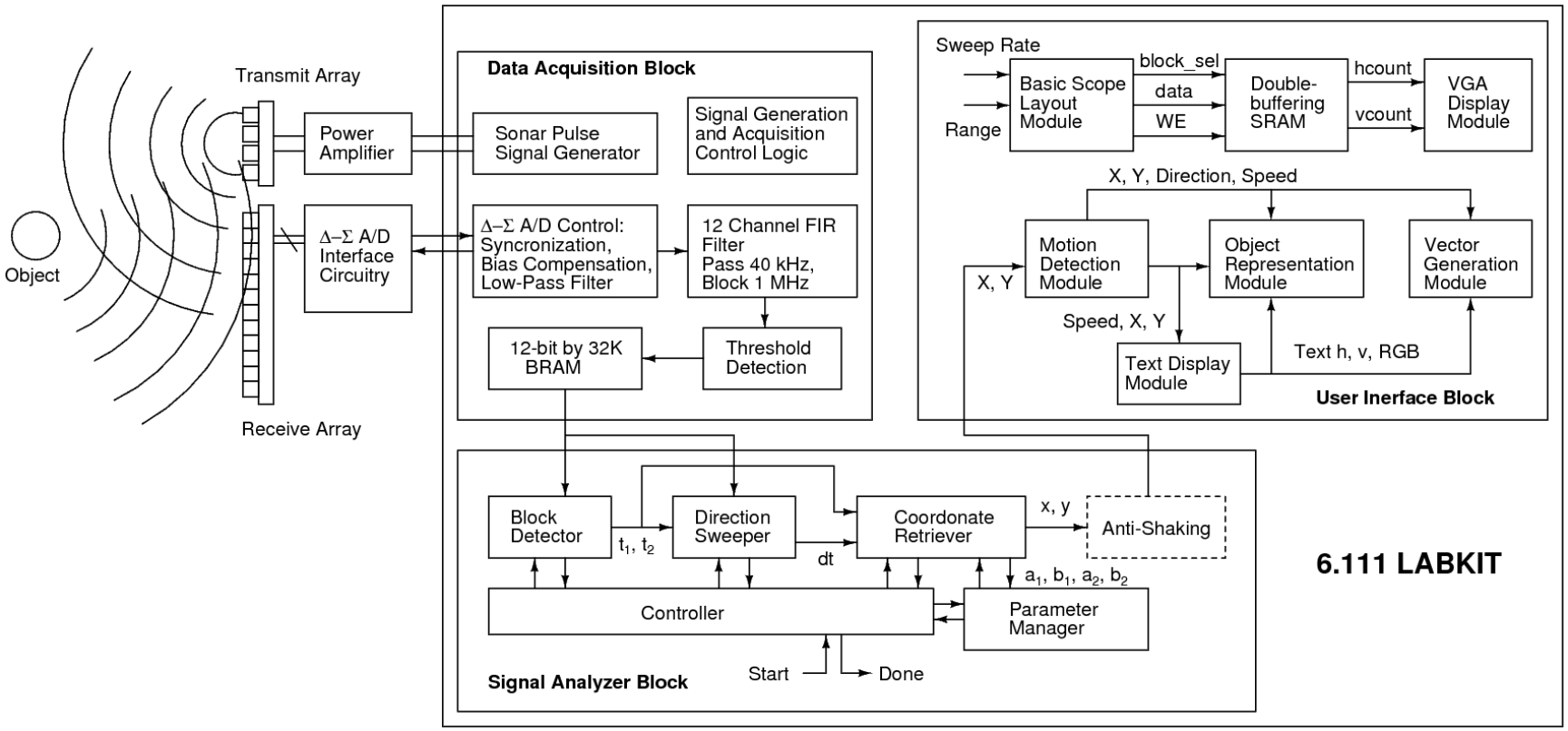
Digital Sonar Project

Brian Wong, Zhen Li, Bryan Morrissey

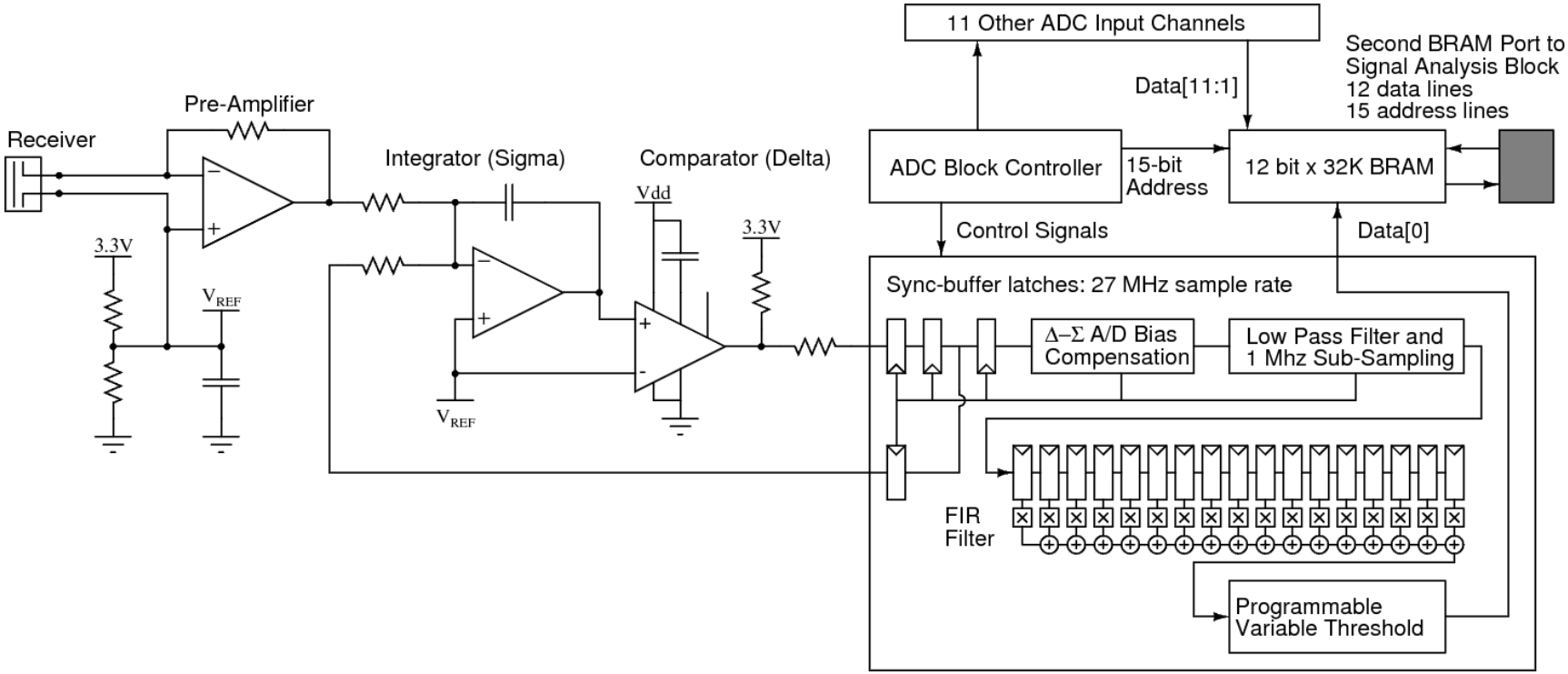
Overview Block Diagram



Division of Labor:

- Bryan Morrissey – Data Acquisition Block
- Zhen Li – Signal Analyzer Block
- Brian Wong – User Interface Block

