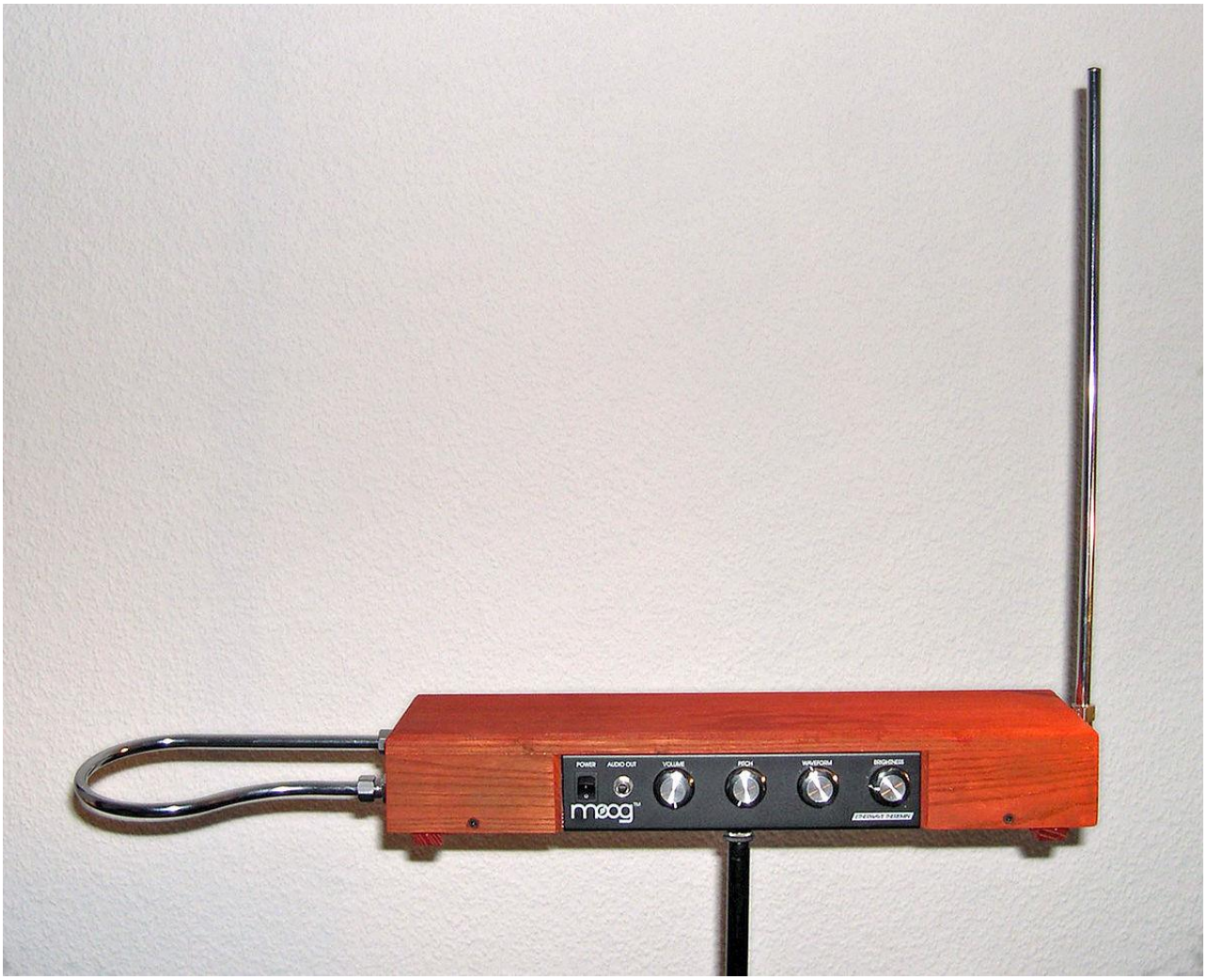
DIY Theremin Project

NAMES



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Introduction

In the first week of the new semester, the group of new students were all split up in groups. These smaller groups, all received the same assignment: Make a Synth in 4 days.

This document will describe our thought and design process from start to finish.

Starting point

In the first presentation of this semester, it was very adamantly provided that recording progress is almost a mandatory step of documentation. In order to honour this, this paragraph is devoted to describing the starting knowledge of our group about Synths and signals.

Our group all followed the same curriculum, being Technology. Sadly however, we have received little to no information about the knowledge needed for this assignment. Sadly, also no-one in our group has a private interest in these topics.

Therefore, we can determine our starting point knowledge of synths and signals to be near zero.

Process

All code for draft 1 and 2 can be found in the added files

Setup

To start this assignment out, we followed the orientational links provided in the presentation. This provided us with some basic knowledge about the concept of a Synth; as well as information about the provided hardware.

