



## Noisemakers! Putting the Analog in Digital Humanities

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**Abstract:** *Noisefest!* is an interactive, multisensory experience centered around a small Maine town and rooted in the sounds and noise of its streets. Comprising a Virtual Reality tour, soundwalks and remixes, a 2D laser cut geographical map with Arduino controllers, and a Futuristic noise intoner, one of the objectives of this collaborative, transdisciplinary, and theory-based project is to create concrete opportunities for students to participate in the “real” world and engage with the materiality of noise and its manifestations by interacting with the soundscape through novel, interactive, and multisensory practices. *Noisefest!* is also an example of how one can creatively and artistically extend the reach of the digital humanities beyond the borders of academia and into the public realm.

Digital Humanities methods, approaches, and tools allow us to explore and present concepts in multimedia formats, but they can also aid us in the actual binding of our intellectual, academic lives to the material reality around us. Building analog artifacts through digital humanities can be the culmination of a string of theoretical reflections on a given concept. If we take, for example, the concept of “noise”, which is a major component of the modern industrial soundscape and the contemporary music scene and is central to a large corpus of scholarly writing, the application of digital tools and methods can be the vessel through which to acquire and develop a heightened understanding of the physical properties of noise and its abstract derivations such as the propagation of sound waves through different spaces and mediums, how infrasound inaudible to human ears affects the body, or how applied filters can modify different areas of the audio frequency spectrum.

Software such as Max for Live, Arduino, and FlatFab – to name a few – that are designed to create objects and experiences and thus occupy the membranous space between the digital realm and reality, can also facilitate the absorption as well as the transmission of knowledge from an academic environment to larger communities outside academia. As Diane Jakacki and Katherine Faull observe in *Doing Digital Humanities. Practice, Training, Research*, Alan Liu’s tripartite methodology of “practice, discovery, community” (that is central to the practice of digital humanities) comprises both critical thinking and critical doing (359). When the theoretical analysis of either data or literary, artistic, and cultural phenomena is supplemented by experiential investigation, the discovery of new knowledge is not only enhanced but also accompanied by the production of objects that will also serve the purpose of disseminating such knowledge. Therefore, the products that are the concrete outcomes of digital humanistic inquiry can provide abundant opportunities to reach beyond the theory and beyond the walls of academia to engage with the wider public.

*Noisefest!* is a case in point. An interactive, multisensory experience, *Noisefest!* is centered around the town of Waterville, Maine, where Colby College is located. Rooted in the sounds and noise of Main Street, it comprises a Virtual Reality tour of the town, various soundwalks and remixes, a 2D laser cut geographical map with Arduino controllers, and a Futuristic noise intoner.<sup>1</sup> Collaborative, transdisciplinary, and rooted in theory (Russolo, Varèse, Adorno, Cage, Schafer, Attali, Nyman, Pasnau, Westerkamp, and many others), the ramifications of this project serve the purpose of participating in the “real” world by engaging with the materiality of noise and its manifestations by interacting with the soundscape through novel, interactive, and multisensory practices. On weekly Google Classroom blog posts and in class, students discussed excerpts from Theodor Adorno. *Quasi una fantasia*; R. Murray Schafer. *The Soundscape*; Luigi Russolo. *The Art of Noises*; Jacques Attali, *Noise. The Political Economy of Music*; Robert Pasnau. “What is Sound?”; Edgar Varèse and Chou Wen-Chung. “The Liberation of Sound”; Paul Hegarty. *Noise/Music. A History*; Michael Nyman. *Experimental Music. Cage and Beyond*; Thom Holmes. *Electronic and Experimental Music. Technology, Music, and Culture*; Maria Maddalena Novati and John Dack. *The Studio di fonologia. A Musical Journey 1954-2012*; Eduard Hanslick. *On the Musically Beautiful*; Paul D. Miller. *Sound Unbound*; C. Lane and A. Carlyle. *In the Field. The Art of Field Recording*; and Bernie Krause. *The Great Animal Orchestra*. These readings were for students an introduction to the field of sound and noise studies, and this theoretical knowledge was manifested in the digital/analog noise artifacts of their own creation.<sup>2</sup> This article, however, focuses primarily on the section of the lab where students built hybrid analog/digital sound/noise artifacts with the intention to promote new, multisensory ways of experiencing and understanding our shared soundscape. *The Noisefest!* artifacts imitate and reproduce urban noise while also highlighting the musical potentialities inherent in the city that Russolo described in *The Art of Noises* over a century ago.<sup>3</sup> As revealed by Cage’s experimental pieces such as 4’33” where he draws attention to the fact that what we call silence is in reality the negation of any type of noise that does not fit a culturally and historically situated definition of music, the mimetic features of the *Noisefest!* instruments serve the purpose of capturing the life of the environment and reminding us that the potential for a “new” music (non-representational and in the form of “unregimented sound” to use Theodor Adorno’s words) is all around us (254).

