# ECE532: Air Drum Project

**Group 20**
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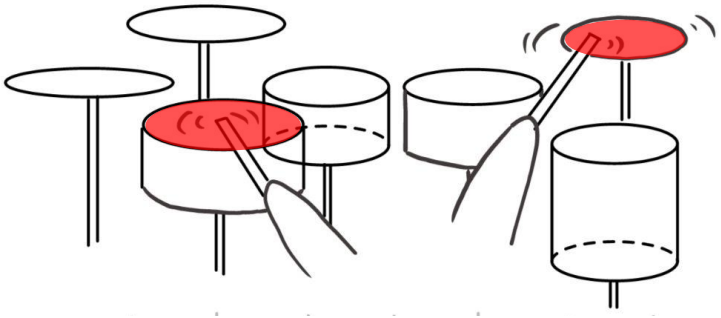
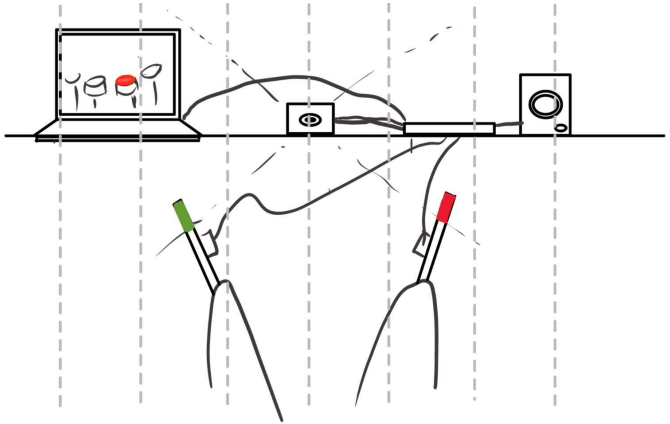
# Overview

- Noise and Spatial :(



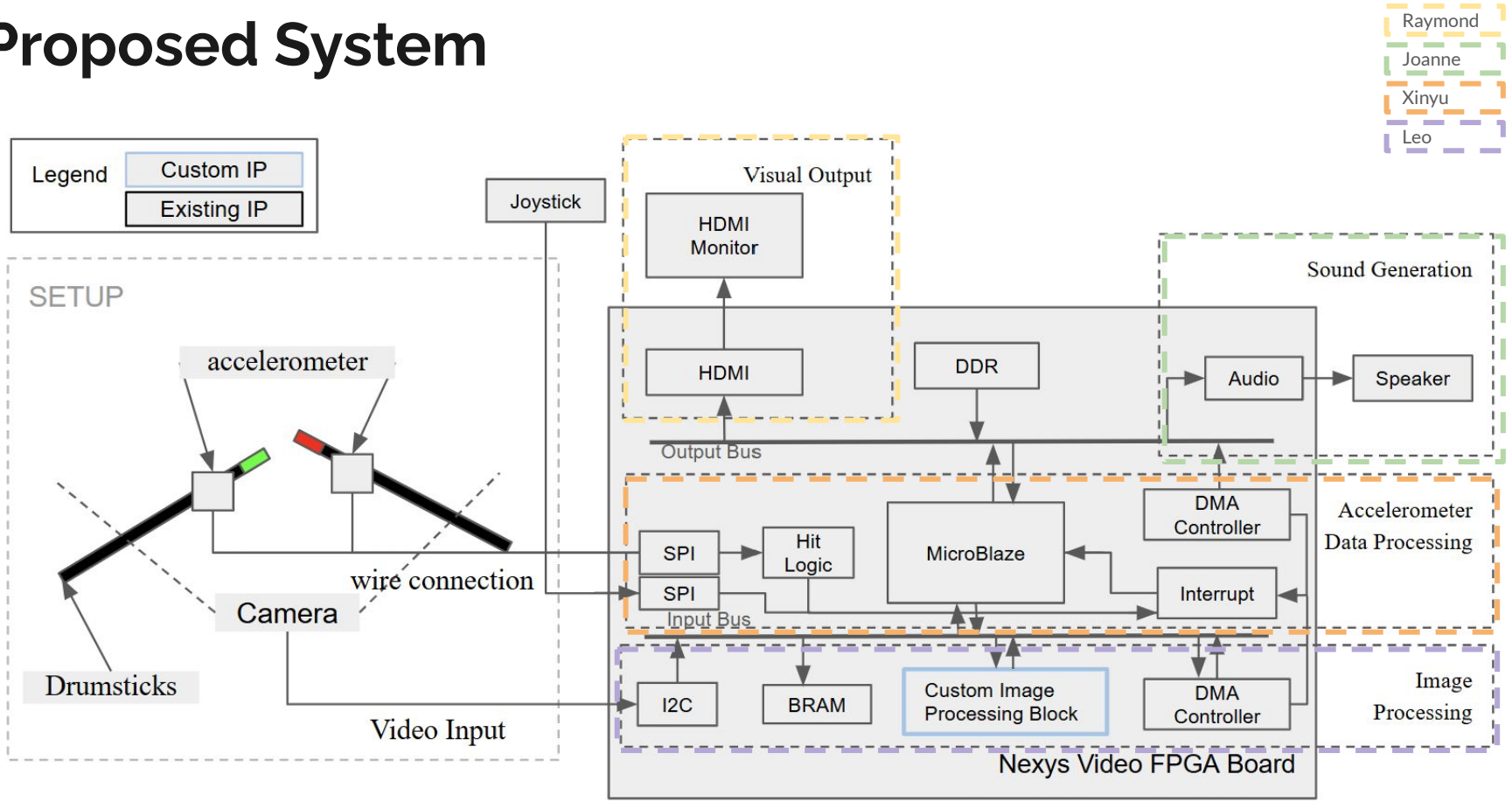
- Hit freely and quietly :)



