Penn Engineering

A.A.P.
Alternative Audio Processing

Team 17

Advisor: Dr. Tania Khanna
Members:
- Davis Polito (CMPE)
- Nikil Ragav (EE M&T)
- Mason Elms (MEAM)
- Enoch Solano (CIS)

Abstract

Current hardware synthesizers are expensive and bulky, prohibitively so to many potential bedroom producers. Lowering the cost with a relatively inexpensive but powerful GPU will open the door to aspiring musicians who can't afford thousands of dollars in DAW's and synthesizers.

This GPU setup can implement a multitude of effects and synthesizer sounds in real time.

Problem Statement

Hardware music synthesizers are intuitive and fun to use but expensive and not portable. Software tools are cumbersome but more powerful. How can we combine the intuitive control of hardware with the power of software into a lower cost, portable package?

Solution

Our portable synthesizer parallelizes audio calculations using an NVIDIA Jetson Nano GPU. This allows for synthesis with large numbers of waves as well as real-time effects processing.

Progress

- **Software:** designed an additivie synthesizer that will run on the NVIDIA Jetson Nano GPU
- **Hardware/Prototyping:** implemented physical user control circuitry and initial firmware
- **Thermal:** completed simulation of factory heatsink

Next Steps

- **Software/Hardware:** read the input from the physical control circuitry so that users can interact with and “play” our additive synthesizer using physical knobs and buttons
- **Software:** add a Phase Vocoder effect module to run on the GPU allowing for autotune effects
- **Hardware:** have PCB Layout ready for review
- **Thermal:** develop system for stress testing and thermal data collection