The Beep Boop

9000

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What Is It?
What It Does

- Audio suite that allows for looping, synthesis and multi-track playback
- The commitment: multi-track playback, fundamental frequency identification, preset instruments
- The goal: learning synthesizer
- The stretch goal: real-time instrument conversion
GUI

- **3 Sections:**
  - Status Bar
  - Mode
  - Tracks

- Mouse Integration

- Drop-down menus

Enter Track Name: _
Data Management
Data Management

- BRAM
- SD Card
- Storage Items:
  - Audio
    - Frequency
    - Magnitude
  - Coefficients
  - Names
FFT and Fundamental Extraction

Flow:

1. ADC - 20kHz
2. FIR - Low Pass Filter
3. FFT_IP - 500Hz
4. Fundamental Finder
5. Learner
FFT and Fundamental Extraction

Base:

- Single note identification
- Maximum bin for fundamental identification
- Assuming ideal harmonic structure

Extended:

- Gaussian convolution for frequency identification
Coefficient Adjustment and Waveform Reconstruction
Coefficient Adjustment and Waveform Reconstruction

- Uses harmonic coefficients that correspond to a particular instrument to turn a fundamental into a textured sound
- Main challenge will be optimizing the IFFT
- Phase offsets for harmonic waveforms
- Artifact of FFT/IFFT frequency
Timeline

Week 1: Demonstrate input and output from FFT and IFFT

Week 2: FFT/IFFT from jack in, fundamental identification

Week 3: Instrument learning, integration/debugging

Week 4: More time for debugging, stretch goals