<sup>1</sup> The reader is invited to visit the Noisemakers! website for photos, videos, and sound clips of the noise artifacts. As per Hildegard Westerkamp’s definition, a “soundwalk is any excursion whose main purpose is listening to the environment.” (1)

*Noisefest!* also featured a talk by Adi Snir, Director of the Harvard Group for New Music at Harvard University, titled “Noise Is A Matter of Listening.” The talk focused on the openness of Snir’s scores, which utilizes the space between performers and composer to promote a greater engagement with the “real” of the performance and tie back to his way of conceiving noise and sound.

<sup>2</sup> For example, inspired by Attali’s work, two students’ soundwalk and accompanying 2D printed artwork explored the environmental politics inherent to increased noise levels when the dam on a local river remained in place even when the paper mill that it fed went out of business and closed permanently.

<sup>3</sup> Another entirely digital project was the soundwalk in Virtual Reality using the Mule Works Innovation Lab’s HTC Vive headset. In addition to recording ambient sounds, students also used a Samsung Gear 360 camera to capture 360 degree videos of the locations they visited. These were then imported into the Unity game engine software running on an Alienware gaming PC in the Lab. With Unity’s built-in 3D Sound Settings, the students were able to spatialize the sounds differently at certain points so that users would hear different things as they turned their heads while watching the videos. We then wrote a C# script for the simulation that would let users navigate from one image to the next with the Vive controllers. At the more analog end of the spectrum was an actual noise intoner constructed with pieces that were cut with a laser cutter and assembled in a sculptors’ studio.

Colby College's Center for the Arts and Humanities sponsors several humanities labs every year, which give students a chance to do more involved hands-on work with the subjects they are studying, such as going on field trips to work with collections at cultural institutions or creating digital projects. *Noisefest!* originates from a digital humanities lab titled *Noisemakers! Tracing the Origins of Modern Music in Italy* that explores different perspectives on noise emerging from the fields of music, ecocriticism, philosophy, phenomenology, and technology and translates them into digital, analog, or hybrid digital-analog artifacts that facilitate the reproduction and the physical experience of noise. Michael Nyman reminds us of Cage's distinction between "old" and new (experimental) music as the difference between communication and perception (23). The performers of experimental music increasingly take on the role of perceivers who must pay close attention to the sounds around them in order to respond to them and adjust their playing. They are at once players and audience.<sup>4</sup> *Noisefest!* creates a similar situation where the emphasis of the musical experience instead of residing in the need to convey an artistic message lies in the participation in a shared auditory experience that is more firmly rooted in life than in music or art as they are traditionally perceived. Emphasis is placed on the value of the process of extracting sound from a city rather than on the results of such operation.<sup>5</sup>

Preparation for *Noisefest!* was an essential part of the students' lab experience, and they began their hands-on work by forming groups to create soundwalks of Waterville and inspired by rule six in Cage and Kent's "Ten Rules for Students and Teachers," "Nothing is a mistake. There's no win and no fail. There's only make." The guidelines were extremely simple: students were free to record anything as long as it was in Waterville. For these soundwalks, the students used Marantz portable audio recorders to record ambient noise at various locations in town. They then downloaded the open source audio editor, Audacity, and in a class session, learned to use it to edit and enhance the audio files they wanted to feature in their projects. For their soundwalks, their goal was to create digital maps with their laptops on which the locations of their recordings would be highlighted. Using MIDI controllers connected to their laptops, students tested how users would be able to play and manipulate loops of the sounds corresponding to each map location. In this way, the aural maps of the soundwalks would function as electronic musical instruments.

