Goal: Real-time conversion of monophonic music, input via microphone, into conventional sheet-music format

- Input: Audio, user-defined clef/tempo/time signature
- Output: Multipage XVGA Display of sheet music

- Features:
  - Transcribe any solo performance
  - Onboard metronome
  - Intelligently displays music in traditional sheet-music format
  - Can be used with a wide range of monophonic instruments
1024-sample BRAM fills up initially then rewrites over itself as new samples come according to Address manager/Activator (port 1)

Counter alerts the FFT to incoming data, and supplies the read_addr necessary to retrieve the audio data (port 2)

Counter cycles through all 1024 locations of the BRAM
Tone Conversion

- Finds point of greatest magnitude in FFT signal
- Takes index of greatest magnitude and calculates its frequency
- Looks at greatest magnitude and decides whether it is loud enough to be a note
• On the change of char_freq, Incrementer cycles through all predefined frequencies of notes
• TSAD examines the difference between r_freq and char_freq, finds the best-matched (smallest difference) predefined frequency and loads it into the register
• The Frequency to Tone ROM outputs the corresponding note & octave to the score converter module
Score Converter Function

- Has enormous free time with which to analyze FFT (1ms)
- Records exactly as played, down to the 1/32nd
- Waits until the millisecond marker to report a completed score_element
Display

Screen layout (1024x768 pixels)
Slice dimensions (32x140 pixels)
Some note sprites (32x50 pixels)
Artist_module detail
Frame Buffer Detail

- **Frame_buffer**
  - ZBT 32 x 512k
  - Only use 32 bits because 1924%32 = 0

- **Video Output**
  - Outaddress = f(vcount, hcount, 32)
  - Phsync = vsync
  - Psync = vsync
  - Plank = blank
  - Pixel = outreg[f(vcount), 32]
  - Count loops from 0 to 31, increments on posedge clk
    - If count = 30 busy = 1
    - If count = 31 outreg = data

- **Outreg** = 32 bit shift register

- **Video Input**
  - Inaddress := f(slice_x, slice_y)
  - If busy = 0 data := slice_pixels
  - If busy = 0 we := 1

- **Buffer_manager**
  - Controls access to ZBT

- **ZBT holds all all pixel values**
Optional Features/Expansions

• Additional methods of pitch-detection, to ensure accuracy in determining the note and octave
• Synthesized playback of recorded scores
• The option to input notes directly from a keyboard or midi cable
• A graphical mouse driven interface to replace the input switches
• The option to write a midi file containing the score to a flash memory card.