Project Theremizer

ECE 411

Almatouq, Brooks, Forsman, Roman

Electrical and Computer Engineering
Portland State University
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1 Executive Summary

Theremizer is a sound control and manipulation device. It produces an audio output that sounds otherworldly and has been used in famous songs like the theme from Star Trek and the Beach Boys' "Good Vibrations". The musician controls Theremizer by moving their hand in the space around from an antenna to change the pitch. Theremizer also accepts an external audio input, and if provided, will modulate this external audio input using amplitude modulation to create wild sounds and effects. Theremizer's output is then run through a classic Voltage Controlled Filter, the AS 3220. This shapes the sound further using resonance and cutoff adjustments. Theremizer is primarily for modular synthesizer musicians, who are always looking for unique, interesting sounds and modular music boxes for live performances.

2 Market Analysis

2.1 Target Market

Theremizer will be initially marketed to analog synthesizer enthusiasts, as they represent a large market of customers that are always looking for interesting audio sources and control methods.

2.2 Sales

We aim to sell Theremizer for $120.00, as devices with a smaller feature set are being sold for $100 currently. We are adding features (filtering, modulation) that are highly desired in the modular synthesizer community, a community that has no problem spending significant money on devices. This device should be affordable to purchase in order to compete in an otherwise cost-prohibitive marketplace.

2.3 Competition

There currently is nothing on the market that does what Theremizer can do. Most theremins are disqualifyingly expensive and tonally limited. Cheaper devices don't have musical filtering on the output, or any modulation possibilities within the device. Both of these options limit the potential market for competitive devices.

3 Requirements

3.1 Functionality

An antenna must modulate the frequency of an oscillator which is heterodyned with another to produce an audio output of at least one octave. The device must be capable of feeding it's output to other audio processing blocks, or a separate audio amplifier. The device must have an enclosure that is self-stable. The device should accept and modulate an external signal, then mix against the theremin output.

3.2 Performance

To make the device useful for musicians, it will have a user controlled filter with a minimum cutoff of at least 5 kHz. It will have a user controlled output up to at least 1 V amplitude. The output and input impedance will be compatible with industry line-level standards and will have an impedance of less than 600 Ω and greater than 10 kΩ respectively.

3.3 Economic

The device must be affordable to produce, with a total parts cost less than $60. All parts must be available for volume purchase, in active production, or easily substitutable by a component in current production.

4 System Architecture

5 Design Specification