Relative Noise, Dancing Glass

by

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ABSTRACT

By confronting what we define as noise, how do the the rifts that emerge in face-to-face communication relate to the associated failures of mediated communication technology? What effect does communication noise have on mediated interpersonal and mass communication when full control of noise is obtainable and unrealistic?

ACKNOWLEDGEMENTS: A CONTEXT FOR NOISE

Noise is inescapable. It could be information that is of no use to us and is also responsible for making the information we desire more difficult to access. As a result of noise, we may misinterpret information and make mistakes. Although noise is typically used as a reference to sound in space, the concept of it spans many more disciplines that just physical sound. The concepts and effects of noise are so relative that they can be applied to other sensory modalities like visual light, just as they can to signal paths of electronic devices.

Studying noise is not easy. And in researching noise, or really anything for that matter, it is important to acknowledge the language to be used when exploring it. Like many words, noise is just one word that has been assigned as a convention to typically mean one thing. There is a problem in this however, because noise can mean different things in different contexts. That being said, it is important to acknowledge the varying definitions of the term and which ones we will be exploring more deeply. Noise, as defined by the Oxford English Dictionary, is "the aggregate of sounds occurring in a particular place or at a particular time; disturbance caused by sounds, discordancy, disturbance made by voices; shouting, outcry" (Oxford English Dictionary, 1997).

This first definition may be fine and well if we just intend to talk about noise in terms of physical sound. Complication arises when we intend to do something else. As Alan Watt's states, to define is to fix. And "struggling as we may, fixing will never make sense out of change. The only way to make sense out of change is to plunge into it, move with it, and join the dance" (Watts).

ANOTHER DEFINITION

Claude Shannon was the first to realize noise's presence in communication in his 1948 paper "The Mathematical Theory of Communication" (Wiley). Shannon's paper and research took place during the same time period that deep research was continuing into the fields of computation and cybernetics. He created a model to map the processes of communication as well as a formula to measure how much information is transferred in the process. In the model, there is a transmitter or signal source. The transmitter encodes the message or signal so it can travel through a channel or medium. The message is then decoded by the receiver but not before being subject to noise.
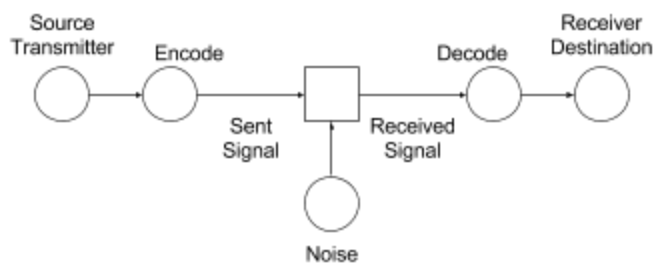
Shannon wrote:

> The fundamental problem of communication is that of reproducing
> at one point either exactly or approximately a message selected at
> another point. Frequently the messages have meaning; that is they
> refer to or are correlated according to some system with certain
> physical or conceptual entities. These semantic aspects of
> communication are irrelevant to the engineering problem. The
> significant aspect is that the actual message is one selected from a
> set of possible messages. The system must be designed to operate
> for each possible selection, not just the one that will actually be
> chosen (Shannon).

The model is a good start and a basis to begin gaining a better understanding of the
concept of noise in communication systems. Another adaptation of the model would include
noise at all parts of the signal pathway.
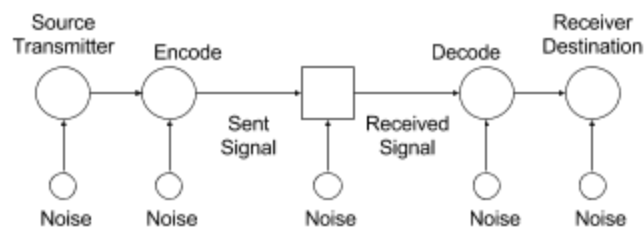
To elaborate, a signal is not just subject to noise after it is sent and before received. It is
subject to degradation at all steps in the path. Birdsong of the Hooded Warbler is an appropriate
example to clarify this. The species of bird has a territorial song to warn intruders with

recognizable patterns like melodies in music. Each pattern is shared throughout the species but there are also individual peculiarities that modify the song. In this case, this is noise from the source transmitter. As the song moves through the forest it is shaped by trees and foliage it passes. Reverberation and attenuation of the sound frequencies alter the song, noise at the encoding level. In addition to the alterations of the sender and its surroundings, the receiver is subject to other sound which may be of no interest. The culmination of all these variables degrades the signal considerably (Wiley).