The Musical Instrument Digital Interface standard (MIDI) is a communications protocol that allows electronic instruments, like synthesizers and samplers, and computers to interface with each other. For the soundwalks, we decided to use Novation Launch Control MIDI controllers, because of their simplicity and popularity (fig. 1). To create the playable maps, we chose Cycling '74's Max/MSP software. Max is rather unusual in that it is really a visual programming language that mimics the type of patching that was done with early modular analog musical equipment and various connecting cords and cables. A Max program is actually called a "patch," and to create one, the programmer adds and, using virtual "patch cords," connects a variety of Max "modules," such as a digital audio player or a buffer for storing a sound file. The benefit to using Max is that it works with a variety of audiovisual media. More specifically, Max allowed the students to upload an image file of

<sup>4</sup> See Cage's concept of auditory *disponibilité* or being open to the sounds of the world, "hear what there is to hear, rather than what [one] thinks there's going to be to hear" (52).

<sup>5</sup> This of course does not exclude the value of this operation for the user, who is also a participant in the shared auditory experience by being able to manipulate sounds extracted from the city but not crystallized in a final composition. In this case, the involvement and the agency of the user are heightened in comparison to those of the traditional passive listener.

a Waterville map and then use this as a canvas in what it calls “Presentation Mode,” a curated view of what the programmer wants to display of a particular patch.



Figure 1. Novation Launch Control MIDI controller.

Given its complexity, we did not expect the students to become experts at Max programming and decided to create a basic patch they could download that would quickly get them started with using their Launchpad controllers to play their found sounds.<sup>6</sup> This patch was mapped to the MIDI outputs of the first column of the Launch Control. A press of the button would start or stop a loop of a sound file, and turning the potentiometers (pots or knobs) would smoothly alter the speed at which the loop played and its pitch (fig. 2). When the students were introduced to Max, we talked them through how to add one of their own sound files to the patch’s buffer object and then walked them through how the patch worked. Though we decided that loop speed and pitch would be good basic interactions, we also showed them how to substitute other objects if they wanted to explore Max a bit more. From this point, they could duplicate the objects in the patch and keep adding more sounds to be played with the controller’s other seven buttons and fourteen pots. After they were comfortable with how the patch worked, we showed them how to geo-locate their sounds in Max/MSP by adding an image of a map to the patch and then assigning or adding objects to Max’s “Presentation Mode” view. This view allows the programmer to control what a viewer sees of a patch on a monitor or screen, and in

<sup>6</sup> All of the code and its accompanying documentation for these projects is available at GitHub: <https://github.com/AcademicTTS/Noisemakers/>.

this case, it allowed the students to put their soundscapes of Waterville’s Main Street at a user’s fingertips. By interacting with the sound clips in Max and manipulating them in real time, launching certain clips and stopping others, the user becomes a DJ with the power to “remix” the town in original ways and revisit a familiar landscape with new eyes and ears (fig. 3).

