Abstract

In 1955, two engineers at the Radio Corporation of America built the first electronic sound synthesizer. It was a primitive design, relying on punch-card input and delivering only a small range of sounds. Since then, many improvements to the design have been made. In this project, we have built an analog synthesizer. Our model takes advantage of a modular design, with each module realized as a circuit that affects the signal in a unique, customizable way. Our synthesizer delivers a wide-range of sounds due to user’s ability to control attack, delay, sustain, pitch, echo, and wave shape.

Methodology

Voltage Controlled Amplifier
• Controls ring modulation, vibrato, and stereo panning

Keyboard Sample and Hold
• Sends voltages to the Voltage Controlled Oscillator to determine pitch.

Voltage Controlled Oscillator
• Creates waveform of desired frequency

Envelope Generator
• Controls attack, sustain, delay, and release

Echo Module
• Creates an echo effect. The user can define the delay time, number of repetitions, and echo frequency.

Noise Generator
• Adds noise to the signal to create a distorted sound.

Motivations and Objectives

Motivations
• A modular design allows the user to configure the synthesizer in many different ways, therefore achieving a unique sound which allows us to distinguish ourselves as musicians.

Objectives
• Build a synthesizer that creates sound through a network or free-floating, interchangeable modules.

Challenges

Debugging
• The modules consist of highly complex circuits, thus increasing the capacity to make errors in construction.

Keyboard
• The keyboard required a changing resistance value to produce different notes. This was a mechanical design challenge.

Acknowledgement

We would like to thank... Ray Wilson of Music From Outer Space for his design work and Professor Bajwa for keeping us responsible.

References