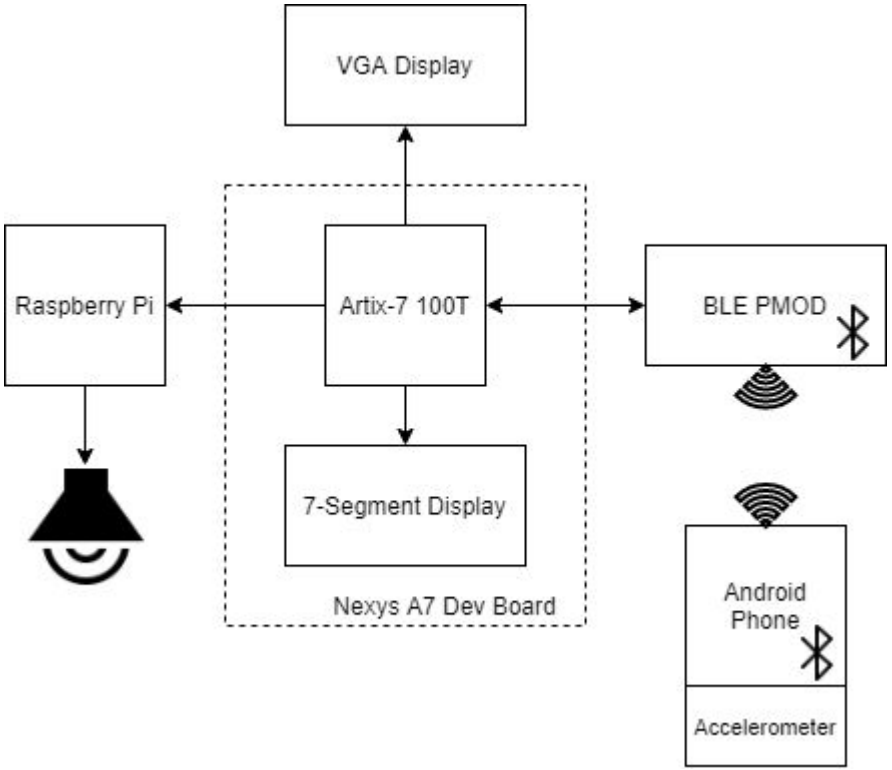
Jump Rope Rhythm Fitness Game

Game Features

Features:

- Measures jumps and ducks
  - More points for well timed ducks and jumps and less points if off
- Gameplay tied to BPM of song, so adaptable to different songs
- Gameplay actions are defined in a simple array allowing easy implementation of new songs and gameplay
- Great for isolated exercise during COVID

Currently Implemented Hardware



Implemented Goals and Features

Level 1

- VGA display
- Button input as “jump” or “duck”
- No sound
- Score keeping on seven segment display
- Start an Android app that measures acceleration data

Level 2

- Android App sending acceleration data over BLE to the game
- Software on Nexys A7 parsing the acceleration data from BLE as jumps or ducks
- Mono audio sounds can be produced
- Nexys A7 can play one full song

Level 3

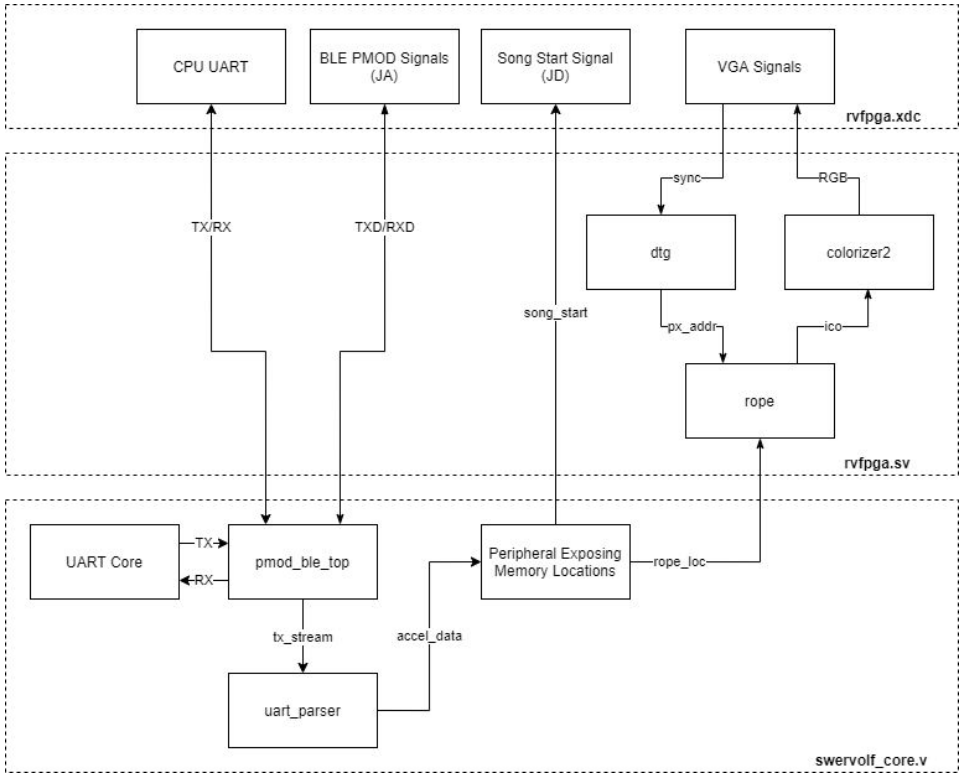
- App allows user to create user profile (□)
- Stereo audio using I2S2 PMOD (□)
- App displays and stores high scores (□)
- Multiple point tiers for critical jumps and duck timing (□)

