FPGA DJ

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Project Overview

System to custom process and mix audio signals in real time

Two audio inputs, single stereo audio output

Interactive user interface for custom settings

LED status display
Major Modules

Processing Module - Frequency and Time Submodules

Mixer Module

Visual Display Module

Control FSMs - High Level, Processing, and Mixer
Processing Module - Frequency Submodule
Processing Module - Frequency Submodule

Obtain frequency data: 7 FIR filters (31 tap)
Perform custom equalization
Output frequency data to mixer
Processing Module - Time Submodule

Perform time based processing effects - Echo, chorus, swell

Requires signal information for wide swath of time ~ 35ms

Effects implemented using feedback/feedforward techniques

Requires 18 bit adders
Mixer Module

Input 2 processed audio signals

Output weighted addition of inputs

Modulate volume of one audio signal with respect to a specific frequency of the other audio signal

Perform time based processing effects on synthesized signal

Output to stereo speakers via RCA on labkit
Visual Display Module

- Receives control inputs from the High Level FSM
- Takes volume and frequency data from the Mixer Module
- Controls LED matrix built upon labkit breadboard
- Creates visual patterns such as frequency spectrum analyzer
Control FSMs

User inputs are sent to modules through FSMs.

- High level FSM acts as a router, changing the destination of inputs.
- Processing FSM will allow for parallel time and filter changes.
- Mixer will alter how the signals blend/influence final output.
Stretch Goals

Additional time based effects: Phaser and flanger

Storing sounds to memory for user to add to audio output.
### Timeline

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<th>Task</th>
<th>Week of 10/26</th>
<th>Week of 11/2</th>
<th>Week of 11/9</th>
<th>Week of 11/16</th>
<th>Week of 11/23 (Thanksgiving)</th>
<th>Week of 11/30</th>
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<td>Audio In/ Stereo Audio Out</td>
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<td>Design Filtering Techniques in Matlab</td>
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<td>FSM to select effects (ongoing)</td>
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<td>Implement and Debug Mixer Module</td>
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<td>Stretch Goals</td>
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