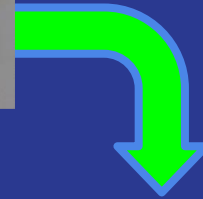
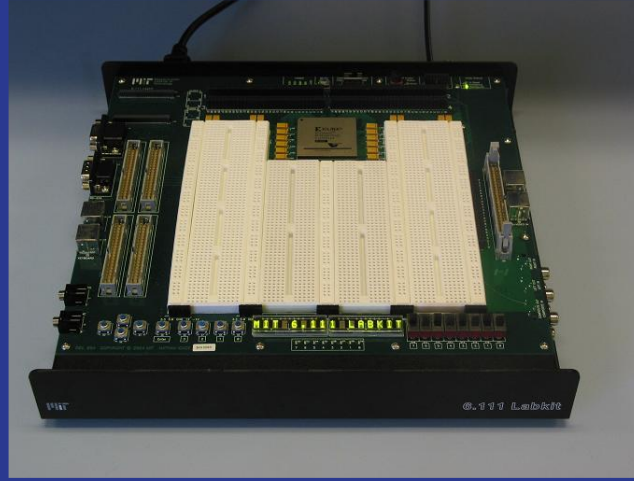


FPGA DJ

Alex Sloboda and Madeleine Waller



Project Overview

System to custom process and mix audio signals in real time

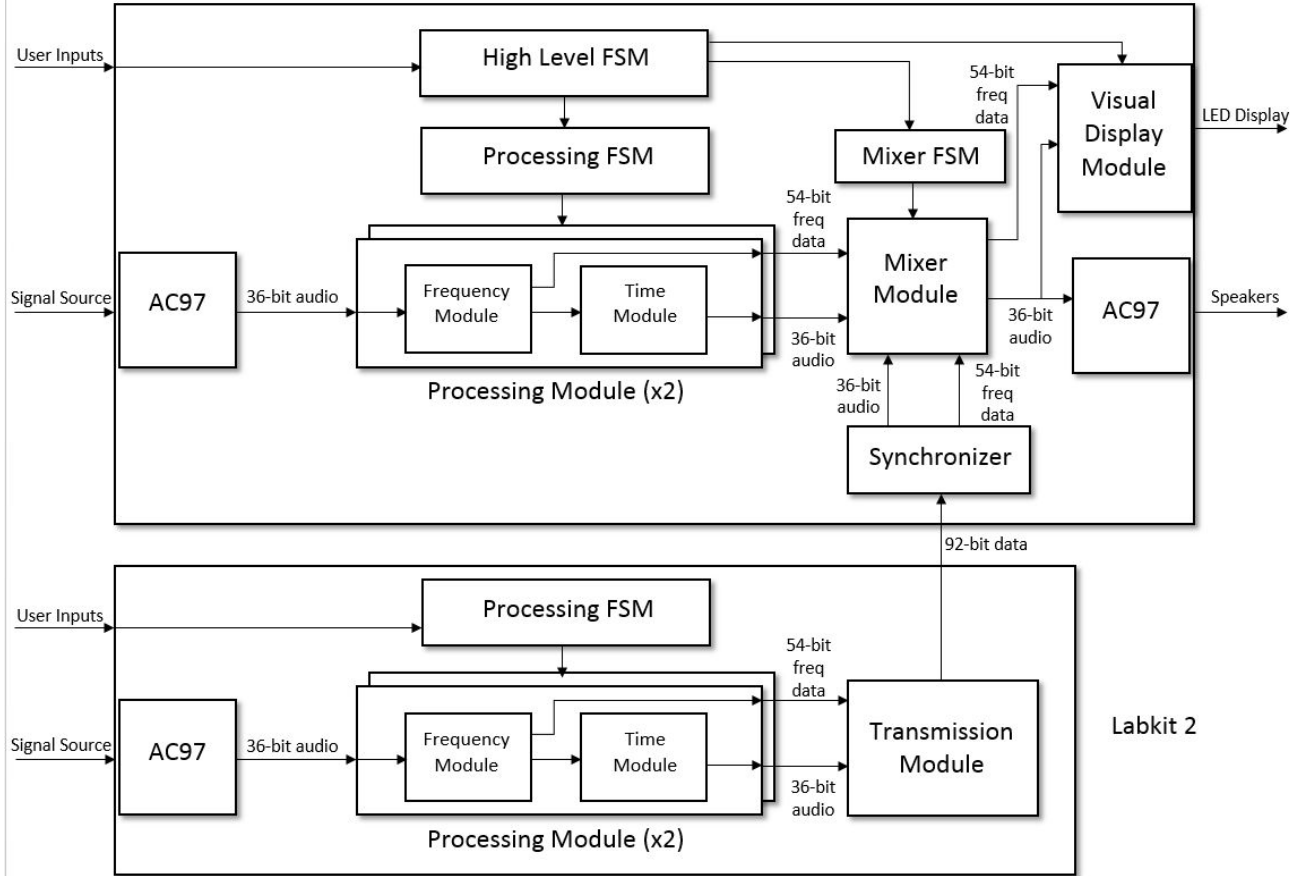
Two audio inputs, single stereo audio output

