Melody Generator

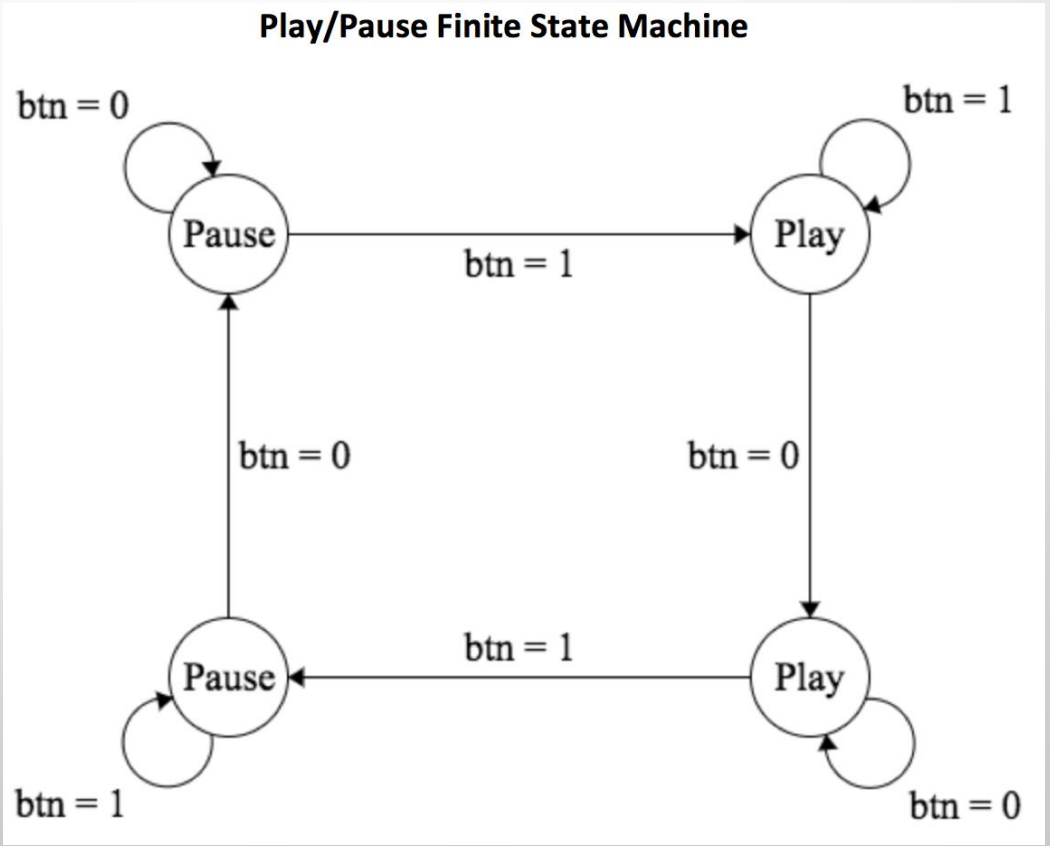
By: Victor Wszedybyl and Kevin Kiliman

Overview

- This project is designed to allow a user to create a melody or short beat
- It includes a Nexys 4 DDR board and a connected speaker
- The user selects switches and uses buttons to choose how many and what kind of notes are played in a given melody
- The melody is then played in a loop through the speaker

Play and Pause Button FSM

- Designed to toggle between two states; play and pause
- Used to ensure proper transitions between states



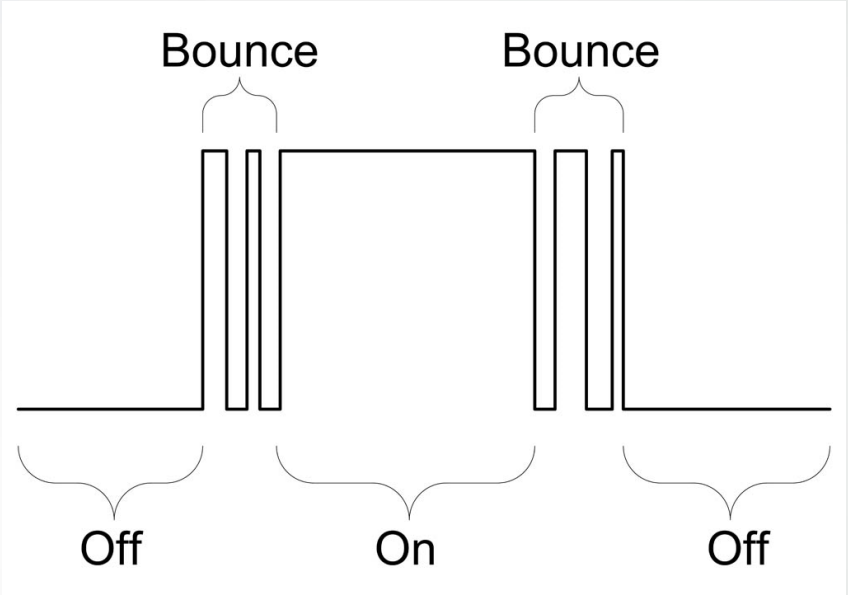
Clock Divider

- Used to convert the base clock MHz frequency of the Nexys board to a smaller frequency so a user has time to hear that sound
- This sets the tempo of the melody generator