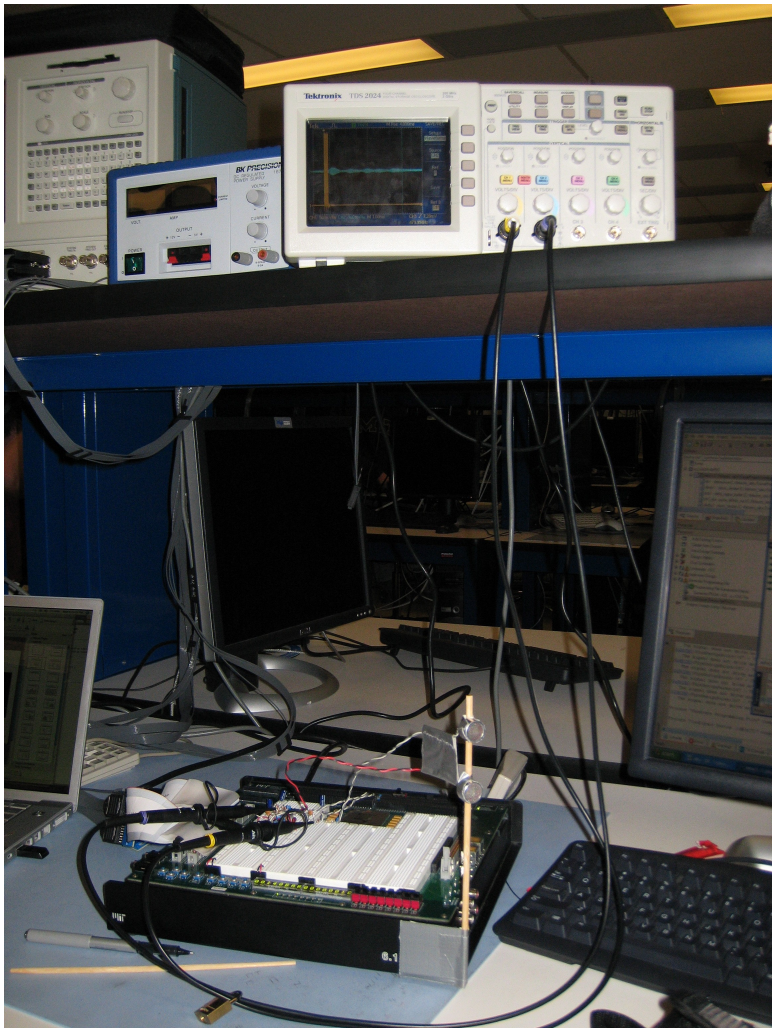
Data Acquisition Block

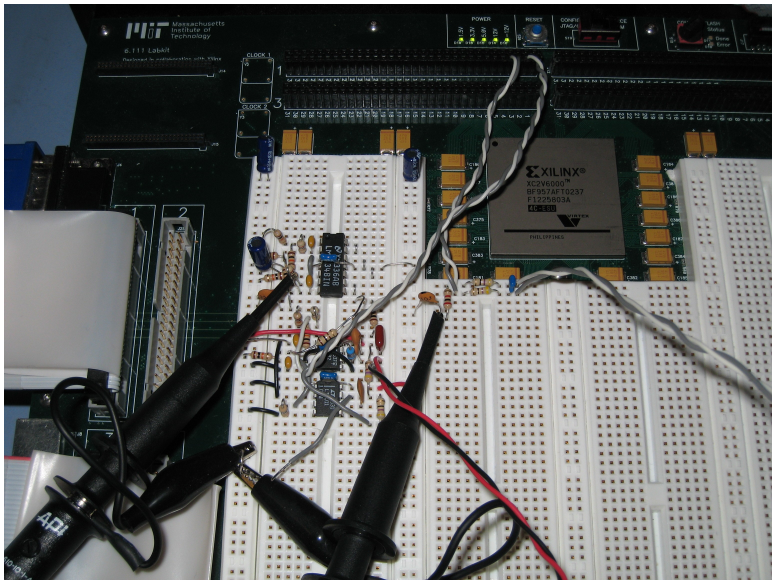


If time permits…

- RS-232 Serial Interface to download raw data
- Alternative raw data display mode

