

EE 120B Lab Final - Music Sequencer Description

High Level Description

The assembly is essentially a sequencer, a musical device capable of taking in a composition and playing it back to the user. A grid display offers the canvas to program your music. Each row represents the frequency of a note, the higher a row is, the higher the tone played. Each column is a piece of the timeline for your song. A marker iterates through the columns sounding the notes in each column until it reaches the end of the timeline and loops back. Additional variables like tempo and length may be changed to fine tune the music.

Controls and Rules

Notes on the grid are toggled on and off via a green cursor that is mapped to a joystick and the first button. The second button begins playback from the cursors position. At the start of a session, your cursor is placed at the beginning of the timeline and the highest note; the top leftmost corner of the grid. From here, you may toggle any of the 32 notes in a column up to a maximum of eight. This allows for an eight note chord every time step. The columns are capped such that adding an additional note to a maxed out column requires you to first untoggle another note. The full canvas is composed of 32 rows and 32 columns, partitioned into 8x8 grids. Moving the cursor to the edge of the current grid allows movement to the adjacent grids that border it. At any point the third button may be held to display your position zoomed out to grid level. The fourth and fifth buttons allow you to change tempo and length respectively. Three play speeds are available and up to four grids or “measures” may be added. The default for these are medium play speed and one measure of length. Lastly at any point, the sixth button may be pressed to reset the canvas and settings to their defaults.

Hardware

- Atmega1284P: The microcontroller that is the basis for this project. The programming was done through AVR Studio.
- LED Matrix: The red green LED Matrix used to display the current grid.
- 2 Shift Registers: Connected to the red and green leads of the matrix, these allowed one 8-bit port to perform the duties of two.
- 2 Axis Joystick: A peripheral allowing three speed movement in eight directions.
- 6 General Tactile Buttons: Basic control interface for pull-down pins.
- 8 Speakers: 8 individually controlled speakers used to output a range of 700-50 Hz.

Demo Video

<http://youtu.be/KViYGZgGDGs>

Resources

C code (timer shift register functions modified from UCR code):

https://docs.google.com/document/d/1GaQOPwuHjBkp67FBt36cEFty8LSFGGs_K1zFteW6eg0/edit?usp=sharing