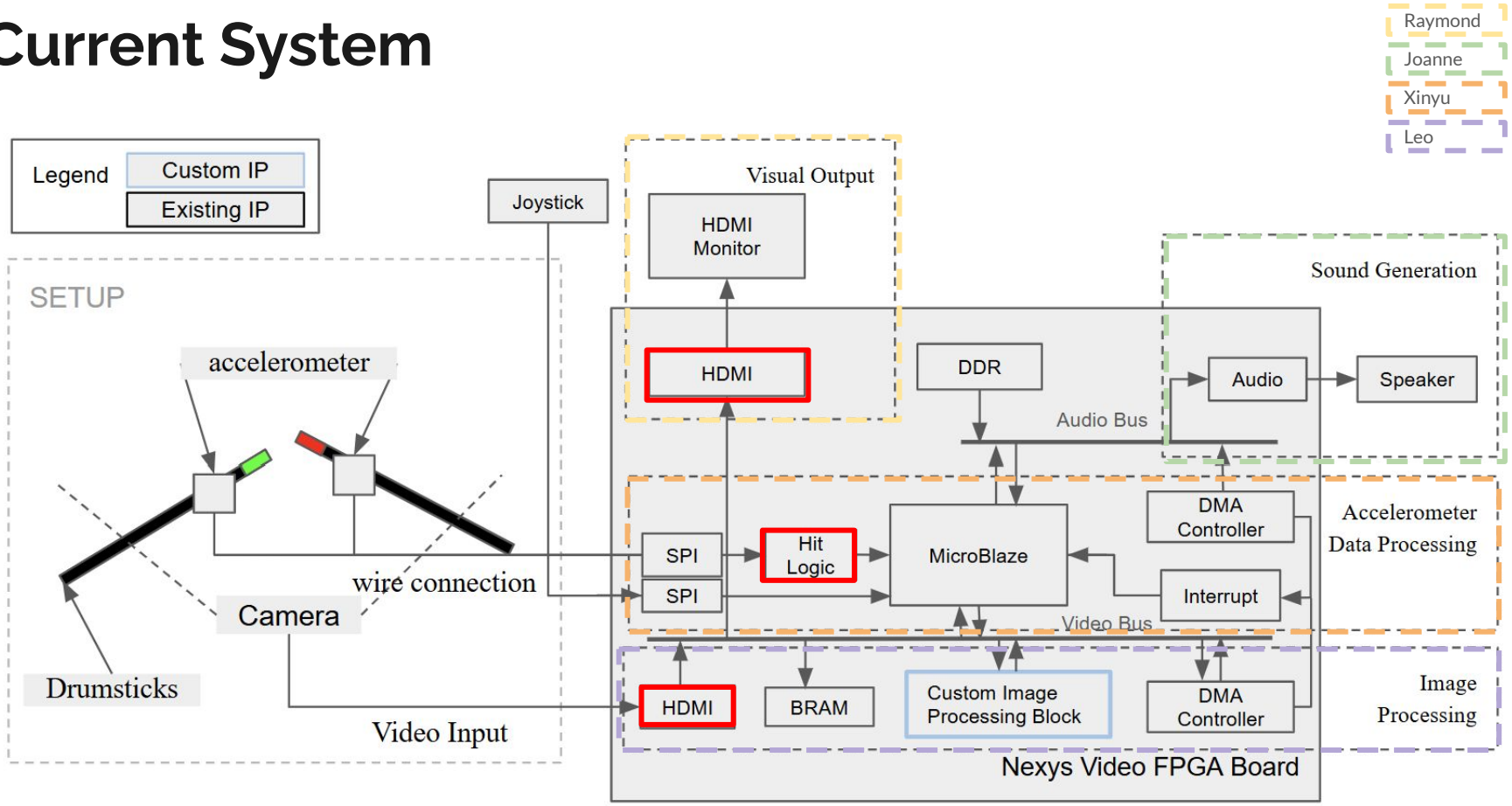
# High Level Description

- 2 accelerometers for hit detection
- HDMI live video input and output
- AR-style GUI with virtual drums and hit animations
- Custom IP for drumstick x-coordinate detection
- I2S audio output for sound effect associated with each drum