Counters

- Two main counters are used; one three bit and one four bit
- Three bit counter is used to cycle between possible notes
- Four bit counter is used to play through the 16 switches on the Nexys board
- Flip-flops are used to cycle through numbers to output either a three bit or four bit number

Button Debouncer



- Button Debouncing is necessary for the buttons on the Nexys board
- Debouncer is used to prevent unwanted switches between states when a button is pressed (Play/Pause or Increment)

Frequency Increase Previous State Check

- Used to increment a counter exactly once with a button press
- Converts input to a pulse with a duration of one clock cycle
- When the input of the pulse generator goes high, its output goes high for exactly one clock cycle

PWM Frequency Generator

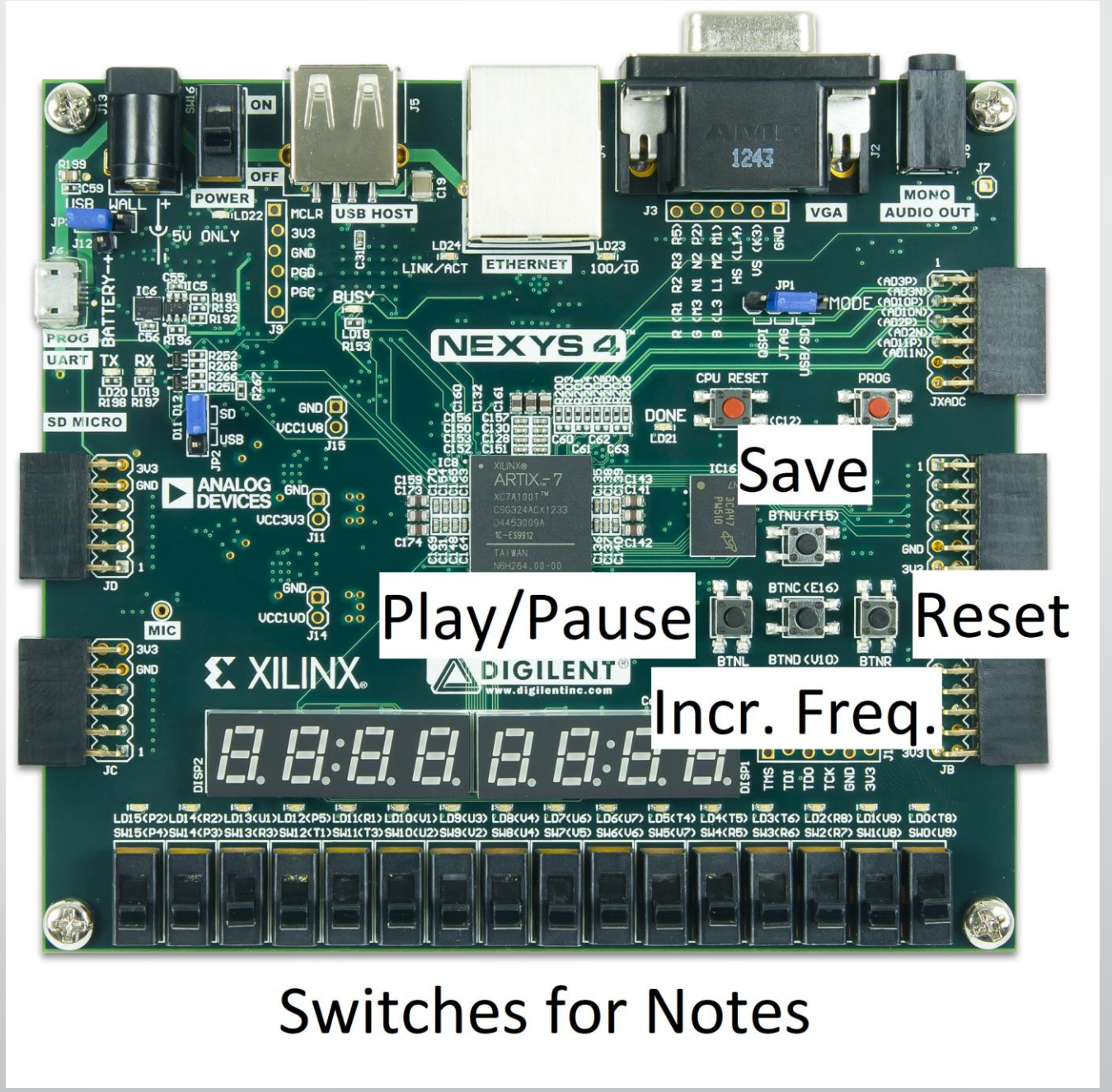
Note	Frequency	7-Segment Number
$G\#_4$	405Hz	1
$A\#_4$	473Hz	2
C_5	526Hz	3
D_5	588Hz	4
F_5	684Hz	5
$F\#_5$	746Hz	6
A_5	862Hz	7

- Generates a wave based on a 4 bit input
- Generates Sound using the PWM on the PMOD outputs
- This is done by dividing the input clock signal by a specific number to achieve the desired frequency
- The frequencies range from 405 Hz to 862 Hz to represent notes on a musical scale

Issues Overcome and Original Idea

- Speaker too quiet
- Would not play through switches in correct order
- Original Idea was a Keyboard with Preset Melodies

How to Use



Project Demo