Abstract

In the modern music industry one of the most important instrument and tool is the analog synthesizer. There are countless variations of this instrument in the industry, each with its own unique functionality. In most cases a single instrument doesnt have all the funcionality what we actually need or just too expensive for us. As a result of this, there is a need for a new, customizable implementations.

In my thesis I designed hardware for my own unique synthesizer, that have the essential funcionalities. First of all, I had to make the specification of my new instrument and do a research in analog synthesisers. Based on my own preferences, I selected all of the necessary functions for my synthesizer.

On my hardware design process, I divided my design into three separate units: a signal processing board, an analog board, and a board for the synthesizer keys. I also created a plan for the physical communication buses between the units.

Afterwards, I created software designs for the I2C communication protocol between panels, the oscillator block, and the reading of the states of keys, buttons, switches, and potentiometers.

When generating high-frequency waveforms, implementing a simple algorithm such as DDS synthesis results in significant aliasing and phase errors. To address this, I focused on designing a BLIT synthesis algorithm in Matlab. I also did measurements to compare the results of BLIT and DDS synthesis spectrum.