

Webcam Theremin

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INTRODUCTION:

The Webcam Theremin is a digital recreation of the famous electroacoustic instrument, which functions through the player's manipulation of radiowaves emitted from a vertical-standing metal rod. This interpretation replaces physical radiowaves with virtual calculations of a video feed from a webcam set to observe the user using the computer vision (CV) library in MAX/MSP 7. This project is meant to act as a tool for performers, musical and movement oriented, to add to their arsenal.

PROCESS:

I accomplished a functional product by first creating a synthesizer and then tying parameters to my laptop's webcam. The synthesizer is a simple monophonic, four oscillator design. Users can choose between sawtooth, sine, triangle, or square wave oscillators, or any combination of the four. The sound envelope for the synth comes from a simple *graph~* command in MAX. This allows for players to simply draw in the shape of the amplitude over time.

Once I had a working synthesizer I tested with MIDI controls I needed to make them interact with real world movements. I delved into the CV library in max. What I discovered was the way digital cameras pixelate the light they receive. This perspective shift could have led me in an infinite number of different directions for interaction. The way that made the most sense to me was to make the picture data binary; the images only consist of black and white, no gray. Using this binary light detection I tracked the difference traveled by white pixels every frame. This difference as well as the pixels' position on the horizontal is what tells the synthesizer what pitch to play: moving your hand in a well-lit space

from left to right will produce a rise in produced frequencies.

INTERACTION:

As a physical interaction this piece is very accessible. Users only need to see the camera's input visualized, and then to hear the corresponding audio. From this point users, or performers, are given the ability to learn the system, and to play and create.

Users who interact with this piece are in a position to create music. Given a full frequency range well below and above human hearing range there's a massive opportunity for unique sequences, patterns and sound to occur.

Given the potential for creation, the thing I hope to see and hear from user experiences is experimentation with the one-dimensional space they've been given. Will people try to make pretty sounds? Will users want to make the best music they can with this? Or will they try to play the worst? Will they try to make harsh, loud sounds? I would hope they would attempt to push the instrument beyond its one-dimension, because I also hope to do that.

This piece has taught me a lot, not just about interaction, but about the way in which I'm developing: MAX/MSP. Every experiment with MAX before this had been purely audio-centric. The full potential of this program is amazing, and I can't wait to be overwhelmed by its capabilities as I master it.