IAP 499

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[WAVE+FORM]

PROGRAM NOTE

I've been studying electronic music my whole life, only I didn't know it. The medium has always fascinated me, with humans and computers working in tandem to organically compose mechanical sounds, forming a vast spectrum of techniques spanning an endless range of genres. So naturally, I began to produce music on my laptop three years ago, beginning my personal project, *E Noodle*. Somewhere along the way, I was introduced to Miller Puckette's free open-source software (FOSS), Pure Data (Pd), a multimedia software that uses visual programming language for creative coding. Pd emulates hardware electronic systems by using a graphical interface that connects objects together with virtual cables, allowing users to create visually represented logic systems that process digital signals in real time. The intent behind this approach is to make computers operate more like instruments in their own right, rather than just tools for production.[1] Understanding the potential of audio software, I know it has the ability to inspire as a performance tool—it's simply a matter of finding (or creating) the right one. This is why I'm excited by using Pd, and it's why I decided to build an instrument that anyone could use to perform with it. [WAVE+FORM] is a project with the goal of creating an accessible electronic music experience for others, in order to demonstrate how computers can act as collaborative partners in performance, and instill some sense of the wonder the medium has given me over the years.

[WAVE+FORM] is a sequence-based electronic instrument that provides six sound modules to play, responding to mouse inputs on a single screen of Graphic User Interface (GUI). Interactable elements are all point-and-click operated, and include buttons, switches, sliders,

and graphs, of which each function is labelled by a unique icon. There are three drum modules for rhythm, and three tonal modules for harmony, each corresponding to a respective color. Elements across the top two rows are global controls, affecting the six modules by controlling muting, a sequence reset, the tempo, effects, and randomization. At any moment, users are able to change individual modules to control which notes are hit, along with their volume, pitch, length, tuning, and more.

A key feature of the instrument involves randomizing parameters automatically for you in order to generate patterns quickly and easily. The instrument is also semi-autonomous, letting the PC control the performance on its own after some time of user inactivity. When this autopilot mode engages, the computer will repeatedly randomize each module at varying intervals, creating a chance-based generative composition. Doing so, the machine-driven instrument displays its capabilities to viewers, inviting them to interact by continuing to generate music on its own even in the absence of a human performer.

The accompanying visualizer is influenced by the control elements, synchronized with six on-screen forms representing modules of matching color. As the values are manipulated, forms respond by changing shape, color saturation, movement behavior, and timing to the beat. Topping things off, a live webcam feed is mapped across the room housing everything, which also distorts in appearance based on global settings, suggesting how both users and the digital system influence each other as they interact.

Puckette developed Pure Data with the intent of representing computer information in a simple, straightforward method. Users engage with digital media by communicating in plain numbers and symbols, regardless of the media type. This structure facilitates manual manipulation and organization of data sets, rather than completely predetermined, automated systems, resulting in an environment that “encourages moving forward through experiment.”[1] [WAVE+FORM] embodies this concept through the live performance of instrument parameters that have data structures I developed to influence the sound and visuals.

Hans-Christoph Steiner discusses how free Pd users are to develop instruments. Highlighting the relationship between user input and feedback, they advocate for the artform of instrument design itself. An emphasis is placed on how peripherals are integrated as a way of interacting with system inputs and responding outputs, with the idea that compelling instruments react in a non-linear fashion, responding in multiple ways from singular gestures. The argument prompts for usage of both novel input devices with instruments, such as drawing tablets and gamepads, and common ones, primarily the ubiquitous mouse and keyboard. While the former aids in exploring new tactile connections of interaction, the latter grants increased accessibility, with more collective knowledge and understanding of usage. Steiner also mentions the potential for corresponding visual information to provide extra sensory information for digital performances in pursuit of bridging the gap between man and machine working together.[2] In [WAVE+FORM], all these concepts are at play, with multiple parameters affected by certain actions, logarithmic scaling of value changes, the appearance

of directly influenced forms, and the important, immediate usability of operation from an everyday input device.

IOhannes m zmölnig is the developer of the Graphics Environment for Multimedia (GEM), which is the software extension used for the visualizer of my Pure Data project. Discussing audience perception of visual performance in Pd, zmölnig helped inform my design with an argument that proposes abstraction as a means to avoid exclusion. Under normal operation, visual coding language is visible as processing happens, leading viewers to question how objects operate with no guaranteed answers. Instead of displaying the code in its default form, by intentionally presenting the software's visual instructions as empty symbols, it allows for anyone to observe the graphical interface without feeling left out of exclusive information.[3] For [WAVE+FORM], this approach was used for the GUI, labeling everything with unicode symbols instead of terms that wouldn't make sense to those without appropriate technical knowledge. Another way I embraced abstraction was by hiding the values of sliders and graphs that users interact with, since they present arbitrary numbers without the context of what's going on under the hood. The obscured interface is also intended to promote playing by ear, prompting users to respond foremost to the affected sound.

In the context of interdisciplinary arts, working with Pure Data provides infinite potential for creating interactive artworks that blur the line between human input and computer influence. Giving access to the fundamentals of digital signals, users can form algorithmic systems that

interpret data however they see fit. Showcasing this tension between the translation of physical inputs and digital outputs through the divide of an interface, audiences are provided new contexts for what it means to engage with electronic mediums. Puckette describes this as “issues of presence and absence," raising the question of when each party is in control, and to what extent. Ultimately, the art of developing our own electronic systems has led to the gradual “dissolution of the distinction between composer, performer, and programmer.”[4]

In [WAVE+FORM] this is highlighted by the program’s ability to randomize, from either a human or a computer performer’s decision, but both of which are locked to values that I designed beforehand. My art has always felt like a collaboration with computers, and I want that to come across here. Working with a PC to express myself, I want others to also feel an emphasis on the digital aspects, noting how the medium influences my process, as well as the world around us.

Moving forward, I plan on sharing [WAVE+FORM] with the Pure Data community through its dedicated site, Discord, and Reddit page, as well as posting demos and recordings to YouTube and Bandcamp as *E Noodle* for others to discover. The potential for iteration is always present, so I might test my work with other community versions of Pd, such as Purr Data, which has an improved system for GUI design. Most importantly though, I hope to always continue learning from others’ work, and experimenting with my own, in any form that may take place.

REFERENCES

[1] Scheib, Christian. “Two Rooms. A short Conversation with Miller Puckette.” *bang: Pure Data.* (2006): 165-169. https://puredata.info/groups/pd-graz/label/book/bangbook.pdf

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[4] Puckette, Miller. “Four Surprises of Electronic Music.” *Lumina (Juiz de Fora, Brazil)* 11, no. 2 (2017): 126–38. doi:10.34019/1981-4070.2017.v11.21445.