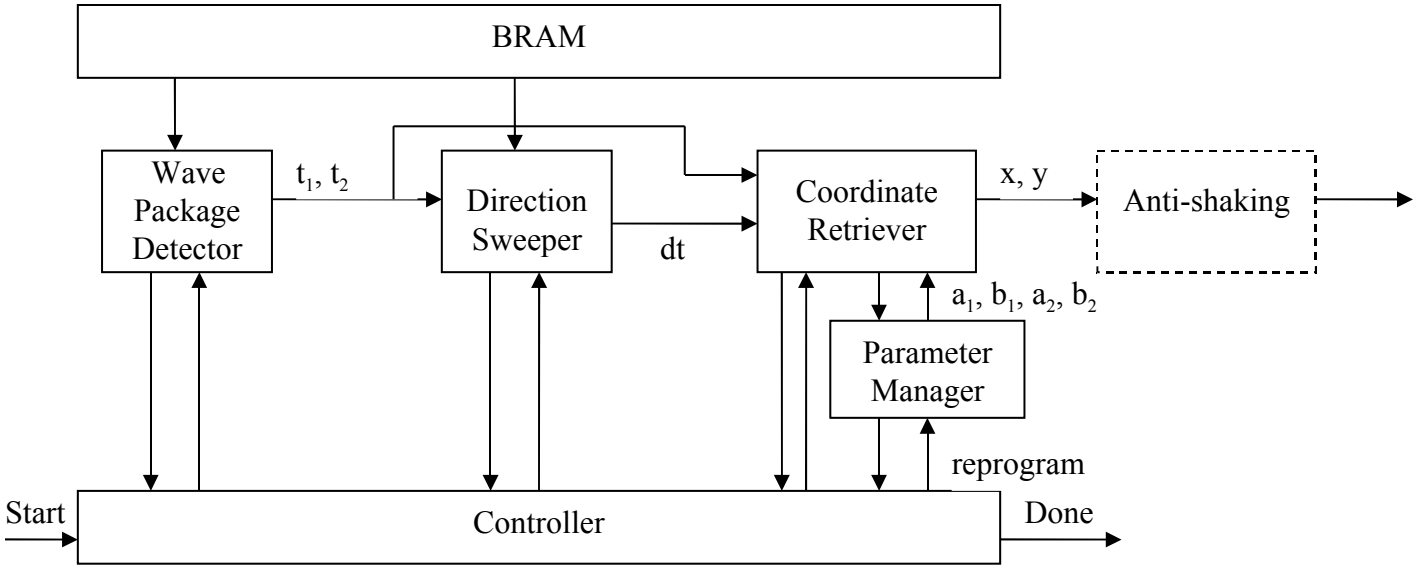
Data Acquisition System





6.111 Digital Systems Laboratory
Sonar Detector Project

Signal Analyzer



Block Diagram

If time permits…

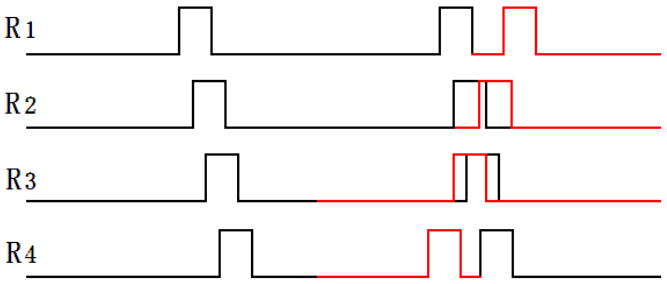
- Anti-shaking
  - LPF for small vibrations
- Width of objects
  - Extract from the width of reflected wave packages

Signal Analyzer

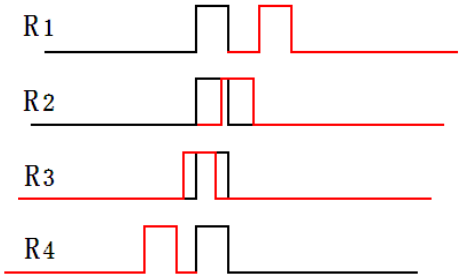
- Wave Package Detector
  - Determine groups of reflected wave
- Direction Sweeper
  - Shift adder, oversampled
  - Peak detector
- Coordinate Retriever

$$r = \frac{v}{2} t_d = a_1 t_d + b_1 \qquad \cos\theta = \frac{v}{d} \Delta t = a_2 \Delta t + b_2$$

- Parameter Manager
  - Normal mode
  - Calibration mode
- Controller
  - Manage ready/done signals



Received signals



Shifted signals (1 block)

Project User Interface

Key Features:

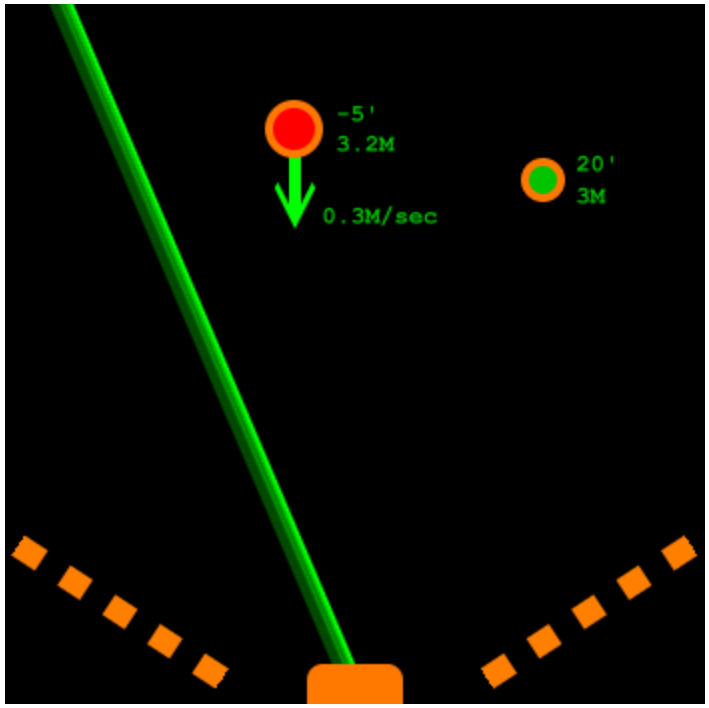
- Angular distance indicator
- Object coloring and size
- Sonar scope simulation
- Sound generator
- Motion detection
- Speed estimation

Testing Features:

- Calibration mode
- Debugging mode for incoming signals

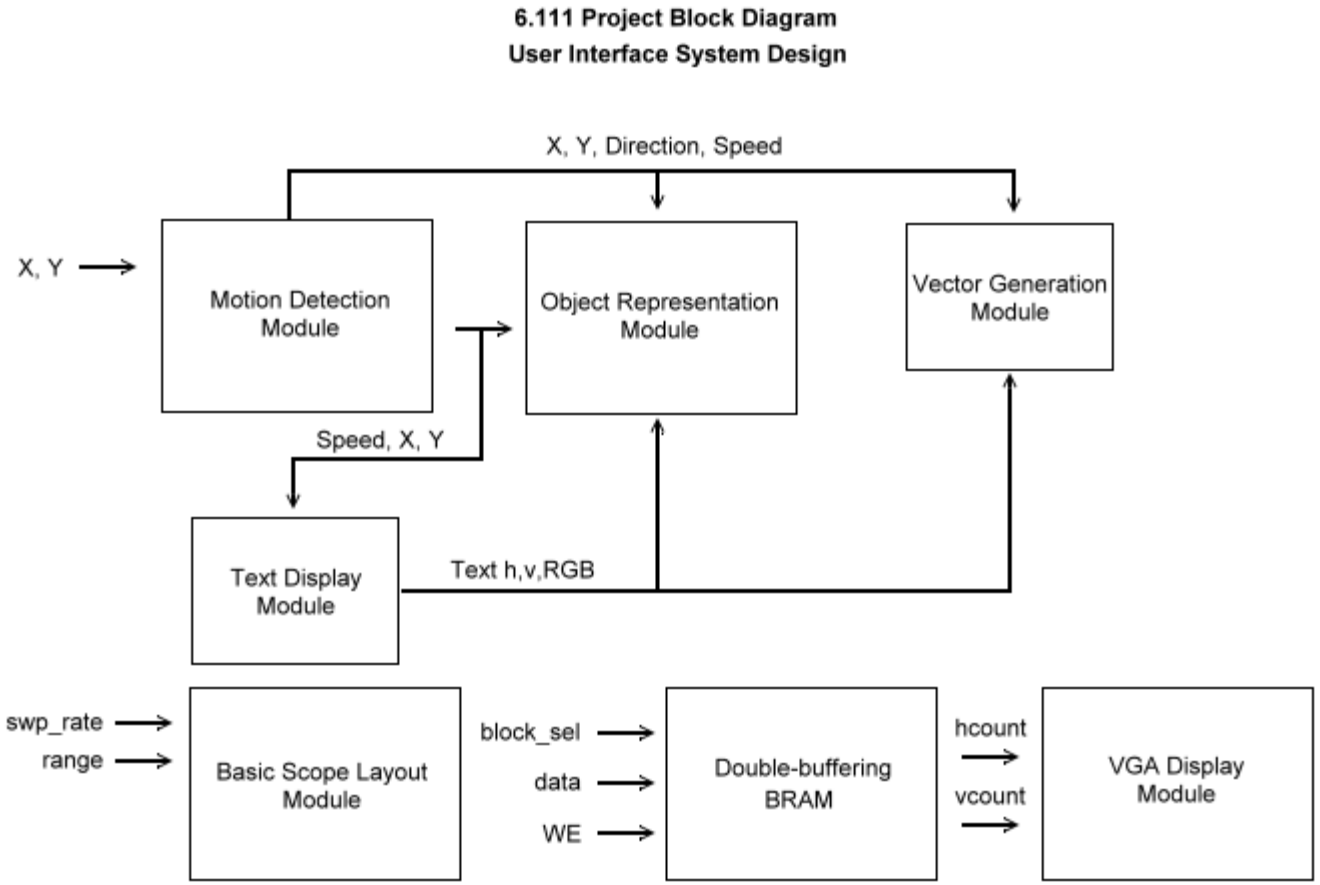
Improvements:

- Object tracking in memory
- Motion alarm



Suggested Look and Feel of User Interface on VGA output.

Project User Interface



Project Timeline

- By Thanksgiving:
  - Brian W: Basic Functional UI for Testing
  - Bryan M: Functional ADC, FIR Filter Code and BRAM buffering, also provide preliminary data to test other modules
  - Zhen Li: Basic Signal Analysis Functionality
- Nov 25 – Dec 1:
  - Module Testing
  - Implement full feature sets as time allows
  - Fabricate full set of interface circuitry
- Dec 2 – Dec 8: System Integration
- Dec 9 -Dec 12: Last Minute Issues