Shannon and Weaver's model is not just relevant to sound, but many different forms of energy. One could easily apply the same concepts of the model to instances of human communication through speech and language, while also using the model to more discretely discriminate the parts of an electromagnetic device's signal path. You could use the model to investigate birdsong in a noisy surrounding environment all while using the same model to study static and other interferences during inter telecommunication system broadcasts.

By looking at noise this way, it is no longer bound to the confines of physical sound, but is a part of any signal pathway, where noise is the irrelevant information the pathway is subject to depending on the context. By modeling communication we open up the potential for a greater understanding of how many different disciplines of communication are working.

NOISE AND ITS FORMS IN FACE-TO-FACE COMMUNICATION

Shannon and Weaver's model comes under pressure in certain instances, especially when using it to study human communication. Many complications arise when studying human communication typically because of the complexity of language and the nuances of face-to-face

communication. That taken into consideration, the concept of communication noise still has its applications in human linguistics. There are typically four types of noise that contribute to misunderstanding and mistakes in human communication.

The first, physical sound, is any external sound stimulus that distracts or interferes with a sender's intended message. Some examples of this would be airplanes traveling overhead as you listen for birds, or loud music playing in the background as you try to converse with someone (Rothwell).

The second type, physiological noise, is attributed to the internal status of the sender or receiver due to natural effects or processes. This could be a product of a person's emotional status, such as being angry or sad, as well as distractions due to being tired, hungry, or inebriated (Rothwell).

The third, semantic noise, is noise caused by a sender. It occurs when the language used to communicate is misunderstood by the receiver. This can be attributed to certain language being misused by the sender or to a receiver not understanding what specific language means (Rothwell).

The fourth, psychological noise, results from predilections that receivers bring to conversations. These preconceptions could be stereotypes, biases, and assumptions. When psychological noise arises, which one could argue, is always present, the receiver becomes deaf to what the other person has to say. In doing so, the original message is bent or manipulated into something that the sender is not trying to say (Rothwell).

All four of these types of noise are so complex that they each could be studied endlessly on their own. It is important to be aware of them however in order to gain a better understanding

of the concept of noise as a whole and as we move forward to talk about its application in

mediated communication and its role in visual and sonic arts.

DISTANT NOISE

>Computer-based media technologies are "transforming the
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>relationship between the audience member and the media and
>
>among individuals in mediated social networks. In the media world
>
>it is a shift from "push" to "pull." Where once audience members
>
>could pick from only a few headlines or channels, they are now
>
>free to pose virtually any query imaginable in a search engine and
>
>in turn peruse a virtually unlimited global collection of articles,
>
>books, and videos. It is a shift from one-way to two-way mass
>
>communication--that is, from broadcasting and publishing to social
>
>networking. Interpersonal and mass communication are
>
>increasingly intertwined (Neuman).

Noise has its place in remote digital communication just as it does in immediate physical

verbal communication. There is no doubt that computer-mediated communication can be

advantageous in comparison to interpersonal face-to-face communication in certain instances.

However, there is also no doubt that these media offer vary in their ability to facilitate

interpersonal communication characteristic of non-mediated, verbal communication (Walter).

Although a problem with computer-mediated communication is that it "provides scant

social information," it is becoming used more and more for this exact purpose (Walter). In light

of the difficulty these media have in providing this information, screen based media and remote communication become all the more normalized in modern society. For this reason, the dismissal of these technologies as being inadequate for interpersonal communication can no longer remain.

If one were to suppose an instance of two users communicating using a system such as digital messaging, the same noise factors as outlined above would affect both sender and receiver simultaneously. This alongside the lack of nonverbal cues leads to an outrageous amount of variability in receiving and sending.

AESTHETICS OF NOISE

Noise has found its place in contemporary art. By exploiting rifts and holes in technology, noise "artifacts," or the product of noise in a system that can be viewed, heard, and experienced. Glitch art, a genre of visual and sonic art, is a genre comprised with the soul intention of documenting and employing the bugs, breaks, and short term flaws of various technological systems.

