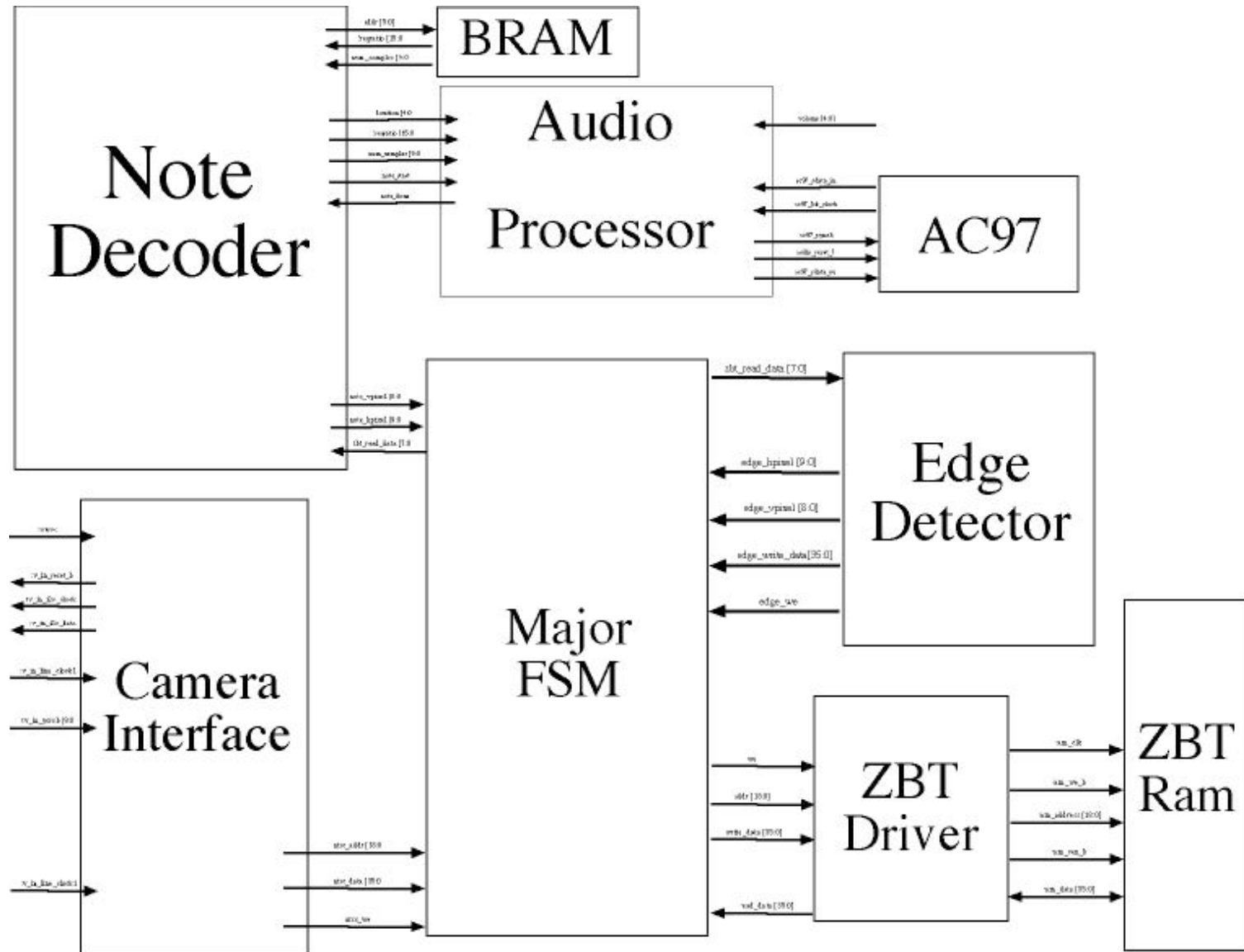


# Digital Player Piano

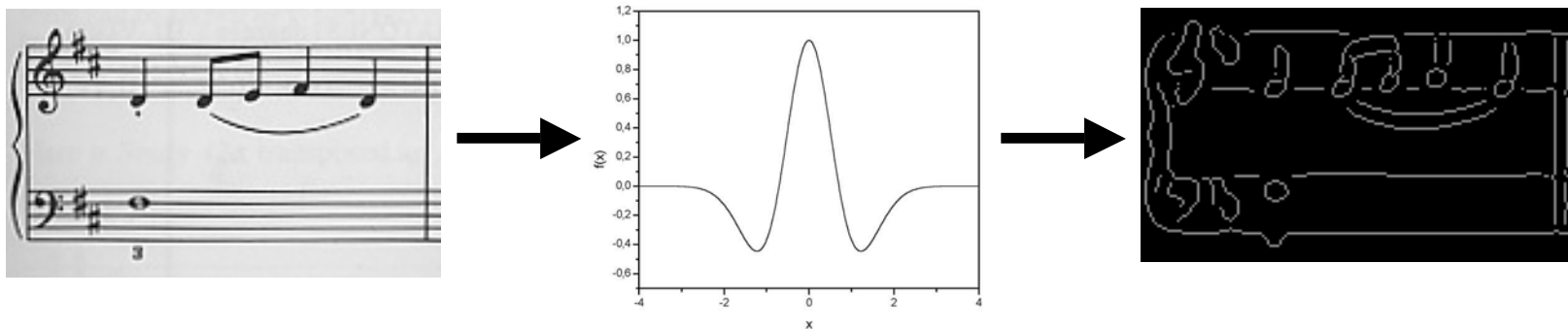
Stephen Chait, Josh Runge

# Overall Block Diagram

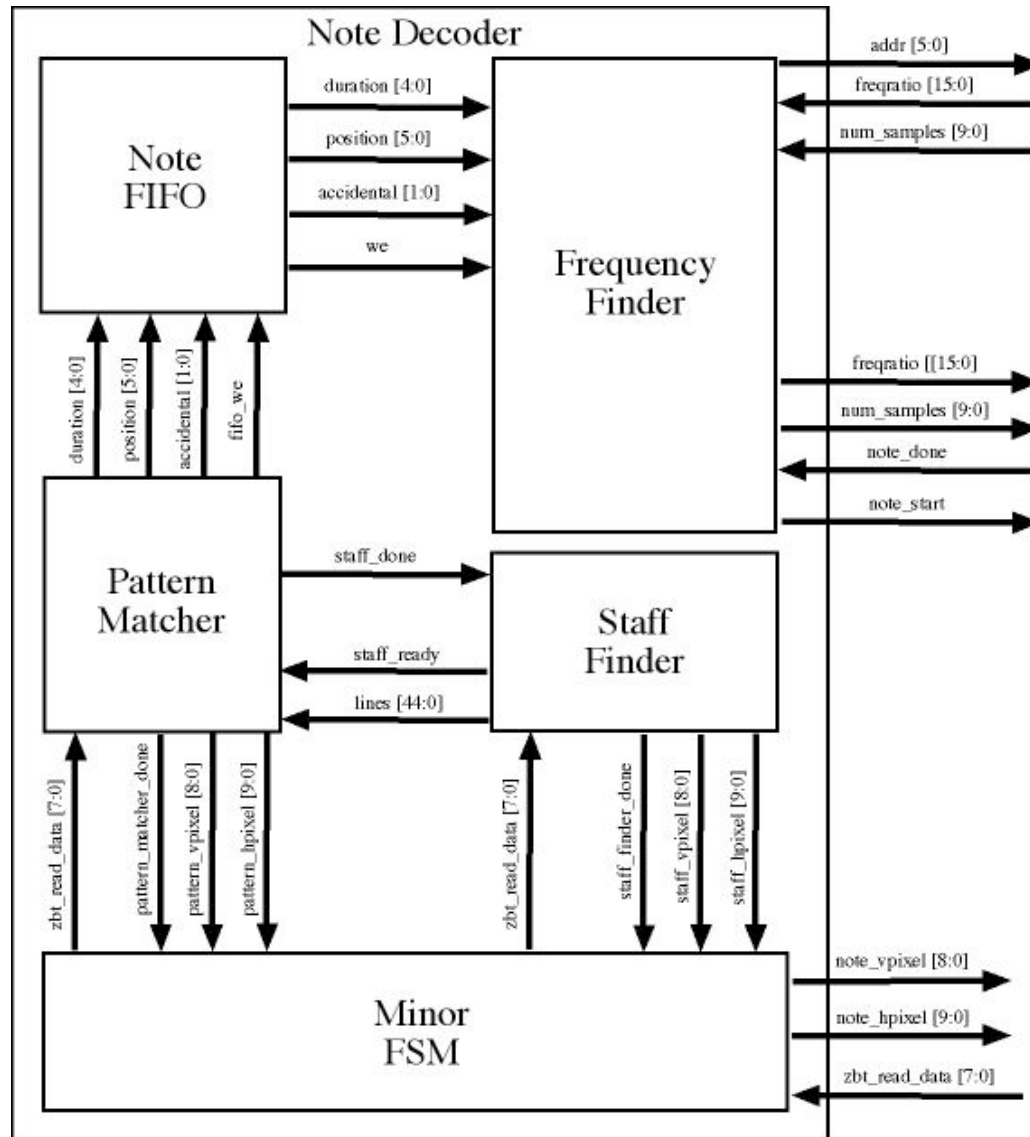


# Edge Detector

- Double-differentiated Gaussian smoothing filter
- Gaussian filter implemented using 16-value lookup table
- 2D convolution split up into two 1D convolutions
- Thresholding identifies values close to 0
- Stores edge data back into the ZBT RAM



