Project Checklist: FPGA DJ
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Commitment:
- Single audio input - AC97
- Stereo audio - AC97
- Selective filtering - Frequency Module+FSMs
- Two audio based effects - Time Module+FSMs
- Simple Visual Display (1 effect) - Visual Display Module
  - controlled by volume
- Volume Control - AC97
- It should be fun

AC97 Module: Alex

The AC97 modules presented in Lab5 will be modified to allow for stereo audio via the RCA inputs of the labkit. In addition, the audio will be taken as 18-bit audio for additional flexibility in processing.

Time Module: Alex

The time module will take the 18-bit stereo audio signals and, in conjunction with the FSMs, be capable of passing the original unedited signal, a single-echo modified version or a recursive-echo modified version for frequency processing. This will be demonstrated by listening to the modified audio. There will be no delays or other audible effects during transitions.

Frequency Module: Madeleine

The frequency module will be capable of amplifying a user selected frequency range while attenuating all others. We will select the effects on the labkit and demonstrate the filtering effect on the audio through speaker output. There will be no delays or other audible effects during transitions.

High Level FSM: Alex

The high level FSM will select between the frequency and time FSMs. We will demonstrate its function by switching between states, such that the user can alternate between selecting frequency effects and time effects on a single labkit.

Visual Display Module: Alex
A 6x5 LED matrix will display the current volume of audio playing through the system.

Goal:
Commitment++
- Dual audio input - Two Labkits + AC97
- Three audio effects - Time Module + FSMs
- Weighted Equalization using filters - Frequency Module + FSMs
- Mixer (utilizes second labkit) - Mixer Module + Transmission Module
- LED display - Visual Display Module
    - spectrum volume display
- It should be more fun

AC97 Module: N/A

The AC97 module will be identical to the AC97 module in our commitment section, but will be instantiated on two labkits instead of just one.

Time Module: Alex

The time module will be further developed to include functionality for chorus, requiring a second instantiation of BRAM or other complicated mechanisms due to the inherent difference of delay between chorus and echo. This will be demonstrated via the modified audio.

Frequency Module: Madeleine

The frequency module will be capable of all effects described in the commitment section, but will also be capable of equalization - the weighted addition of the various frequencies bands to the original signal to produce effects such as amplifying the bass. It will have an FSM that enables the user to select the effects desired on the labkit.

High Level FSM: Alex

The high level FSM will be capable of switching between the frequency and time FSMs as described in the commitment section. It will additionally be capable of selecting between the mixer module FSM and visual display module, such that the user can interface with all four of these modules individually.

Mixer Module: Madeleine

The mixer module will be capable of mixing the two processed audio signals via weighted addition. It will have an FSM that enables the user to select the effects desired on the labkit. This module will be instantiated on only one of the labkits, but will receive inputs from both labkits.

<u>Transmission Module</u>: Alex

In order to obtain the processed data from the second labkit a transmission/receiver module pair will have to be developed. This will require dealing with two separate clock domains and ensuring good transmission quality between the kits. This will be demonstrated by inputting audio into one labkit and playing it out of the other labkit.

<u>Visual Display Module</u>: Alex

The visual display module should now be capable of both displaying volume levels as in our commitment section as well as frequency spectrum data. Specifically, along its 6 columns, the volume of 6 frequency bands should be displayed in real time independent of each other's volumes.

Stretch:
- phaser and/or flanger - Time Module
- prerecorded sounds stored to memory - Sound Access Module
- more exciting visual display - Visual Display Module
    - spectrum analyzer with decaying visual effect
- It should be the most fun

AC97 Module: N/A

The AC97 module will be identical to the AC97 module in our goal section.

Time Module: Alex

The time module would be modified to include the variable delay flanger effect which, like the chorus effect, would require more complicated mechanisms to allow for the additional delay while maintaining smooth transitions. This will be demonstrated like the other time effects.

Frequency Module: Madeleine

The frequency module will be capable of all effects described in the goal section, but will also be capable of a phaser effect that will make the music sound more electronic than the original signal.

High Level FSM: Alex

The high level FSM will be the same as described in the goal section but developed to incorporate the additional effects added, including the injection of pre-recorded sounds into the system.

Mixer Module: N/A

This module will be the same as described in the goals section.

Transmission Module: N/A

This module will be identical to the module described in the goal section.

Visual Display Module: Alex

In addition to the functionality described in the goals section, when in frequency display mode the user will be able to change between the basic spectrum analyzer as described above and a decaying visual effect where the loudest volume reached will remain lit for a period of time, decaying slowly down to the current volume.

<u>Sound Access Module</u>: Madeleine

This module will be new and will be in control of storing and injecting pre-recorded audio samples into the system for processing and mixing with the live audio stream.