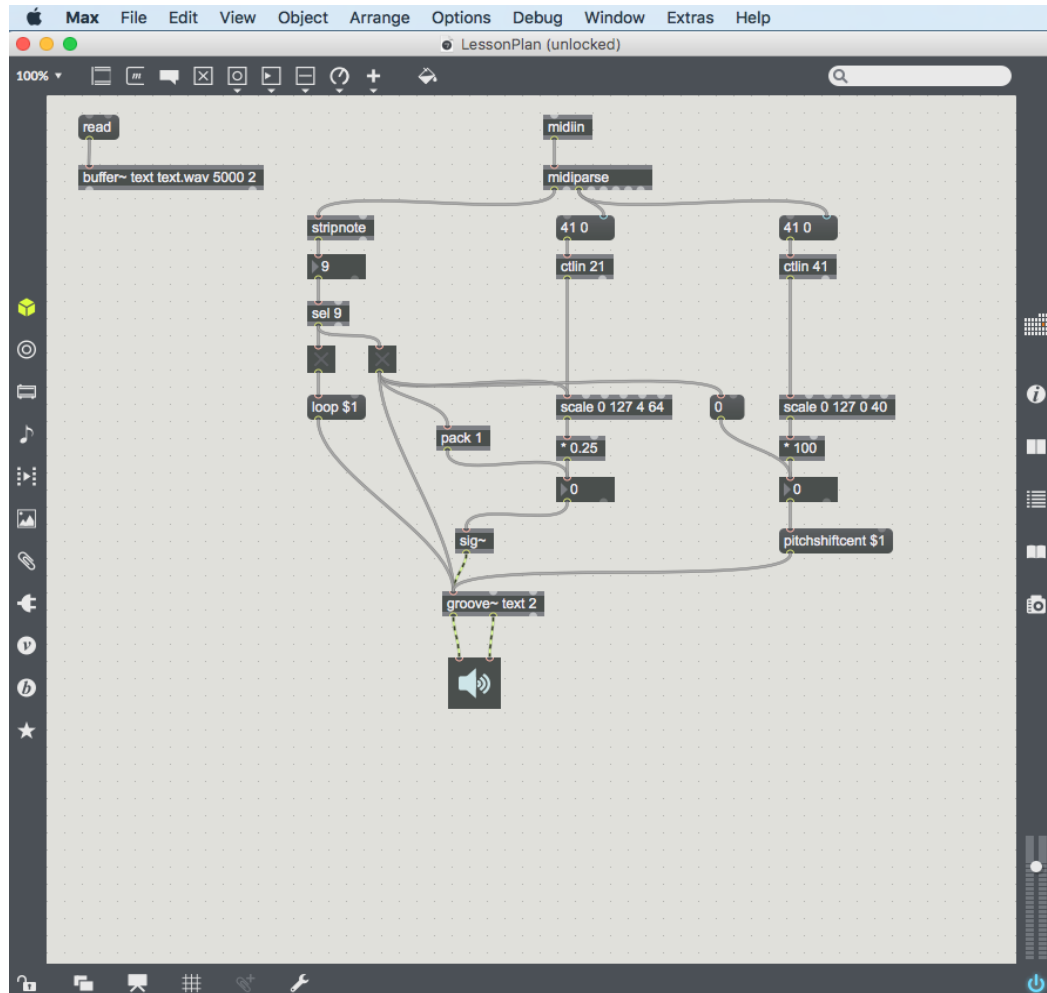


Figure 2. Max interface with the basic patch.