Not Yet Completed

- Multiple songs to choose from (□)
- More display elements such as point or performance icons (□)
- Android app allows user to preview and select songs (□)
- Game displays high scores after song on screen (□)

□ - *Stretch Goal*

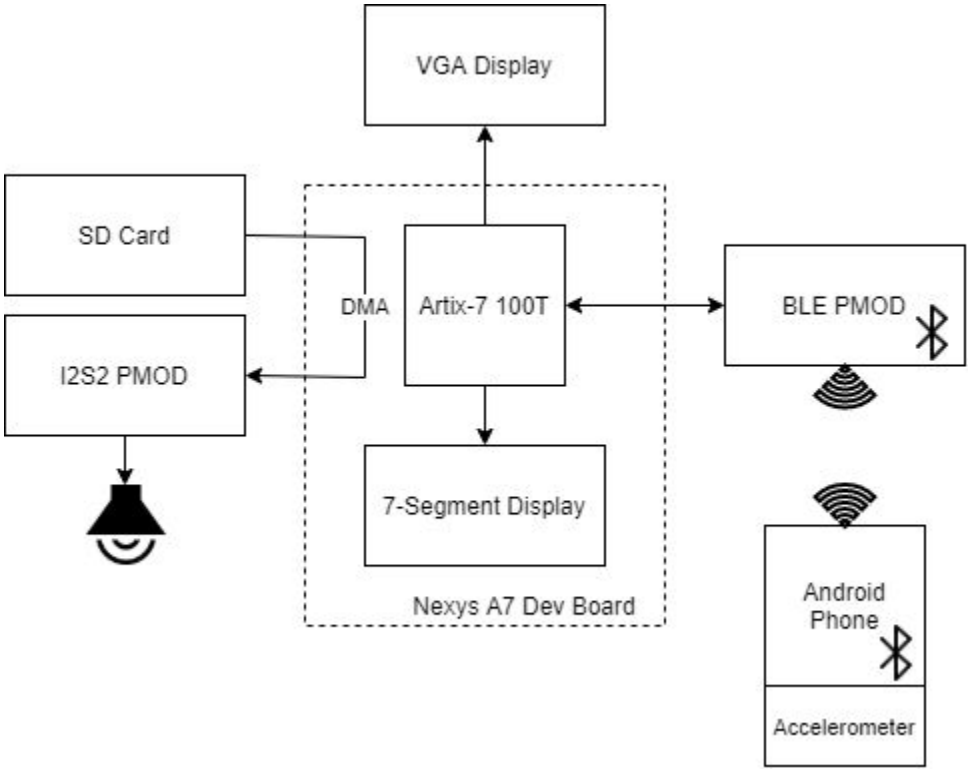
Hardware Module Implementation



Current Issues and Future Work

- Bonding (Pairing) between the Android phone and the BLE PMOD doesn't work nicely requiring manual connection from PMOD side, rather than a completely software initiated connection
- The game doesn't perfectly distinguish between a jump or duck and sometimes still awards points if the wrong movement is done
    - This might be solved with more robust calibration (extracting appropriate thresholds and baselines) prior to game start or better reworking of the algorithms
- In the future we'd like to integrate the on-board audio using the I2S2 module currently being developed

Possible Future Implementation (w/ onboard audio)



Challenges

- Implementing interrupts for the PWM signal
- Transitioning app to using fragments
- Working with BLE in general
- Synchronizing music with the game activity

Demo Video