The term glitch art has only been colloquially used since the new millennium (Menkman). The etymology of the term glitch itself was considered unknown for some time and was credited mainly to its use by John Glenn in his contribution to *Into Orbit*, where he talks about short term malfunctions of hardware in Project Mercury (Zimmer). Glitches in systems can be attributed to many things, one of those things being noise, or "a spike or change in voltage in an electrical circuit which takes place when the circuit suddenly has a new load put on it" (Zimmer).

Noise and it's related art forms have more at stake than design or aesthetics. In employing the faults of technology, one brings into question the medium and technology itself while opening up new opportunities as to how the process or tool is used (Menkman). It forces those who experience it to reconsider how the technology is being used and extrapolate what is truly going on inside the devices we use to communicate or to channel aural or visual stimulus. It progresses understanding of how each point in the signal pathway is working, interfacing, and communicating with the other parts in the path. In doing so, a parallel to virtually every form of communication is created.

As technology continues to develop, new possibilities emerge in how disparate technologies could be interfaced and synthesized to create new forms of communication as well as visual and sonic art. Where these new relationships succeed in reducing noise, new forms of it are created. Where these new forms reside, new art forms are sure to follow.

DESIRE FOR CONTROL

Although we can perhaps begin to learn more by studying noise and its effects on effective communication, the belief that we could eventually not be subject to it is a fallacy. That is to say, that there is no such thing and never will be the noiseless channel. To quote Rosa Menkman from her *Glitch Studies Manifesto,* "The dominant, continuing search for a noiseless channel has been – and will always be – no more than a regrettable, ill-fated dogma" (Menkman).

To reiterate, any media or channel, be it verbal communication or digitally mediated remote communication, will always have noise at odds with the signal it carries. For example,

spikes in electrical charges constantly take place in circuits, something that if not accounted for, would yield dirty and unintelligible signals.

A very common problem with noise in audio pathways is the occurrence of alternating current ground loops. When a system carrying audio signals is powered with a configuration where there are multiple paths to ground, extra electric current is picked up through electromagnetic induction. The result, is a large amount of physical noise in the output of a system, usually intelligible by a loud hum sound (Vijayaraghavan). Thankfully, the noise can be eliminated by taking the right measures, which is very similar to how certain noise can be avoided in human communication.

The same cannot be said for verbal and also computer-mediated communication. There is no device to "correct" noise's effects and often the effects go unannounced and unnoticed. The only way is to be aware of its presence and take active measures to negate it if the goal at hand is to communicate without the original message being degraded.

Whether noise is the undesirable by-product of a specific channel or medium, distracting sound stimulus of an external environment, or communication deemed unworthy or dismissable, there remains a desire to send and receive clear signals. It must be recognized that full control of noise is idealistic and for the most part, unobtainable. What can be done, however, is to take steps to become aware of noise and its sources and how to communicate effectively while at odds with it.

SIGNAL OR NOISE

There is both a problem and a question that arises when one begins to seek noise with the desire to employ it to generate an outcome. Does it still constitute as noise, or a signal? On one hand, by discovering glitches and practices to channel them, it becomes possible to study specific noise in a way not possible before. However, by seeking out the noise, does it become the desired signal itself? At what point does the noise become the signal and not the irrelevant information?

Whether it be physical noise, electric or thermal energy in electronic components, or a failure of language, systematic noise is not a choice. There must be some consideration then into the use of the word to describe the noise artifact making process when the desired outcome is to alter the original signal. As soon as process becomes predictable and replicable, it is no longer a glitch, but a means to an end (Menkman). As soon as we desire what was originally described as noise, something very peculiar happens. The positions of the noise and signal switch. Signals and their associated noise are interdependent in their origination. That is to say, they arise mutually. Just like the figure and the ground, both cannot be separated from one another. Why then is it worth pursuing?

Despite the complications of noise and the failure of the language surrounding it, when we choose to confront noise we take back some control in the signals we send. We live in a world where language is bound to fail but is the best tool we have available. By being aware of noise and its effect on communicating and by continuing to join the change, question sender and receiver relationships, and desire to find the glitches, breaks, and noise in systems, communication has a chance to progress and evolve. At a point, the process no longer serves as a metaphor but as a pathway towards more effective communication.