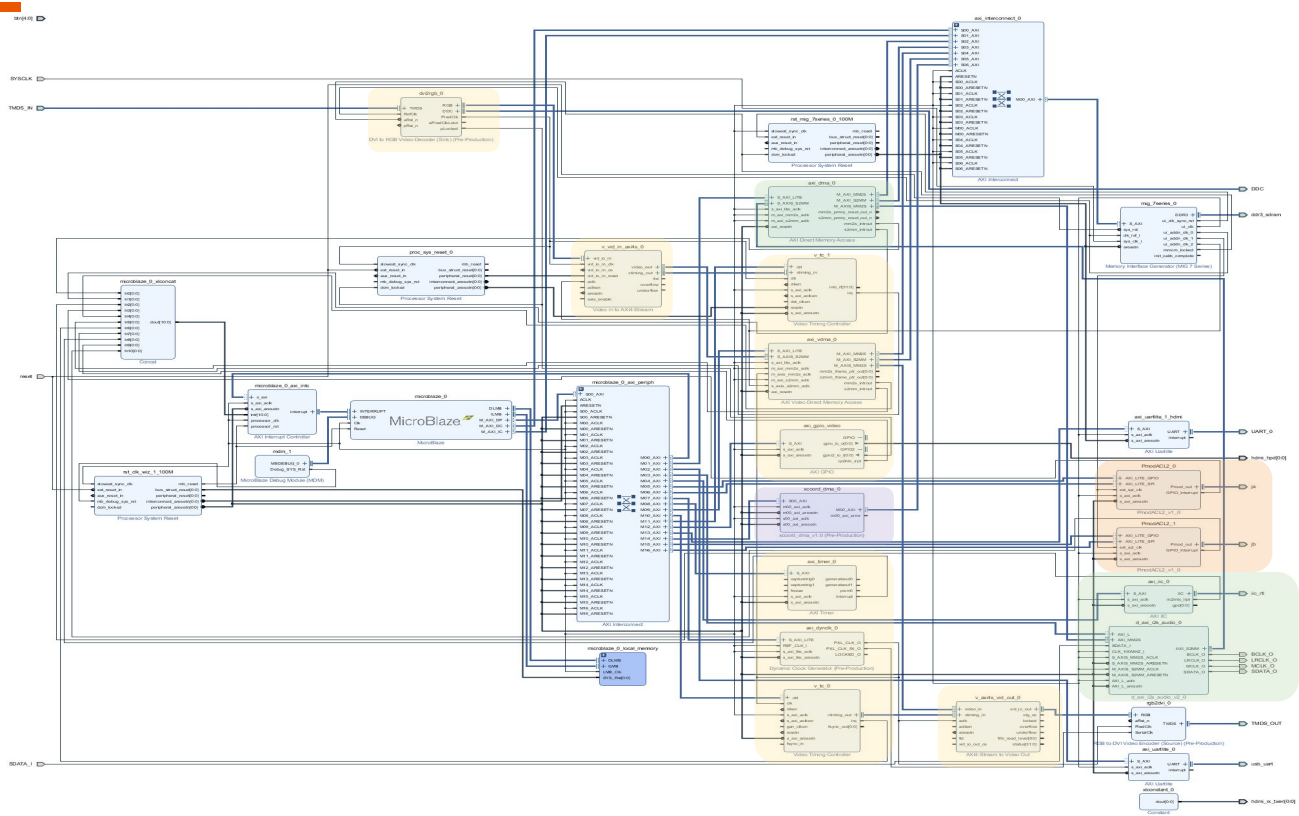
# Proposed System



# Current System

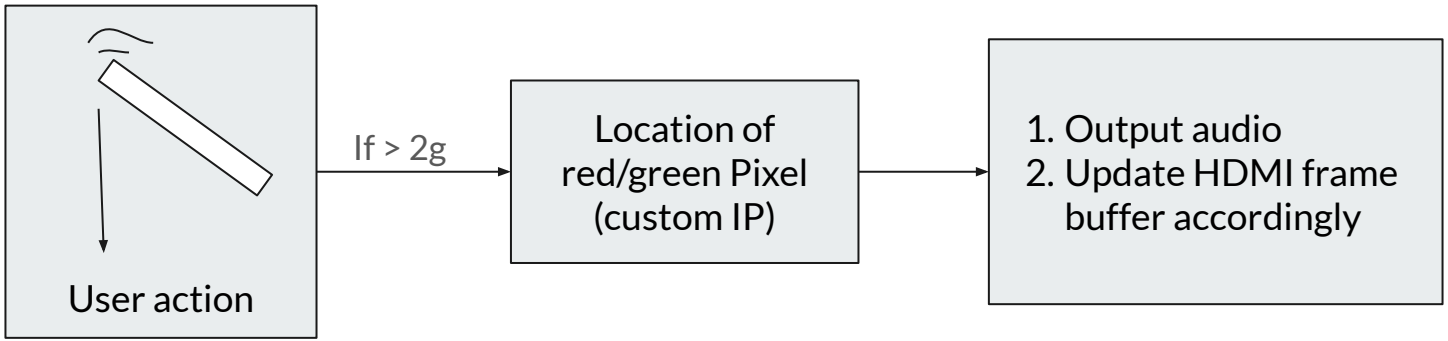


# Block Diagram



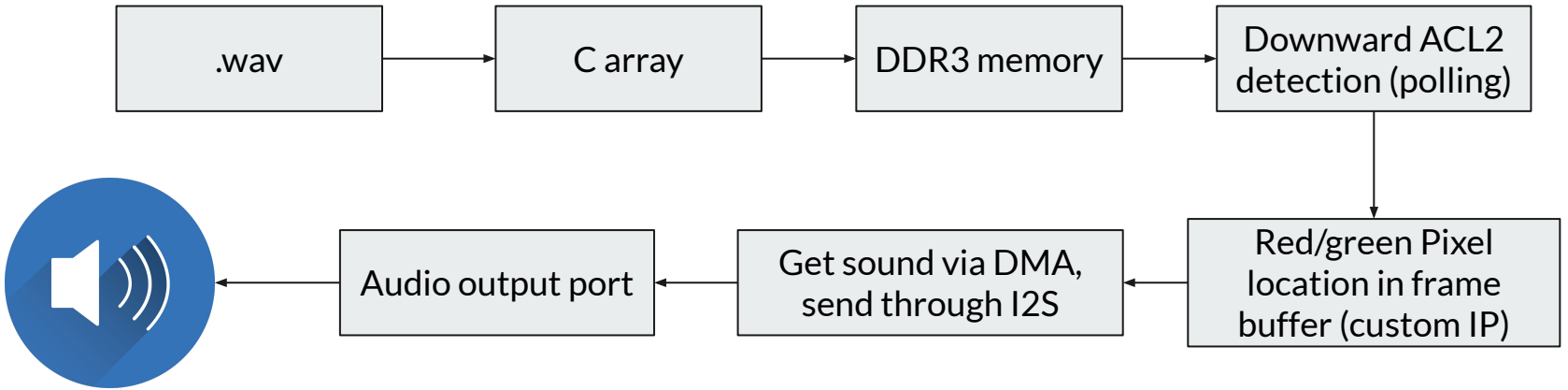
# Accelerometer

- Uses PMOD_ACL2 IP Block (SPI communication)
- Polling to get acceleration data in z-direction
- If the acceleration z > 2g



