Final Project - Intro. To Embedded Systems S23

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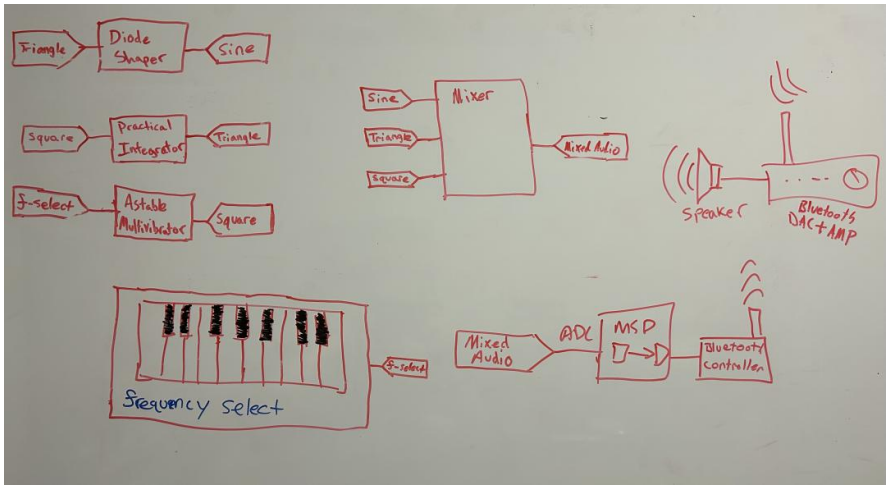
Section Number 3

Project Description

Our project is going to consist of a synthesizer that plays from C4 to C6 using buttons. The synthesizer will be able to connect with a bluetooth speaker via the MSP430. The audio will be comprised of a combination of triangle, square and sine waves. If time allows, a sawtooth wave may also be added into the mix. The volume will be adjustable.

Block Diagram



High-Level, Behavior-Base System Operation

A keyboard of buttons selects how much resistance an astable multivibrator sees. This, in turn, allows the user to select a frequency for the square wave to be generated. This square wave is then put through an integrating amplifier to turn it into a triangle wave. The triangle wave is then put through a 6-diode diode shaper to chop the triangle wave into a sine wave. These three signals are then mixed using a weighted summing amplifier, where

each weight is adjustable through potentiometers. The mixed signal is pumped into the MSP430's ADC to be transmitted into a bluetooth signal. The bluetooth signal is generated using a peripheral for the MSP430 that can connect to a bluetooth amplifier. This amplifier is plugged into a speaker and voila, a wondrous sound is created.

Budget Breakdown

Item	Quantity	Unit Price	Notes
Axial Through-hole resistors	~25	~$0.10	Probably 1% tolerance and of many values yet to be calculated
Through-hole ceramic capacitors	~5	~$0.10	Varying values between 1-10uF
LM324 Quad OpAmp	2	~$0.54	For oscillation, buffers, integration
Silicon diodes	6	~$0.20	For shaping the triangle wave into a "sine" wave
Buttons	25		For keyboard
Potentiometer (100k)	3		For tuning how much of each sound channel is in the output
MSP430	1		
Some kind of bluetooth host device for the MSP430	1		
Bluetooth DAC + AMP	1	Depends on specific item	We have one already, but if need be we can get a cheap one
Speaker	1	Free	Found on floor after ProfHacks

Team Work Plan

Considering that we spend a great deal of time together, we will most likely work on the project a few times a week in the evening. Not Thursday nights, as Elise has a class from 6:30-9:15 pm. Both the electrical and programming work will be a joint effort.