Fig. A - "Terminal #2" - detail view

DOWN THE RABBIT HOLE

As I began to observe the effects of communication noise in face-to-face communication, I began to wonder what place it had in mediated and mass communication. As our society shifts ever towards remote and computer-mediated communication channels, I began to ponder how individual internal desires were affected by the shift from "one-way" mass communication channels such as radio, newspapers, and television to "two-way" mass communication channels like social networking.

It is my opinion that this shift has created a huge amount of confusion, or relative noise, that lingers over users of these new computer-mediated channels. Where there once was a clear

distinction between interpersonal private communication and mass communication, the line blurs as a product of these new media.

It was after observing some of the effects of these channels that I desired to create something that could evoke a viewer to reexamine their relationship to channels and question how effectively they may be typically communicating.

EXPERIMENTS

My first experiments relative to this project began over two years ago. I began growing interested in circuit-bending and analog video processing. Prior to this, I had done experiments with digital video editing and VJ software. With these advanced softwares I was given vast control as to how I could manipulate and work with source footage.

With time, I grew tired of the process. With that control came a major setback, there was no uncertainty. There was nothing indeterminate that could happen unless it was mapped and programmed into the system. This process grew tedious and tiresome. The first magic with having control of video signals through physical midi controllers began to fade. I desired something more organic.

I found a new process in older technology. Having a deep interest in media technology history and its eventual obsolescence, I began exploring analog video and film cameras. After seeing the art of Nam June Paik, Steina and Woody Vasulka, and Laurie Anderson, I had a desire to know how to create the same effects that they were making many years ago. I found a community online of artists who were circuit-bending composite video hardware to create similar glitches in video signal pathways.

After digging through my basement I found a VHS-C camera. The camera had RCA outputs, enabling me to run the RCA cables from the camera into a TV. I began experimenting by running the camera through guitar pedals, powered amplifiers and mixers, circuit bent radio shack equipment, even through multiple television sets and projectors.

What I found so interesting about the process is that each moment was unreplicable. Even if you ran the same tape or video signal through the same signal chain the effect at the moment of origin was indeterminate. The image channeled was always different. I found myself fascinated with simple electronic components and variable resistors to have a massive effect on signals whether it was audio or video.

I next began to replicate the same effect except using digital outputs. The problem was that when a video signal was being bent, mangled, and destroyed by the hardware in the middle, the digital projector or television could not interpret the signal. Where a CRT-TV would display whatever signal it received, "smart" digital outputs would find the signal to be too dirty to work with, and as a product, not display anything at all.

I found another way however. I used all analog equipment to create a signal pathway and run it into a time-based corrector or an analog monitor that had a dedicated video output. The output signal was clean enough for a digital monitor to display the channeled video from the analog system with minimal dropout.

In regards to my research with this project, I think this was my first physical experience with signal degradation that I was aware of in relation to Shannon's concept of communication noise. I began to relate this process to the process of human communication.

Each hardware component acted like one person in a game of telephone. Each person, or piece of hardware, both acted as a sender and a receiver, an input and an output. Each entity only had access to the signal it received and in turn would pass that degraded signal on to the next receiver. The whole process became an infinite source of case studies surrounding the concept of signal pathways where you could visually see the differences between two received messages.

It was after listening to Alvin Lucier's "I Am Sitting in a Room" that I began to desire a physical manifestation of noise's effect on a signal and message. I believe Lucier's work to be extremely important because it degrades his original signal and message just through physical phenomena.

As the recording of his voice is played back into the room, the sound is re-recorded. The subsequent recording is then played back into the room and the process repeats. After a series of iterations, Lucier's speech becomes indistinct as the resonant frequencies of the room build on top of each other in each recording. It was after truly understanding how this process worked that I desired to do something as simple to achieve something as effective. I began to experiment with ways to degrade or generate noise of a source signal through a physical channel.

At around this time, I had recovered a number of window panes that were discarded in a dumpster. Many of them were intact and I desired to use them for a series of sound experiments. My first experiments included attaching contact mics to the window panes and recording audio through them. The subsequent recordings were only of the sound that resonated the glass panes. I began recording airplanes, passersby, and eventually rainfall. I found the process of recording through objects to be a new way to approach sound. To think that we are equipped with tools to listen, but that they only pick up a relatively small portion of the vibrations that surround us!

