CSM152A Final Lab Proposal

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Design:

Overview:

For our final project, we will create a synthesizer able to produce and output a variety of different sounds. The user will be able to select different notes and instruments using the switches. A button will play a sound corresponding to the selected instrument/note. Track selection, record, and playback will also be controlled using the buttons. We will be using the I2S module to output stereo sound.

"Piano" Functionality:

The switches can be used to specify a particular sound to play at any time. Two switches will be designated for instrument selection, two for octave selection, and four for note selection. Once a particular sound is selected, the "play note" button will be used to send that note to the FPGA, where it will output through the I2S module.

Record/Playback:

There will be multiple tracks that the user can cycle through using one of the buttons. The currently selected track will show up on the display. Upon hitting the "record" button, input will be recorded until either the record button is hit again, or when a certain threshold time (8 seconds) passes. A panel of the 7-segment display will count down to show the time remaining for the loop. The user can hit the "play track" button to play back the selected track on loop, and an indicator will light up on the 7-segment display to show that it is playing.

Instruments:

0	Drum Kick
1	Hi-Hat
2	Lead Synth
3	Bass Synth

Toggle Switch Mapping:

SW 7	**SW 6**	**SW 5**	**SW 4**	**SW 3**	**SW 2**	**SW 1**	**SW 0**
Instrument Select (bit 1)	Instrument Select (bit 0)	Octave Select (bit 1)	Octave Select (bit 0)	Note Select (bit 3)	Note Select (bit 2)	Note Select (bit 1)	Note Select (bit 0)

Push Button Mapping:

	Pause/Play Track	
Clear Track	Play Note	Cycle Track
	Record	

7-Segment Display:

Digit 1	**Digit 2**	**Digit 3**	**Digit 4**
Selected Track	Track Status (playing / not-playing)	(empty)	Record Timer

Rubric:

Speaker Output (20%)	Able to output a chosen frequency, going through the I2S module.
Instrument Selection (20%)	Implement various tones/instruments, i.e. drums, lead, bass. Selection switches will be used to set the current instrument.
Octave and Note Selection (20%)	Switches can specify 2-bit octaves and 4-bit notes on a per-instrument basis.
Record, Playback, and Track Selection (30%)	When a user hits the record button, it will begin recording input until the next time the button is hit. Multiple recording tracks can be stored and played concurrently.
7-Segment Display (10%)	7-Segment Display shows the currently selected track, track status, and recording timer.