# Note Decoder



# Note Decoder

- **Staff Finder**

- Looks for edge data identifying top and bottom lines of the staff

- **Pattern Matcher**

- Identifies notes and rests on staff
- Determines duration and position of each note

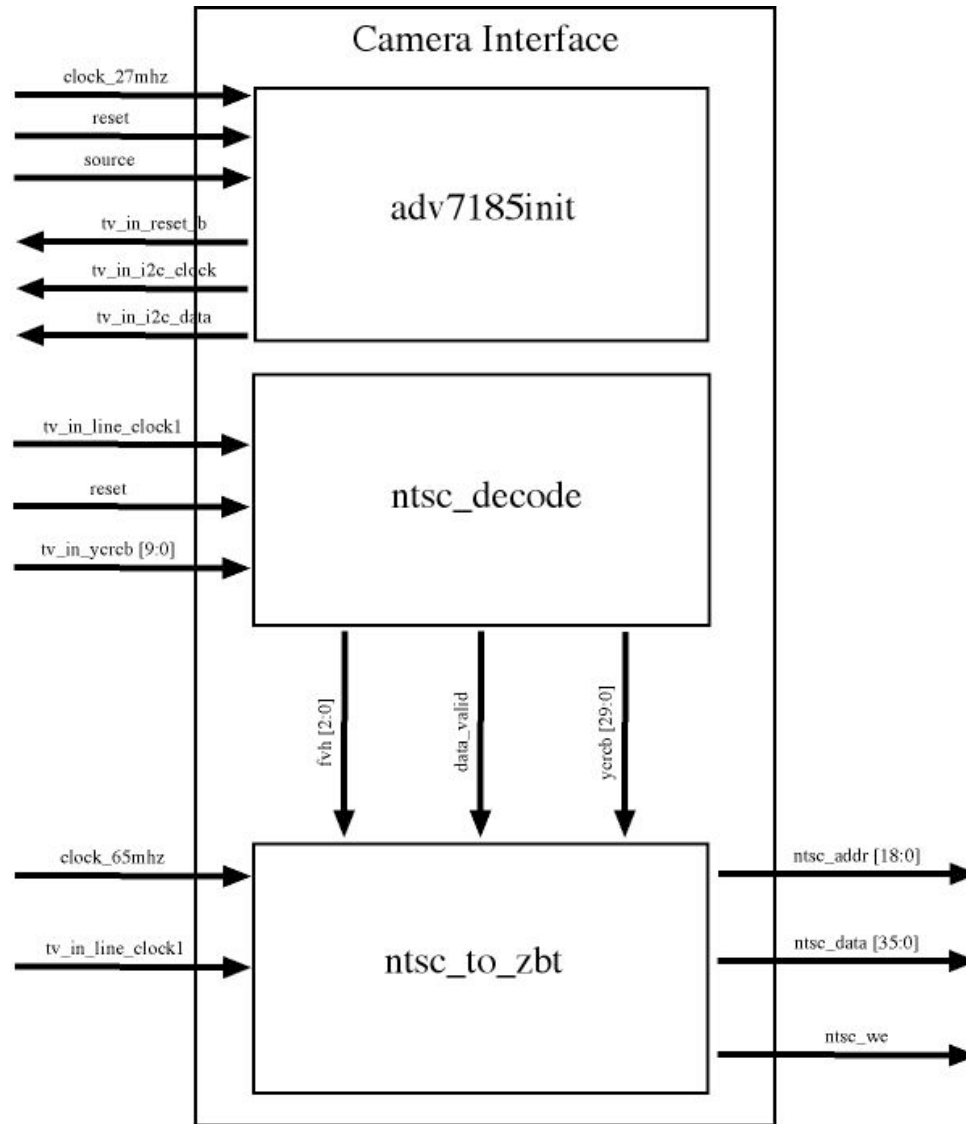
- **Frequency Finder**

- Takes in position data and determines the frequency of each note using a lookup table

# Audio Processor

- Generates sampled sine waves at frequencies specified by Note Decoder
- Sampling rate kept constant at 48kHz
- CORDIC core used to calculate sine values
- User-controlled tempo clock

# Camera Interface



# Camera Interface

- Camera mounted at fixed distance from sheet music
- ADV1785 chip converts camera output to NTSC
- NTSC decoder handles interlaced data and outputs raster YCrCb values
- Image stored as 8-bit grayscale values in ZBT RAM



# Milestones

- Audio Decoder finished by presentation
- Edge Detector/Note Decoder finished by Monday after Thanksgiving
- Use remaining weeks to connect modules, test, and debug