I began playing these recordings back through the window panes using transducers. Transducers are just like loudspeakers in that they convert an electrical signal into a sound signal. The difference is that speakers have a diaphragm that pushes air to generate sound. Transducers do the same thing but lack a diaphragm and instead resonate the surface or material it comes in contact with. In attaching transducers to the glass, only the resonant frequencies recorded through the contact microphones were played back through the glass and then to the air.

Prior to experimenting with contact microphones, I visited the Caramoor Center of the Arts. At the time there was a very special exhibit of only sonic sculpture. Each piece acted as not only a visual sculpture, but as a sounding object. My first trip to the Center was extremely eye-opening and inspiring. "Stonesong" was also a piece apart of the exhibition that was placed on SUNY Purchase's campus. It was during the first Introduction to Sound class in the Fall of 2014 that I visited the sonic sculpture. It had a profound effect on me and was one of the main influences in developing a desire to begin creating sonic sculpture myself.

FAILED EXPERIMENTS

Before thinking about signal and noise mutually arising, I was convinced that using the glitches of analog and digital video equipment was working with noise. It was during a critique that a professor and mentor stated that even by using hardware for reasons they are not typically supposed to be used for, I was still generating signals, not noise. It wasn't until this was pointed out to me did I realize that it was exactly what I was doing. Even if the images were distorting and abstracting source footage, and even if they were non-representational, they were still picked

up and displayed by the output. They were still ultimately the signal to be displayed regardless of the content of image.

I found myself confronted with a double-bind. How could you generate noise if it had nothing to do with the content of the image? It was at this point that I realized that signal and noise arise mutually. That you really cannot just generate noise, that noise is not determined by what the message looks or sounds like, but its relationship to the receiver.

DIFFERENT MEDIA

After extended experimentation with analog and digital audio visual equipment I began to grow discouraged and disinterested in the process and the product of video glitch. While this was happening I began to feel a desire to "disconnect" from social networking and digital mediated communication as a whole. As a product of the digital revolution it has become nearly impossible to live and operate without the digital tools that help us communicate. We live in a society where remote communication has become a norm and in doing so creates friction between interpersonal and mass communication. After feeling the effects of oversaturation and reliance of these communication methods, I began to work without the aid of digital technologies.

I began to draw. It was a few years prior to this exploration that I had acquired a stained book of 24"x18" newsprint paper. The large booklet was on clearance because of the stains and tears it had been subject to in its long duration of sitting on a craft store's shelf. I found drawing and writing on these sheets to be grounding. In light of anxiety and insecurity using computers to create and research, drawing became a new fascinating way to illustrate the stress and friction I

