Virtual Board Breaking

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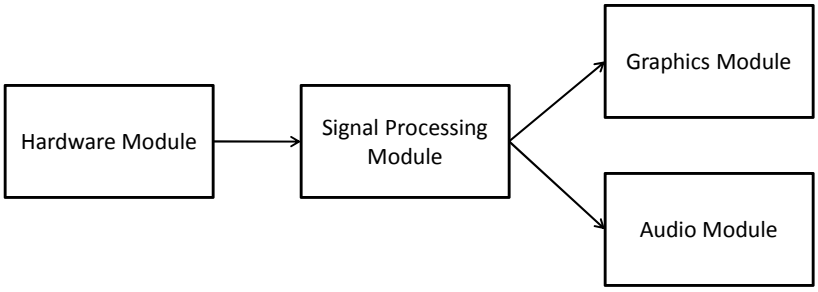
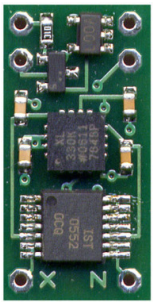
Project Description

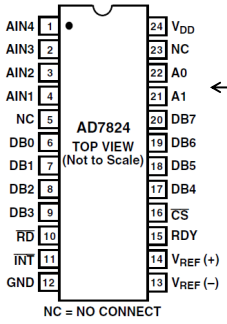
- Overview
  - Simulates board breaking with input provided by the user's punch
  - Provide feedback to the user on force magnitude and final state of the board
- Potential Enhancements
  - Expand use to kicks and head breaks
  - Include difficulty level selection to adjust thickness of the board

Module Overview

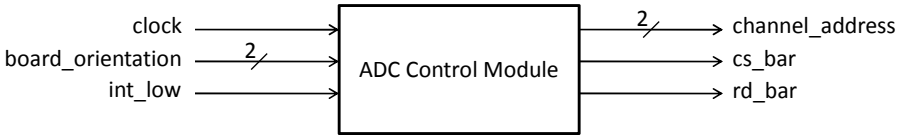


ADC Control Module



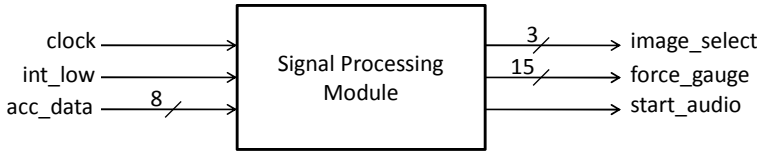


channel address



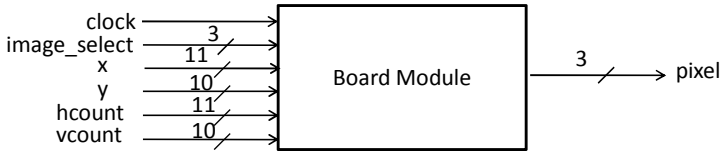
Signal Processing Module

- Keeps track of the maximum acceleration detected
- Integrate the acceleration over a set window of time to determine if the force is large enough to break the board



Board Module

- Displays the image of the board in one of three axes
- Iterates through images to display a board broken
- Store images in BRAM
  - 128 x 256 images (x axis, one for each half)
  - 128 x 32 images (y and z axes, rotated)
  - 4 of each size for animation
  - 4 color bits for each pixel (boards have few colors)



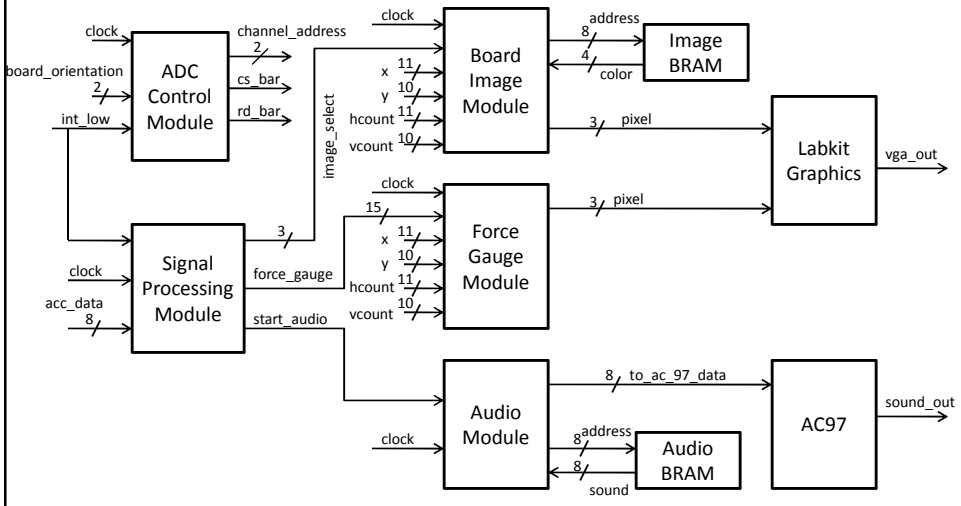
Force Gauge Module

- Implemented as a sprite
- Changes length depending on magnitude of acceleration
- Color gradient: dark -> light

Audio Module

- Uses AC97 module to play back the sound the board break in conjunction with the image for the board break.
- Store audio data in BRAM
  - Length 0.5 seconds, down sampled to 6 kHz

Full Block Diagram



Testing

- Sensor: visually, with an oscilloscope
- Signal processing: input sample acceleration waveforms with ModelSim
- Sound playback, image display, and force gauge magnitude: input sample signal values with ModelSim

Timeline

- Week of 11/15
  - Board image module complete
  - ADC control module complete
- Week of 11/22
  - Signal processing module and sensor mount complete
  - Force gauge and audio modules complete
- Week of 11/29
  - Cross-testing and module integration
  - Add enhancements, time permitting
- Week of 12/6
  - Prepare for checkoff & write report