

EEE102 Term Project Proposal – Synthesizer

Goal: Purpose of this project is to create a musical instrument from a FPGA device such as BASYS3.

Description: Switches and buttons of the BASYS3 will be used to operate the synthesizer sound wave. To change the frequency of the sound wave, switches will be used. A pair of buttons will be assigned to change the amplitude of the generated sound wave.

Design: Since there is 16 switches, there are 2^{16} configurations, which means there are more configuration than we can use to generate frequency, because there are 88 notes we can use effeciently (88 keys on a piano, no quartertones). Rather than assigning every binary number (switch states can generate a binary number) to a note, last 12 switch will be assigned to generate 12 notes on an octave. By using this method, it will be more easy to use the synthesizer, on the other hand we will increase the number of switches. Since there are 8 octaves we can use 3 swithces ($2^3 = 8$) to change the octave. There will be also a pair of buttons to increase/decrease the amplitude of the generated sound wave. There may be some other buttons/switches to change the function of the generated sound (square, sawtooth, distored etc.). To generate the sound wave, a sound amplifier will be mounted to the BASYS3 board, and an output device (headphone, loudspeaker etc.) will be connected to the amplifier via auxilary cable.

Components: BASYS3 board, audio amplifier, an output device (headphone or, speaker with auxilary cord).

Phase 1:

- Notes and octaves will be assigned to the switches
- Amplitude control will be assigned to the buttons

Phase 2:

- Amplifier will be mounted
- Output device will be mounted

Final Phase:

- A music demonstration will be present.
- Maybe different sound waves from square wave will be generated.