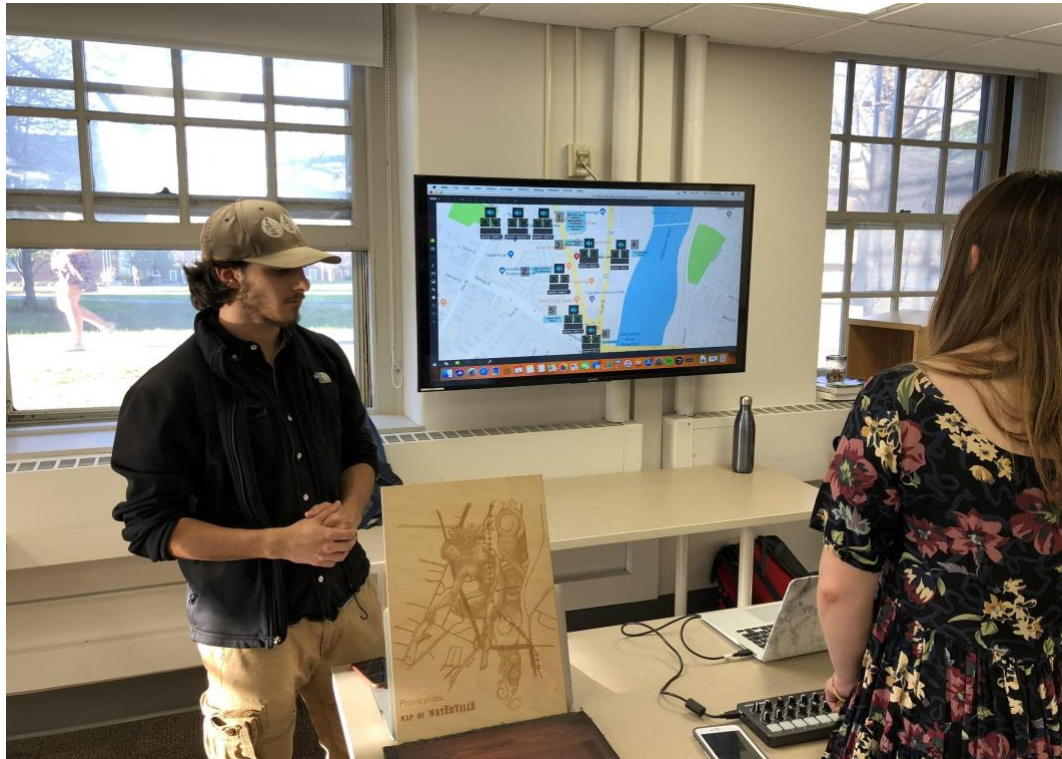


Figure 3. Max sound map in “Presentation Mode.”

The embedding of analog features in a digital artifact such as a Max sound map, like the one in fig. 3, creates great terrain for the mind to engage with the materiality of the senses, and makes it thus a valuable instrument for both the creators and the users. The process of building such an instrument requires a knowledge of the necessary software and hardware to create and operate it, a great dose of creativity to make it as engaging and as efficient as possible, and an exploration of the theoretical discourse surrounding the topic of noise.<sup>7</sup> It also requires the awareness that building a digital object based in reality that will become part of the public domain will reach an audience that may not be digitally-inclined or tech-savvy. The use of analog tools and materials to complement and enhance the digital component therefore becomes crucial. For this reason, Noisefest! features an interactive map with Arduino hardware that is the result of a combination of digital and analog media. It is, in fact, a digital sound machine encased in an analog shell where knobs that control electrical voltages are connected via soldered wires to a circuit board that converts their analog signal to a digital one (fig.4).

<sup>7</sup> This exploration included reflections on the definition of noise, its physical properties, its integration into modern and contemporary musical compositions, as well as the listeners’ ability to participate actively in the experience of noise, and the socio-political implications of noise such as the power of enharmonics (or notes that have smaller intervals than a semitone) to disrupts the established music system and related cultural hierarchies.



Figure 4. Interactive map combining digital and analog media.

That signal is then passed to a laptop running Max/MSP. Having already guided students through creating their Max soundscapes, we encouraged a team of students to design and build an actual wooden map that would be playable in much the same way. Since mounting a manufactured MIDI controller, like a Launch Control, into a map would severely limit the look and feel of the project, we decided to see if we could build our own controller with an Arduino microcontroller board, which would allow us to place pots or buttons at any location. We started by trying to replicate the button and two pots of a single Launch Control column. Using a breadboard for prototyping, we wired a button and a resistor to a digital input and two pots to analog inputs on the Arduino Uno board (fig. 5). We then wrote a short C++ program to make these output the appropriate MIDI messages. Since the Arduino had to connect to a computer using a USB cable, instead of a dedicated, five-pin MIDI cable, we used the open source software, Hairless MIDI, as a bridge to get the MIDI output from the Arduino to Max via USB (fig. 6).





audio file but felt that we should replace the button that starts the loop with a pot that controls volume. That would allow the sound to play continuously and give users more control of the mix while “playing” the map. To represent the space depicted by the map, we spatialized the sounds by adding a monaural reverb and panning module to each loop in the Max patch. These were then adjusted so that sounds farther away from the listener (i.e., closer to the north of the map) were “wetter,” or had more reverb applied to them, and the panning, or stereo positioning, of each sound was determined by how far east or west the location was on the map.