The next step was setting up all our hardware, according to the knowledge we just gathered from the introduction links. This proved to be very easy. Minor hiccups occurred when selecting some proprietary ports. But this was quickly solved.

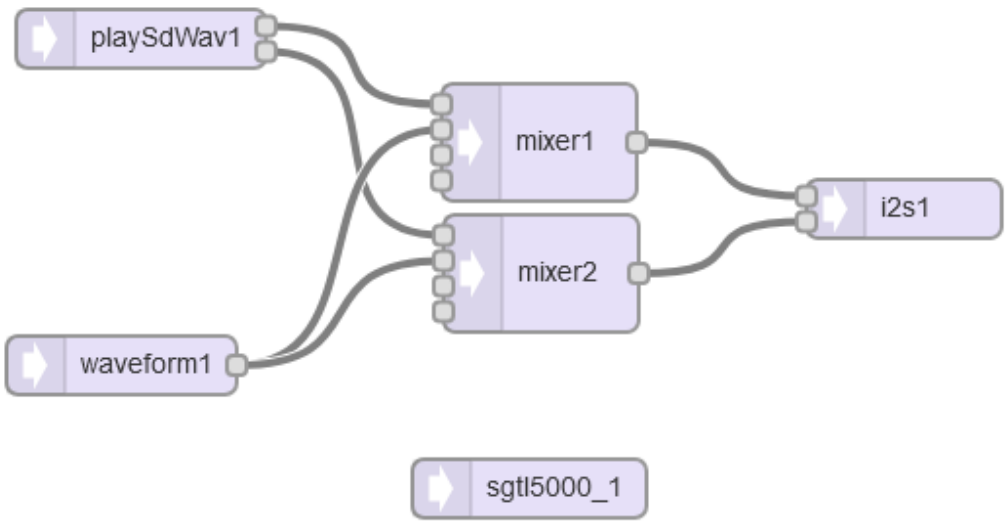
First steps

After getting comfortable with all our new hardware, we made our first little steps!

To test out the teensy and uploading and flashing code, we made a little POC with a buzzer actuator. We did NOT use the provided audio board for this, so we could focus on the teensy, since this board was new for all of us.

The premise of the POC was a buzzer with an ultrasonic sensor, the closer our hand came to the sensor; the higher the pitch!

After a successful POC, we integrated the audio board into the POC, we did this using the provided Design tool. In our group, often nicknamed: The fake Node-Red. We created a small sketch with this which we again uploaded to our board.



Idea brainstorming

After we felt like we understood the hardware, the premise and the technical information about the synth assignment a little better; we brainstormed about the premise and idea of our project.

Due to the nature of our POC, we quickly came to an idea to make a “DIY Theremin”.

A theremin, in short, is also kind of a synth! Though controlled by movements of the hands. Each hand controls a variety of different settings, which to the naked eye; look very confusing.

To put more clarity to these words, watch this video of a theremin demonstration: https://www.youtube.com/watch?v=K6KbEnGnymk

This real Theremin is based on electromagnetism, though this would be too complicated for our short deadline. Instead, we opted to re-use the same idea from our POC; Ultrasonic sensors! Not only does this provide the same theremin-like “feel”; it also looks like the real deal!

One ultrasonic sensor would be used for adjusting the frequency, while another would be used for the amplitude.

First draft

Building upon the small little POC’s we had made earlier; the first draft of the theremin was quickly finished. There really was nothing remarkable about this phase of the project; work flowed nicely into each other. And progress was quickly made.

A working product was created!

Pitch

Our teacher asked of us to pitch our project and/or idea in front of the class after 2 days. We did this, and the feedback was very positive. The only remark we received was a missing Project name. Our product was more or less already approved of in a positive way.

Second draft

Out of fear we underperformed for our first project, we decided to add more functions to our product.

Most notably, we added 2 potentiometers. We used these for the following:

1. To control how fast the system goes from current to target

Much like a PID, this potentiometer determines how fast the system changes from the current value to the target value. This speed value is global. This means that all systems which use a current to target feature, utilize this speed value.

2. Sample-rate sensor

This potentiometer determines the sample rate of the ultrasonic sensors. This is useful, since otherwise the sound becomes very jittery due to the high sample rate.

Furthermore, we have added 4 buttons.

1. Waveform Cycler

There are multiple waveforms available, to cycle through them (and thus adjust them using the theremin function) we have made a cycler button. Each button press cycles to the next waveform.

2. Lock

To lock the current sound settings of the theremin, we have made a lock button; which locks down the system and always uses the current values; unless pressed again. This works great in combination with the sample-rate potentiometer!

3. Beat generator

We have uploaded 11 different beats to the theremin, they can be played and paused with a play and pause button. These beats are in a continuous loop and will never stop unless instructed to.

Conclusion

Concluding, this project was a lot of fun to do in the first week. Each group member contributed to the project in an equal manner; which made working together a lot of fun!