Interactive user interface for custom settings

LED status display



High Level Block Diagram



Major Modules

Processing Module - Frequency and Time Submodules

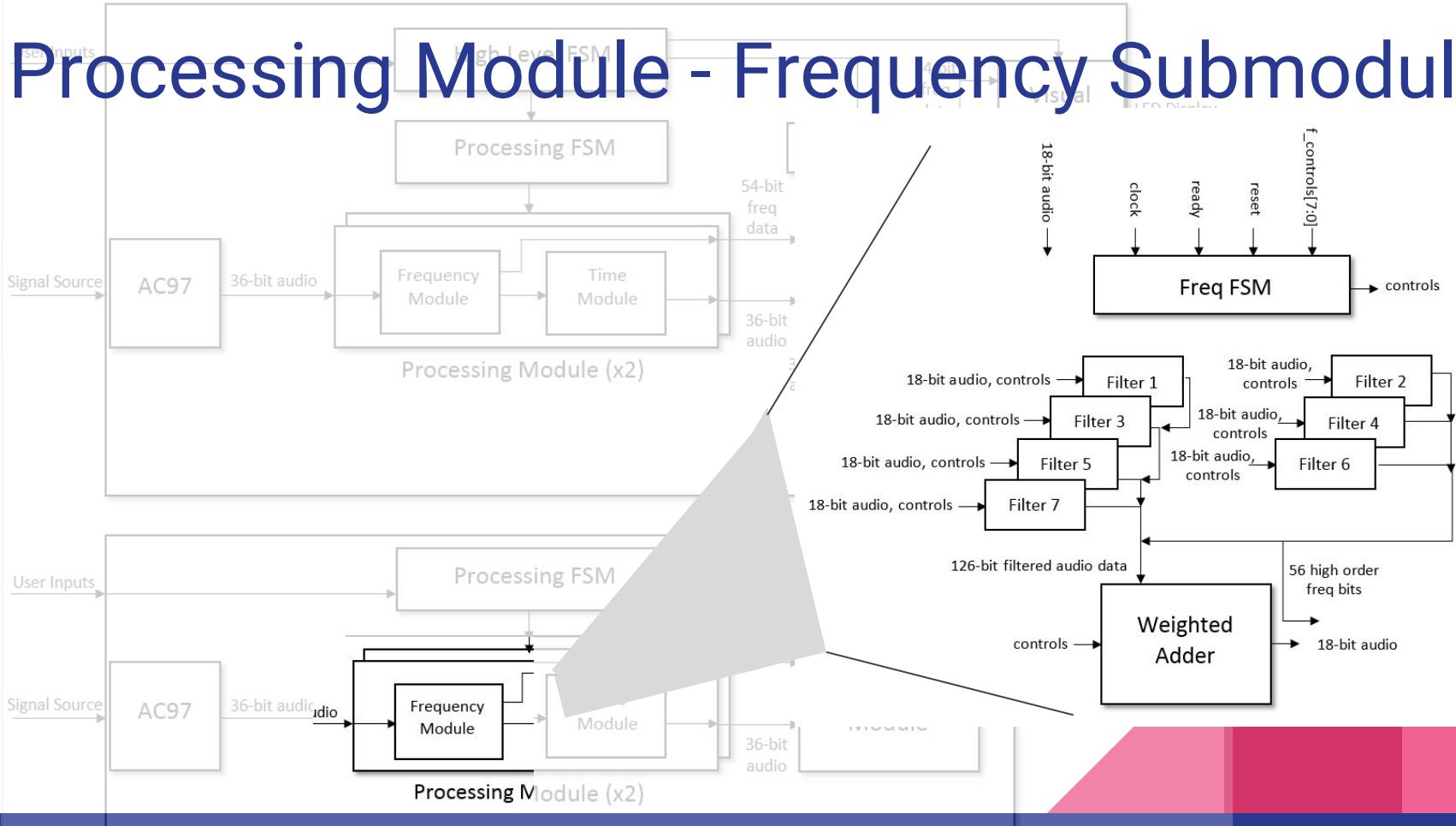
Mixer Module

Visual Display Module