was feeling as a result of computer-mediated communication's necessity in the new millennium. I set a constraint for four weeks to not create or research with the aid of a computer. In doing so, I found and unlocked new sub conscious connections to the very problem I wished to learn more about. It was during this time that I generated a series of drawings that illustrated degradation of signal pathways in relation to human verbal communication as well as the sending and receiving of signals between various media technologies.
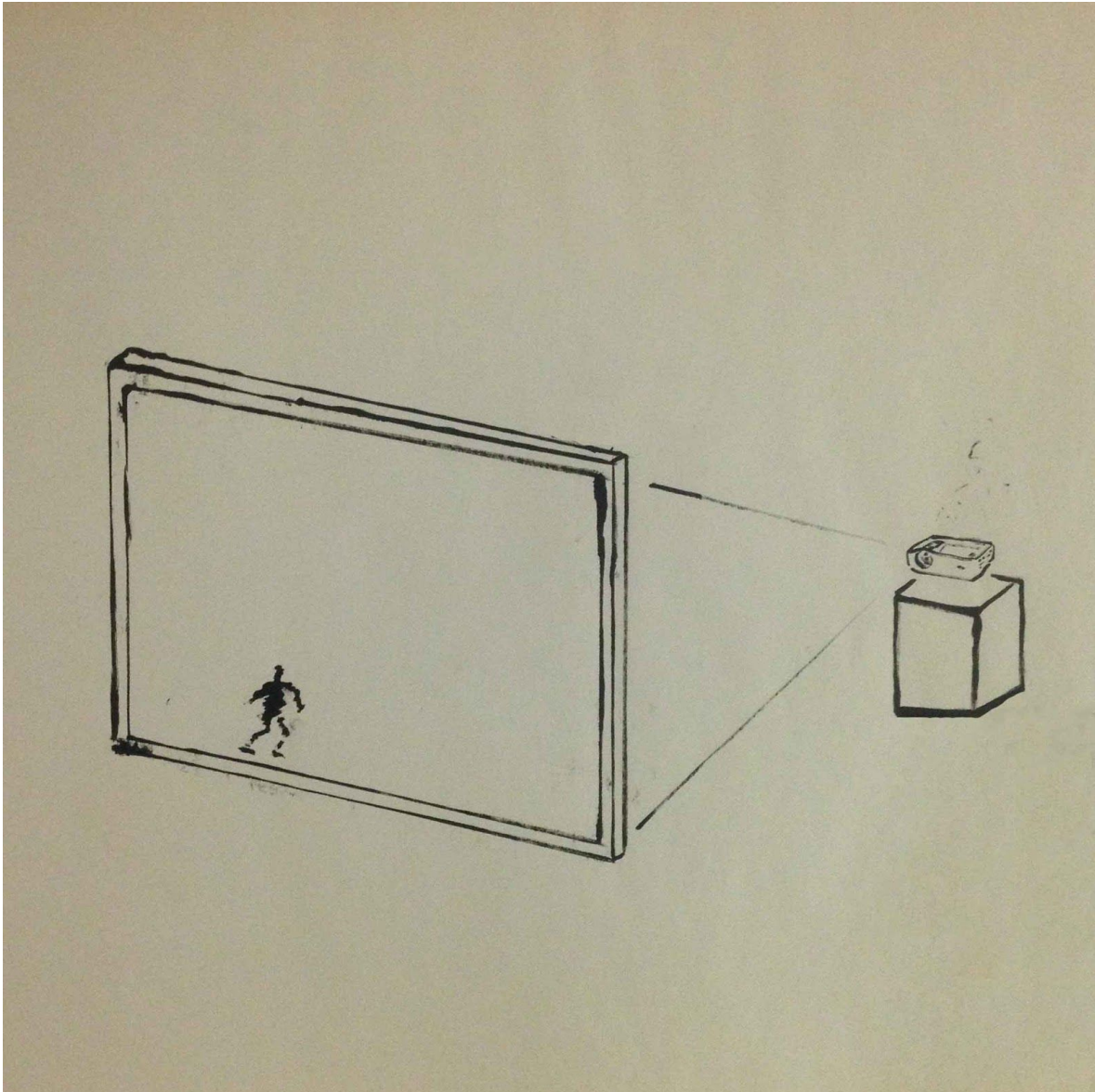
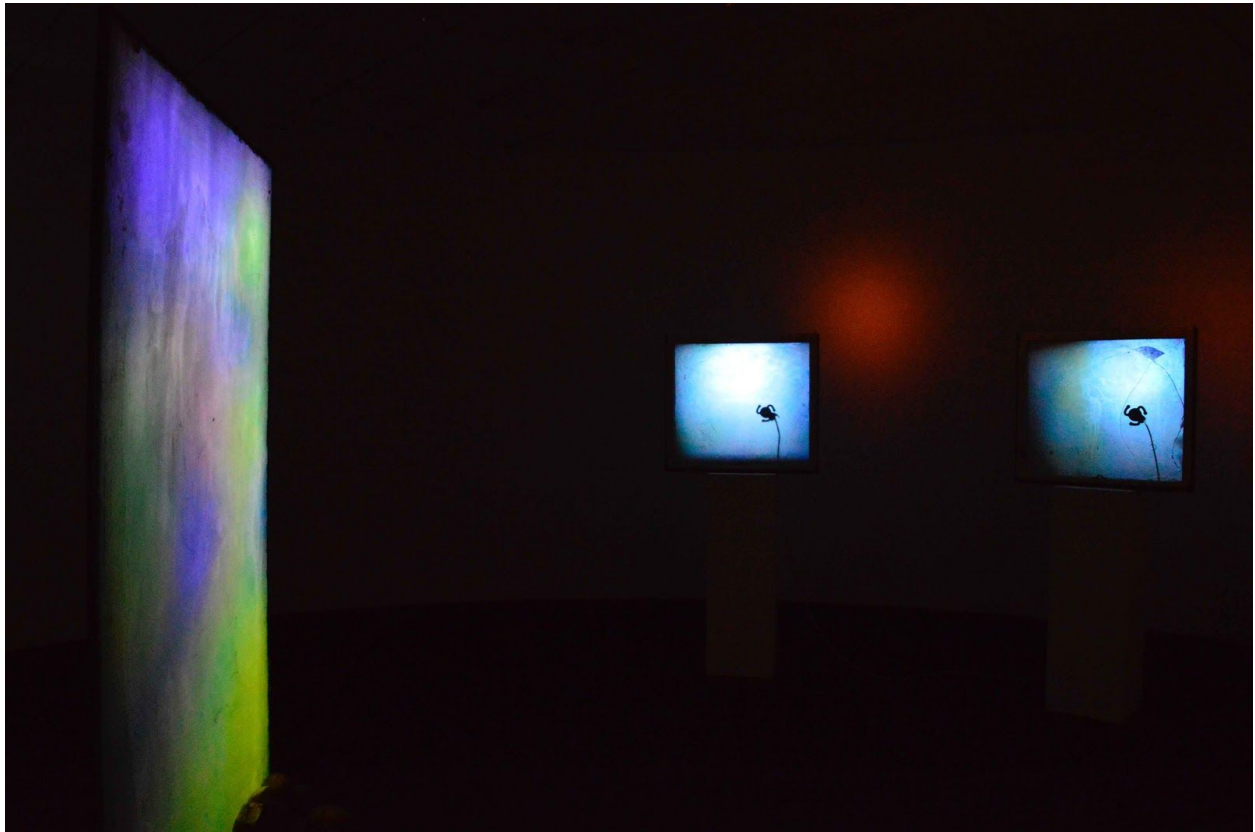Fig. B - "Figure/Ground" - India ink on news print - 24"x18"