The students then designed the map of Waterville in Adobe Photoshop, and the JPEG file they created was imported into RetinaEngrave software. The plywood map was cut and etched with a Full Spectrum laser cutter in Colby College’s Mule Works Innovation Lab. From there, the students brought the wooden map to sculptor, Bradley Borthwick’s, campus studio to build a frame for it and drill the necessary holes for the pots. Finally, the students were taught how to solder and began wiring the pots to the Arduino controller.<sup>8</sup> At this point, we encountered a few difficulties. The map featured eight different Waterville locations, such as the public library, city hall, and a popular coffee house. Since each of these locations required three pots, we needed twenty-four analog input pins for our controller. Since even the largest Arduino board, the Mega, only has sixteen analog inputs, we had to use multiplexer (mux) boards to add additional input pins for the pots. These could then be combined into a single output from the mux board and wired into a single input on the Arduino. The code for the Arduino program had to be adapted to this new arrangement. In the end, we did get the map working, and the final result was an impressive looking and sounding instrument.<sup>9</sup> The traditional look of the board makes it quite approachable and enticing even to the non-technologically-inclined user, and hides the seventy-two wires that are soldered to the knobs and connected to the Arduino board. Compared to a Novation MIDI controller, this large semi-analog board presents a much warmer feel and appears more immediately playable than its sleek counterpart and, for this reason, consistently garners greater interest and use.

The skills required to develop noise-based artifacts such as the laser-cut Arduino-controlled map comprise the ability to apply noise and sound theory to the ideation of concrete objects, as well as the ability to find creative solutions to practical problems such as determining the optimal scale of the Waterville map for laser cutting or the placement of the knobs on the board.<sup>10</sup> Such skills also extend to using a drill and a soldering kit, which are not among the traditional goals of the liberal arts education offered at Colby but that nevertheless engage the brain and the body in equal measure and are transportable to various fields of work and research such as architecture, art, music, and engineering. The transportability of these skills to a variety of disciplines is mirrored in that of the digital-analog noise artifacts that they inform and that can be brought to a museum, a creative space,

<sup>8</sup> Special thanks to Louisa Baum, Anikka Schliesmann, and Olivia Wandres for their dedication to the project, and to Tim Stonesifer from Colby Information Technology Services for the technical support and expertise that he provided. Many thanks also to Assistant Professor of Art, Bradley Borthwick, for sharing his knowledge and putting his sculpture studio and its tools at our disposal.

<sup>9</sup> There were a few pots that did not work due to either soldering or wiring errors. One thing we learned was that it is critical to agree on a color scheme for wiring and to stick to it. That makes troubleshooting bad connections much easier.

<sup>10</sup> While building the noise instruments, students pondered what the purpose of a soundwalk was, the capacity that noise has more than music to carry non-static, mutable message, and how the listener plays an active role in the creation of a sound experience.

a library, or a concert hall where they can engage with the public without requiring any mediation, theoretical explanations, or technical expertise. *Noisefest!* captures the distinctive sounds and noise of Main Street in Waterville at a specific historical time and provides both creators and users with the opportunity to be completely immersed in the physicality of the present and interact with it in creative and experiential ways. While building their noise artifacts, students reflected on the past and looked to the future as they listened, analyzed, and critiqued early- and mid-twentieth-century noise compositions and sound recordings and learned to situate sound and noise along geo-temporal coordinates. This helped them follow and understand the process of inclusion of urban and anthropogenic noise into the modern musical landscape and inspired their creative work.

Furthermore, the ability to portray and “play” the city of Waterville as a musical instrument is a way of drawing attention to the city as a multilayered sound system and away from the unreceptive and unresponsive act of being passively subjected to the cacophony of urban noise. Embodying the convergence of the concrete auditory substance of the world with theoretical meditations on noise, such as Cage’s suggestion that music is not about understanding but about awareness, *Noisefest!* is an example of how one can creatively and artistically extend the reach of the digital humanities into the field of sound and noise studies beyond the borders of academia and into the public realm.

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