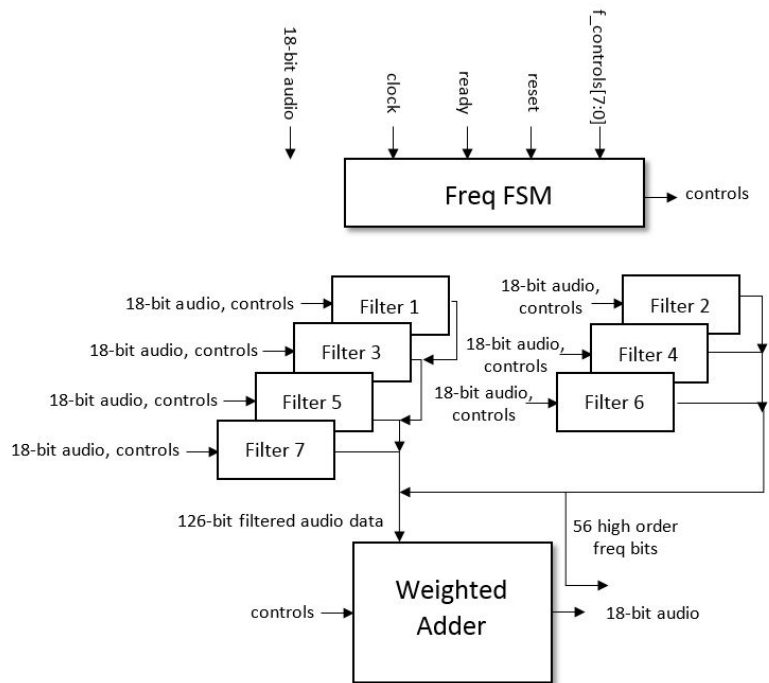
Control FSMs - High Level, Processing, and Mixer



Processing Module - Frequency Submodule



Processing Module - Frequency Submodule



Obtain frequency data: 7 FIR filters (31 tap)