DANCING GLASS

Fig. C - "Dancing Glass" - exhibition view

The final piece was exhibited in the Two Walls Gallery as a part of the Hot Keys

exhibition. As the viewer entered the room, they were immediately viewing Terminal #3, a

thermal paned window frame seventy-five inches tall and forty-five inches wide. To the right

were Terminals #1 and #2, two twenty-four square inch window frames placed on 4 foot tall

pedestals. These windows were fixed with transducers that played a long playing sound

composition consisting of only sound recorded through the same window frames.

Use of space and placement of each element was extremely important to me. Because the

goal was to get viewers to walk in between the projected image and the glass pane, I placed the

largest pane in the center of the room. This was partially because there needed to be enough

space in between the wall-mounted projector and also because I wanted viewers to walk around

it.

The others panes were placed closer to the walls and played sound into the space. They

partially meant to allude to the feeling of actual windows by letting in light and sound into an

interior space. They were meant to operate as terminals to another simultaneous space. Much like

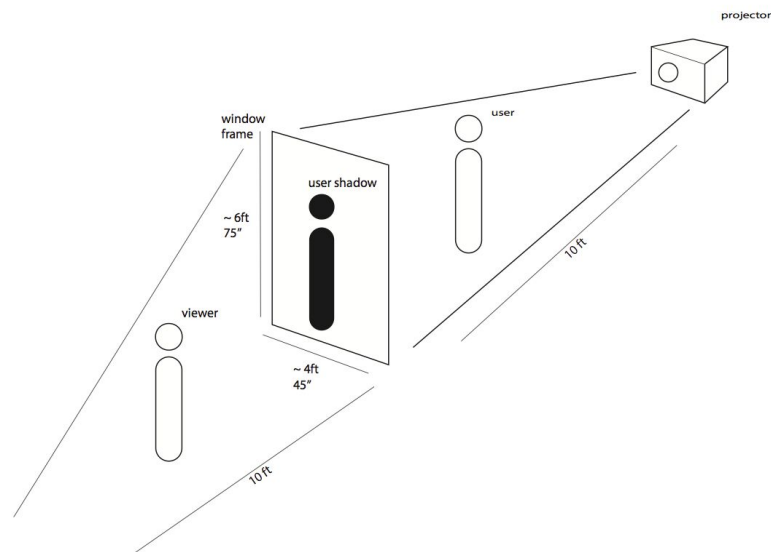opening a window to hear the sounds of the exterior environment.