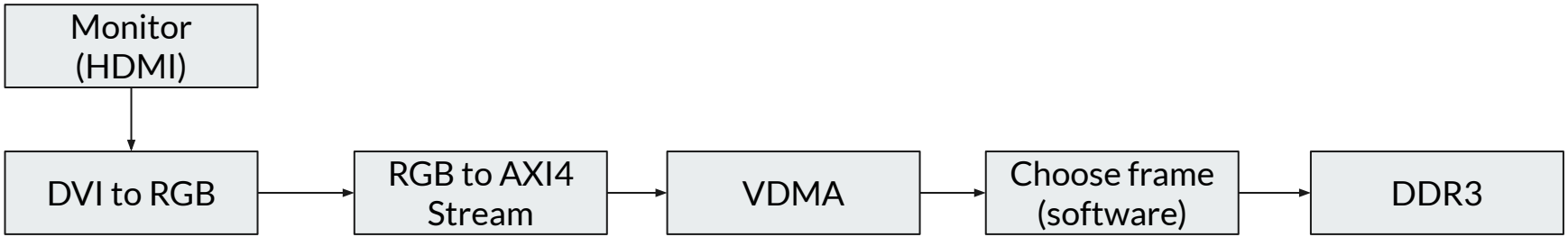
# Audio

- Onboard headphone audio output port
- I2S communication
- .wav to C array
- Dependent on location of red and green pixel on HDMI output, a different sound will be generated