Perform custom equalization

Output frequency data to mixer

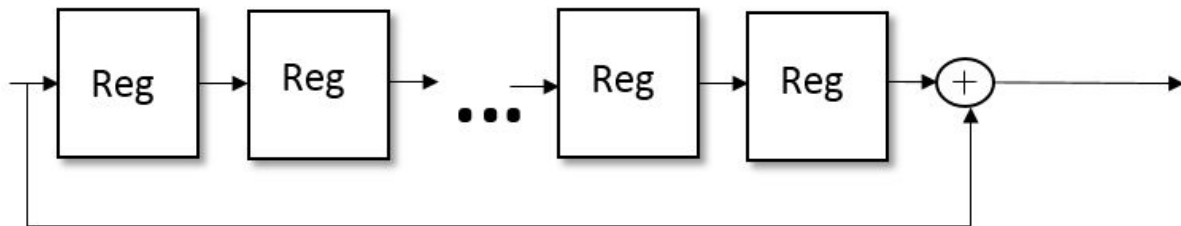
Processing Module - Time Submodule

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

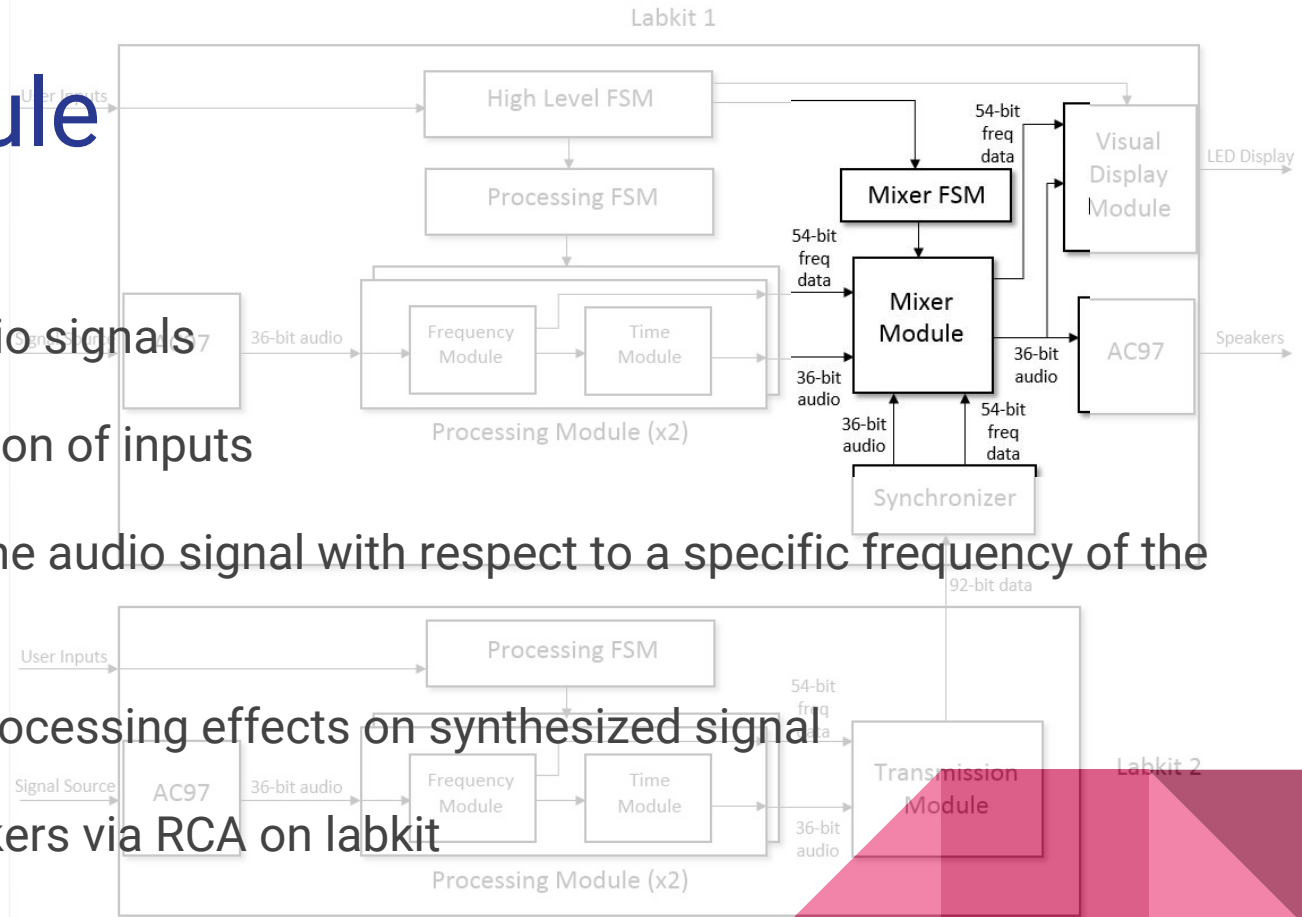
