

feedback

a multimodal instrument by sam smith

overview

I set out to create a piece that was more than just an instrument or composition: “feedback” is the result. “Feedback” is an audio-visual instrument controlled through a pair of gloves with a variety of installed sensors. This piece plays off the concept of feedback loops and the interaction between the audio, visual, and physical domains. The aesthetic of this piece is based around the sounds of eclectic audio-visual equipment such as static fuzz, audio feedback, VCR machines, and CRT televisions. These sounds were used as the source material for the sound generated and the inspiration for the animation. This project was programmed using max/MSP, processing (java), and an arduino. Other technologies utilized were analog sensors and OSC messages.

This project was inspired by many other works, which are noted in my related works section.

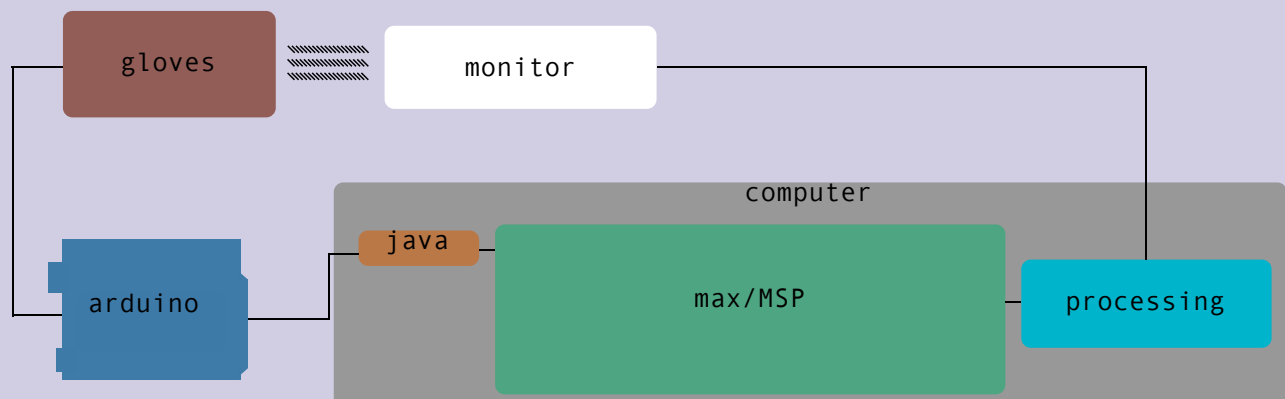


interaction

A fundamental tenant of this design is to engage with a common-enemy of audio, feedback. In this case, the feedback produced was not a deafening screech or, extreme distortion. It is extremely important to have a volume control easily accessible while playing any instrument, and “feedback” is no different. In this design, the flex sensor on the right glove mapped directly to the loudness of the instrument: a flat hand would elicit no sound, while a balled-up fist would produce the loudest sound. This encourages the user to create musical phrases with beginnings and endings instead of “just noise”.

Integrating the photocells was challenging because I wanted to create noticeable and predictable changes to the sound, while embracing the possibility of ambiguity within the design. The interaction between the mediums is as follows the signal from the controller modulates parameters within a granular and FM synth whose signal is analyzed and sent to generate an animation that the user points their fingers at to control the output. This cycle repeats as the user becomes more aware of their interaction and its results.

I additionally wanted to allow the user to easily quit the feedback cycle if they wanted to present a new phrase or idea. The user could use the solid black/white boxes at the left edge of the animation to halt the feedback loop(see “visuals”). The figure below shows how the system operates.



audio engine

The audio engine has two objects: FM synthesis and granular synthesis. The FM synth has 3 parameters that change according to the data from the sensors. The left hand photocell controls the carrier tone while the right hand photocell controls the modulating frequency.

The granular synth randomly selects an audio source from either VHS or feedback noises at varying intervals. The left photocell controls a size/pitch variable, the right photocell controls the grain position within the larger sample, and the flex sensor controls the grain size and volume.

Additionally, there is a delay effect that both sound sources are sent through. The parameter levels differ for the two sound sources (please see max patch for more information).

hardware

This piece is controlled by a pair of custom built gloves with 2 photocells and one flex sensor installed. The photocells are attached at the tip of the index finger's and the flex sensor is installed in the palm of the right hand. This hardware was built during COVID-19, which explains, the usage of electrical tape and winter gloves. While it may not be the most elegant design, it is robust and comfortable to wear.

This controller was inspired by the likes of Leon Theramin and Maurice Martenot. In addition to their consideration of hand position and expression, I also involve the users environment. Finally, this instrument does not require virtuosic skill or years of training to become proficient.

more information

instrument demo - <https://www.youtube.com/watch?v=ZqF2G3tSDjI>

source code - <https://github.com/sdsmit/feedback>

visuals

The animation for this piece is fairly simple. The concept was derived from an enlarged view of a pixelated screen (similar to white noise). The number of boxes and variation in each level of brightness depends on the signal coming from the audio engine. The rate of refresh and the range of difference in brightness depends on the data as well.

In addition, there are two solid boxes: one white, one black. These can be used to pause the noise and add a new level of expression to the performance. I also found it liberating to be able to use the surrounding lights and surfaces in addition to the screen while playing the instrument.

I intend to develop the animations further in the near future. I would like to add more sensors to make the instrument even more expressive.



related works

Imogen Heap - Mi.Mu Gloves - <https://mimugloves.com>

Peter Bennet - Petecube - https://www.nime.org/proceedings/2006/nime2006_081.pdf

Leon Theramin - Theramin - <https://en.wikipedia.org/wiki/Theremin>

Maurice Martenot - Ondes Martenot - https://en.wikipedia.org/wiki/Ondes_Martenot