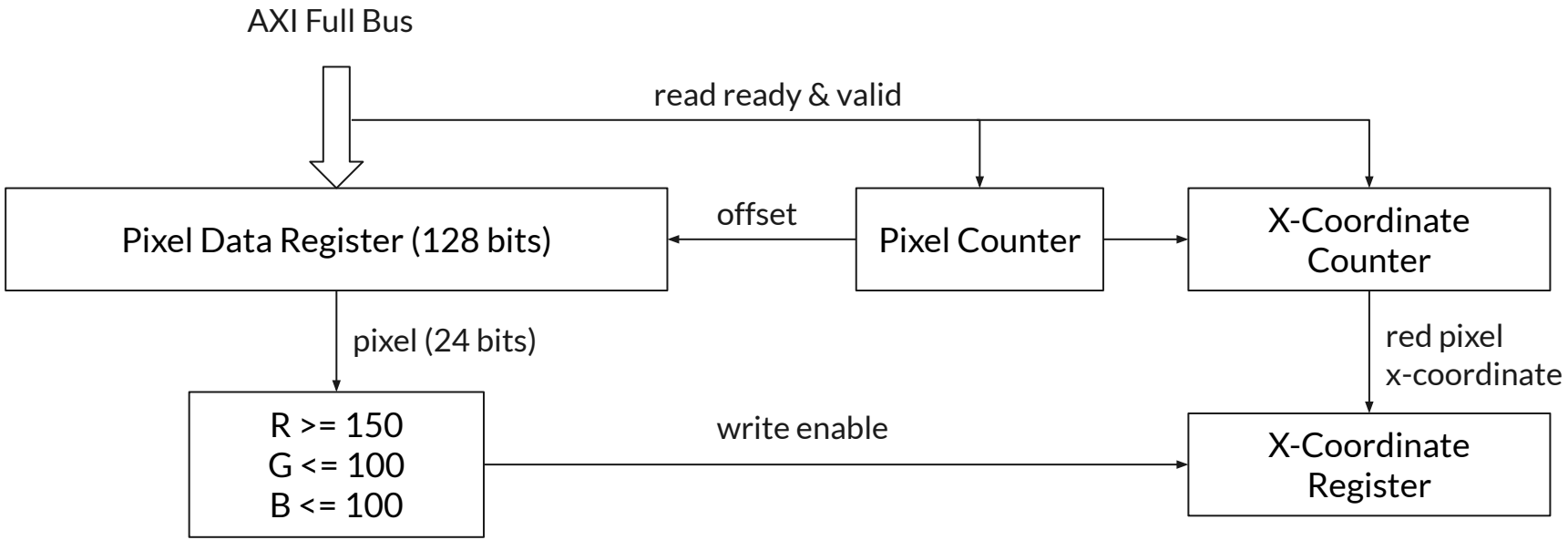
# HDMI

- Input: from Webcam, Output: to monitor
- Switching frame buffer, 3 frames

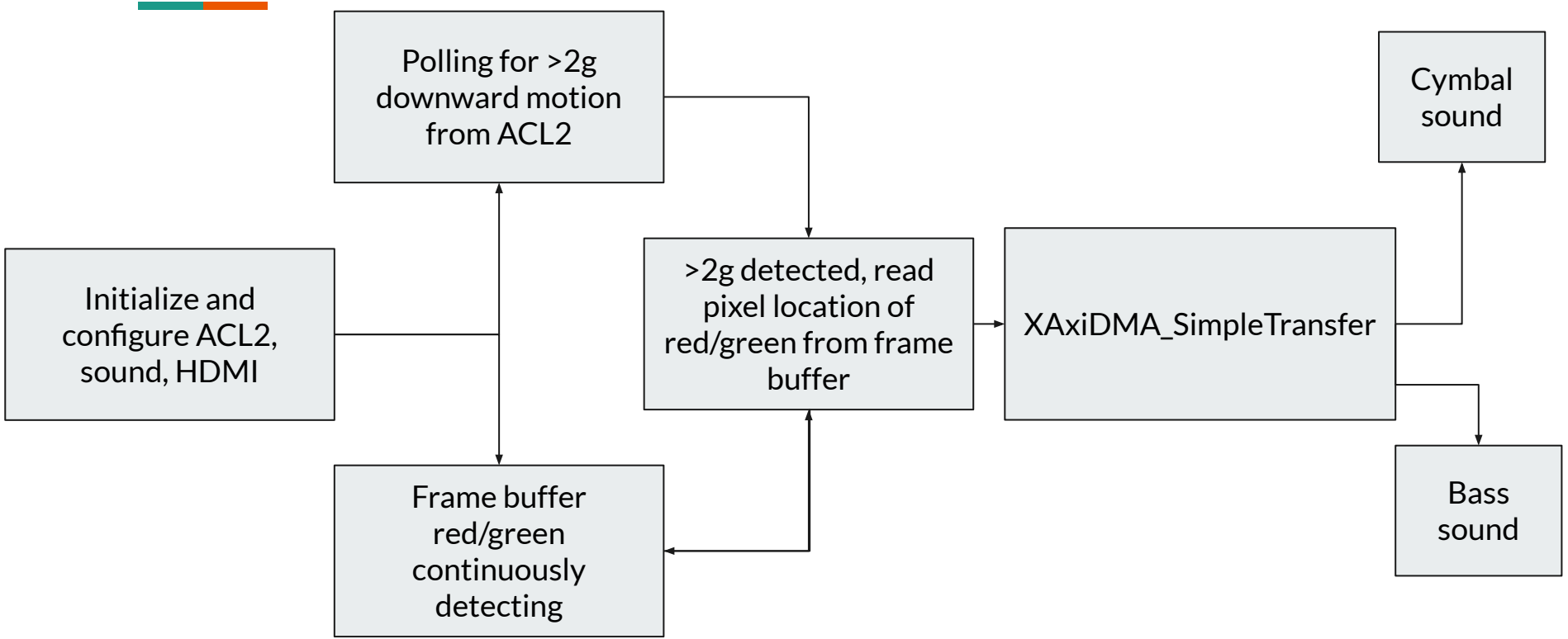


# Pixel Detection IP

- Red and green pixel detection
  - Only red pixel detection explained below



# Software Flow



# Complexity Score

| Component | Number | Complexity Points |
|---|---|---|
| HDMI input | 1x | 1 |
| HDMI output | 1x | 1 |
| SPI accelerometer | 2x | 1.25 |
| Audio output | 1x | 0.5 |
| GUI | | 0.75 |
| Custom red & green pixel detection IP | 1x | 1 |
| **Total** | | **5.5** |

# Future Work

- Delay between hit detection and sound generation
- Increase # of frames that can be switched between
- Increase number of drum sounds
- Output sound buffer data overlay when close hit detected