Input 2 processed audio signals

Output weighted addition of inputs

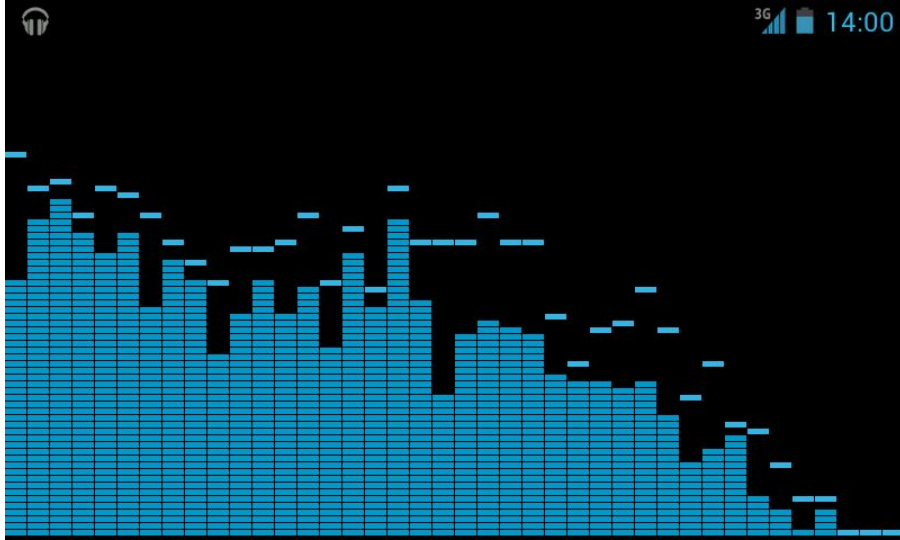
Modulate volume of one audio signal with respect to a specific frequency of the other audio signal

