EXPANDING ACCESS TO MUSIC TECHNOLOGY

Rapid Prototyping Accessible Instrument Solutions For Musicians With Intellectual Disabilities

Portland Community College Cascade Music and Sonic Arts Program

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Abstract

Working with artists with ID/DD at Portland Art and Learning Studio, our team conducted exploratory sessions to prototype accessible DMI's.
Our diverse team benefitted from accessible uControllers, object oriented DSP and experience working with and advocating for people with ID/DD. The team along with Dean Wenger and Daniel Rolnik set intentions of intersectional justice, disabled dignity, People First language*, and sharing designs for other maker spaces' use.

Project parameters

- Parts budget of $400** for control surfaces
- Sound generating with Max/MSP
- Utilize a variety of sensors
- Assist expression and choice
- Intuitive and inspiring for players of all abilities
- Consonant or in-key improvisation
- Facilitate quantized rhythm as well as real-time playing
- Sounds complement each other when played together
- Low-cost materials
- Open source where possible

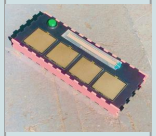
*Snow, Kathie. "People First Language" 2009, www. disabilityisnatural.com

https://github.com/pccadaptiveinstrumentsteam/PCC-Adaptive-Instruments-Project

Controller solutions-

Auto Scaling Touch Synth

Etched copper panel keys embedded in a piece of plywood. Sends midi notes and CC's from Teensy to a subtractive synthesis MAX patch with a Karplus/Strong plucked string sound. Two buttons on the side cycle through scales and presets. The max GUI is a traditional "analog" style synth that offers preset tweaking.

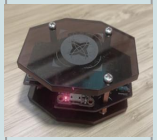


Interactive Drum Sequencer

Pressure sensing pads and touch strip control drum machine and pattern via midi CC's from Teensy. The GUI shows accompanying visual feedback of the 4 sensor pads and sequence. The sounds are modulated by pressure with filters. With a C.V. script, the webcam tracks bodies moving left or right to control tempo, shown by a slider on the screen and in a colorfully filtered video of themselves embedded in the GUI.

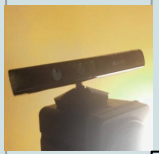
Rotation Detecting Headband Synth

An accelerometer embedded in a wearable headband, sending position from a feather m0 via OSC to MAX with a subtractive synthesizer, Turning left and right moves the note along degrees of the scale. Moving the head side to side adds harmony, and up and down added more or less reverb to the synth.



Handheld 9 Degrees Of Freedom Controller

Compact and wireless handheld acrylic case detecting orientation and rotation of the device. The handheld controller drives the same synth via OSC as the headband controller, but with up and down tilting controlling the pitch in glissando, and left and right tilt controlling filter cutoff.



Xbox Kinect Air Harp

A kinect camera read in Processing with skeleton tracking. Provides visual feedback of the user through a colored filter, to the GUI. The camera is divided into columns and rows of cells, which hold different degrees of a scale. A detected body part crossing the threshold rom one cell to another triggers a note-on at a specific pitch, sent as OSC to MAX - triggering a guitar-like Karplus Strong patch.

Conclusions

- Vastly different preferences in interface - affect had a much bigger role than diagnosis
- Different instrument's visual and sonic and tactile feedback require consideration of cognitive style
- Our frameworks for good/bad or virtuosity less useful than level of artist's engagement
- Generally enthusiastic response to more immediate gesture to sound relationships
- During testing it was difficult to clearly hear individual instruments, we altered instrument timbres, separate monitors could help
- Object oriented programming makes it easier to develop for minority populations

Future Development

- Capturing and sonifying "stimming" behaviors
- Centralizing sound generation to a single efficient "brain"
- Open source alternatives to Max
- Applying machine learning at the edge or within the synths holds vast possibilities to add musical complexity

Ethical statement- ** $400 budget donated by Cycling 74 To avoid conflict of interest we avoided making comparisons or claims about Max in particular, and are working on and encourage others to develop fully open source versions. Engineers were compensated $15/hr by Portland Community College. PCC is built on traditional village sites of the Multnomah, Kathlamet, Clackamas, Tualatin, Kalapuya, Molalla, and Chinook Peoples. We acknowledge the necessity of the collective uprisings like the one occurring in Portland Oregon at the time of this work.