Fig. D - "Terminal #3" - installation plan

As I hoped to create something to address my goals and research, the whole installation

acted as a physical manifestation of a signal exchange between a sender and receiver. As

illustrated in Figure D, the projector was to act as a sender, or message source. The light would

travel to the channel, in this case the window frame, where a receiver on the other side viewed

the image. Users who pass between the projector and window frame act as a metaphor for noise in that their silhouettes interfere with the original source signal.

I also used the window frames as metaphors for screens and terminals as an example of a channel. By using something like a window frame to act as a channel, I hoped viewers would begin to question the system of communication itself, and not the specific material it was transmitting.

A TURNING POINT

In December of 2016 I experienced something that shaped my final piece. It was a very cold and dark evening in upstate New York. As I lay in bed, the power on my street suddenly went out. The violent, cold, whipping winds had brought the power down for about an hour. As I lay there, my eyes began to adjust. Slowly, what was complete darkness came to light. I realized that the street lights and the interior lighting that pour from the window panes of the surrounding homes was really a layer of relative noise degrading the dark landscape that truly existed.

It was only a matter of time before the streetlights flickered and the power came back on. I sat patiently by the window as slowly television sets and computer monitors turned back on. As I could not see the screens themselves I only saw the light they generated, flickering on the walls of the interior spaces that traveled out the window panes into the relative darkness of the street.

It was at this moment that I realized just like the streetlights were are surrounded by media technology that creates a form of noise that distracts us from our immediate environments. I realized that there was no defining aesthetic characteristics of noise, but that it had to do with a stimuli's relationship to the viewer or listener and the environment it inhabits.

Fig. E - "Terminal #1", "Terminal #2" - exhibtion view

EFFECTIVE/INEFFECTIVE

After installing and receiving feedback from viewers, it became clear what worked and

what did not. What I believe worked best was using the window frames as a metaphor for

televisions and screen-based media. The link between flat terminal screens and window frames

resonated with the viewers and worked with the idea of how turning on a television or computer

is much like opening a window.

I also believed the similarities between the large window and two smaller ones worked to

create unity in the piece as a whole. Having the three elements work together spatially and

sonically made the piece more coherent as a whole.

I think what was truly most effective was allowing users to interact with the sculpture.

By creating space for the viewer to move around the screens, viewers were able to interfere with the source signal. The resulting image being obscured and obstructed by the viewer's body. In doing so, the figure and ground arise mutually, and viewers from the other side much consider the relationship between the source footage and silhouette that arises.

Although there were elements of the piece that worked, there were some parts of the piece that were not as effective. For instance, I think that the river stones holding up the large window distracted from the overall message of the installation. My original intention was for the stones to hint at how screen-media forms have been developed and become more "polished" over time. Although I think that conceptual thread could work, I don't believe it was as important in comparison to the instance of the figure and ground relationship that arose when users interacted with each terminal.

I also felt that the smaller windows should been closer to the gallery walls to infer that they were acting as windows and not as terminal screens. Having them on pedestals with projectors behind them allowed users to interact with them, but I think having them hanging from the ceiling with flat screen monitors behind them could have made them act differently than the large-scale terminal while still addressing the related noise of messages mediated by screens.

Because of the large amount space I had to work with, I spent a lot of time moving each element of the piece around. Having three different sculpture elements all in one space created the challenge of arranging them in a way for the installation to work best. I think I used the available space to the best of my ability, but could see the installation working differently, potentially more effectively, in another instance.

CHANGED PERCEPTION

After going through the whole process of creating this piece, I learned many things. My understanding of the issues I explored changed, and my goals changed with it. I learned that signals and noise have an interdependent relationship. To reiterate, that they cannot exist without one another, they originate together. Regardless of the content of an image, it is the images container and the relationship to the viewer where the question of signal and noise arises.

In realizing this, I am left with new questions surrounding the phenomena of communication noise. In the future I hope to explore its effects more literally in relation to newer forms of communication technologies like two-way screen-based communication platforms. I have also desired to create a form or metaphor to illustrate the concept and phenomenon of feedback. I wish to explore new media platform's ability for both parties involved to share collaboratively and simultaneously. For this reason, I hope to one day create another iteration of the project that acknowledged not only noise's presence, but feedback as well.

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