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

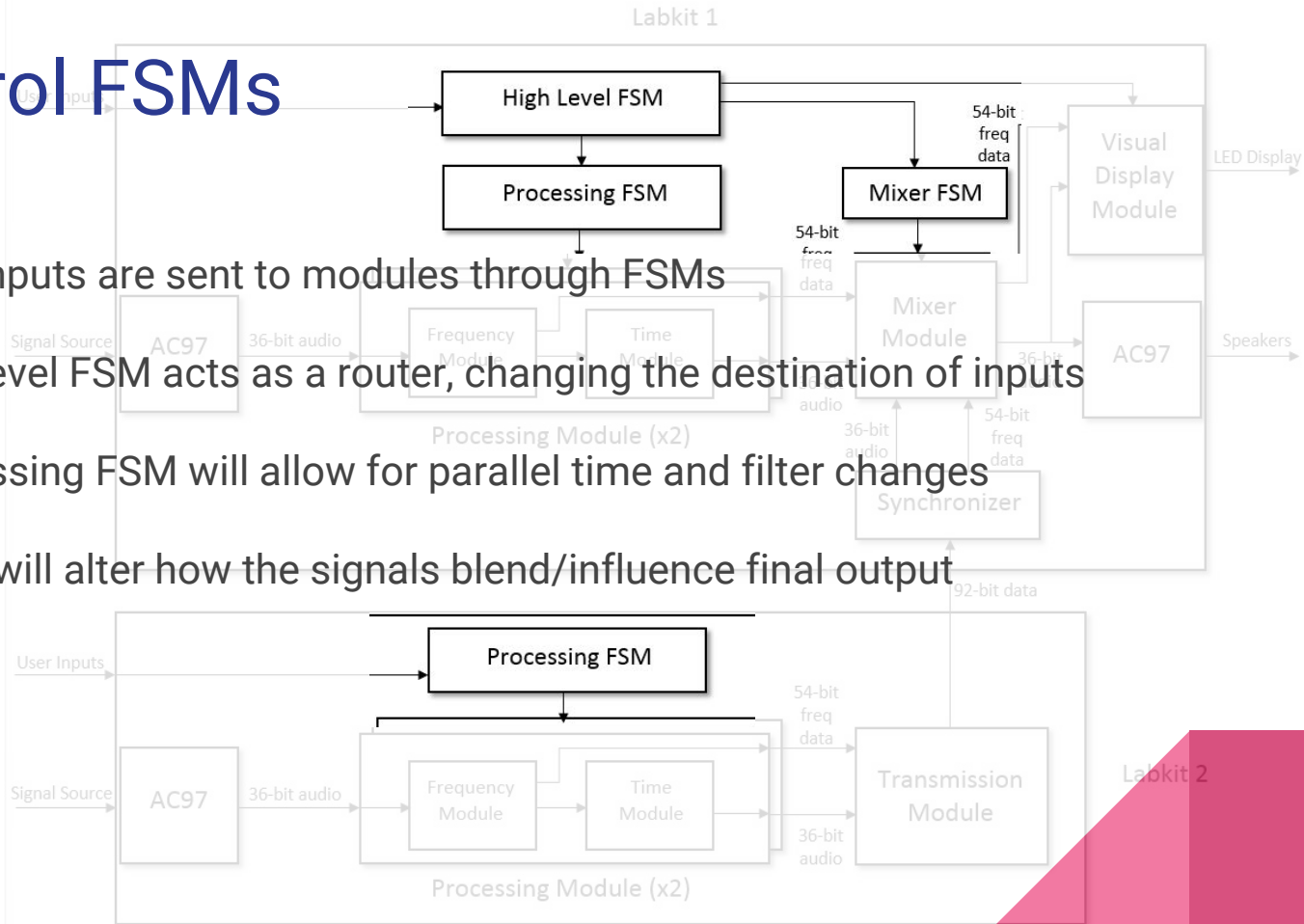
Control FSMs

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

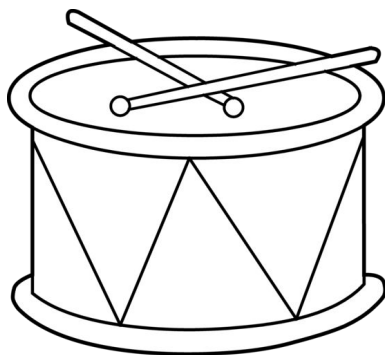
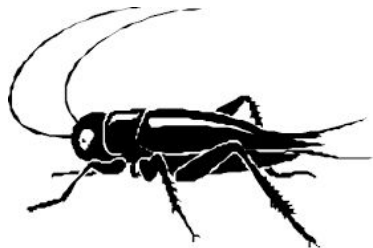


Labkit 2

Stretch Goals

Additional time based effects: Phaser and flanger

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



Timeline

	Week of 10/26	Week of 11/2	Week of 11/9	Week of 11/16	Week of 11/23 (Thanksgiving)	Week of 11/30
Audio In/ Stereo Audio Out						
Research Filtering Techniques						
Design Filtering Techniques in Matlab						
Implement and Debug Frequency Filters in Verilog						
Implement and Debug Time Based Processing Modules						
FSM to select effects (ongoing)						
Implement Frequency Based Processing Modules						
Build LED Display						
Implement and Debug Mixer Module						
Implement LED Display Control Module						
Stretch Goals						
Final Debugging						