Signal & Noise: Information

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Claude Shannon’s Information Theory of Signal & Noise (1949)

Shannon at Bell Labs developed the theory to get rid of noise from telephone communication

- How to send a maximum amount of information
- How to measure the capacity of a channel to carry information
• **Signal**: Ordered information
• **Noise**: Unstructured, randomized information
• **Redundency**: The measure of unnecessary, therefore “wasted” space. Functions to reduce errors
• **Entropy**: A measure of the average level of information, or uncertainty (noise) in a situation. How things result in relation to what is expected (probabilistic model)
• **Data compression**: Reduces the redundancy
Noise is unintended, unplanned information that got into the signal

Engineers want to reduce the noise

But noise is useful to test systems, to increase the complexity

Noise is also interesting as an aesthetic device
I Ching to Binary System, Gottfried Wilhelm Leibniz (1701)

https://en.wikipedia.org/wiki/Gottfried_Wilhelm_Leibniz
**Frequency Modulation**: Where one wave modulates another to get a complex signal

**Fast Fourier Transform**: A way to decompose a (complex) signal to its make-up of multiple basic frequencies
- **Brown (1827)**: Erratic motion of inanimate particles in water
- **Einstein (1905)**: Particles are moved/pushed by water molecules

https://en.wikipedia.org/wiki/Brownian_motion
Random sequence results in noise (in this case black or white cells)
Markov Chain: What is the probability of the next state based on what has previously happened

https://en.wikipedia.org/wiki/Markov_chain
Analog TV noise (left), Digital Noise (right), George Legrady (1985)
“Beneath the Surface, Scratching the Surface”, George Legrady (1987)
A signal is scrambled based on a pattern turning it into noise – and the same pattern is used to descramble the data once it is received returning it to signal.
“The Art of Noise: Futurist Manifesto”, Luigi Russolo (1914)

Exhibition History (1986-1990)

• USC Atelier Gallery, Santa Monica (1987)
• Digital Photography, Captured Images, Volatile Memory, New Montage, SF Cameraworks (1988)
• Minneapolis College of Art & Design (1990)
• YYZ Gallery, Toronto (1992)
• “Iterations”, International Center of Photography, NYC (1994)
The siren song of Western consumerism is echoed by Kodak's presence in Hanoi.

Amy Rink of Novato, Calif., throwing out her latest batch of junk mail.

https://www.digitalartarchive.at/database/general/work/equivalents-ii.html

Glitch Art, Rosa Menkman (2010)

http://transfergallery.com/rosa-menkman/
The Perception Of Glitch

Our taverns and our metropolitan streets, our offices and furnished rooms, our railroad stations and our factories appeared to have us locked up hopelessly. Then came the film and burst this prison-world asunder by the dynamite of the tenth of the second, so that now, in the midst of its far-flung ruins and debris, we calmly and adventurously go traveling. 

- WALTER BENJAMIN

THE MEANING OF NOISE

To develop a categorization of noise for contemporary audio-visual media theory, I have used Claude Shannon's mathematical theory of communication. In his definition of informational noise, Shannon conveniently focused on the transfer of information between machines, leaving human elements and context out of the equation. Drawing on Shannon's model, I was able to divide digital noise into three basic categories of noise artifacts: encoding/decoding artifacts (which are most often referred to as compression artifacts), feedback artifacts and the 'other' corruptions known as glitch artifacts – artifacts for which the causes are not (yet) known. It is important to realize that the difference between each of these artifacts is not rigid, as the description of a glitch artifact can be understood as a de/compression or feedback artifact (and visa versa), depending on the viewer's knowledge of the technology. In the context of human-computer communication, I also deviate from Shannon and Weaver and believe that the concept of noise becomes more complex as it connotes meaning and translation. Consequently, human-computer definitions of noise must also include social parameters and become more complex, inevitably negotiating questions of context, perception and aesthetics.

The etymological definition of noise refers to states of aggression, alarm and powerful sound phenomena in nature (‘rauschen’). When the concept of noise is approached within a social context, noise does not exist independently, but only in relation to what it is not. However complex or inclusive noise appears as a signifier, it is always a kind of negativity: it stands for unaccepted sound, not music, invalid information or the absence of a message. Noise is unwanted, other and unordered. Accordingly, there is also no unequivocal cultural definition of noise, because in the end, what noise is and what noise is not, is a social matter. As James Brady Cranfield-Rose writes, noise is a "cipher", a question mark, forever eluding fixed definitions. Furthermore, whichever way noise is defined, its negative orientation also has positive, critical dimensions. Noise tends to reflexively stage a reconsideration or re-view its opposite – the world of meaning, norms and regulations, goodness, or beauty.

A Phenomenology Of Glitch Art

"Failure" has become a prominent aesthetic in many of the arts in the late 20th century, reminding us that our control of technology is an illusion, and revealing digital tools to be only as perfect, precise, and efficient as the humans who build them.

- KIM CASCONE

THE PREDICAMENTS OF DEFINING GLITCH ART

Artists often find themselves on a frontline, reflecting on the cultures, politics and technologies of their time. Over the last decades, audiovisual media and computers have gradually gained more and more importance in an art field that is still fundamentally ruled by classical media forms and genres. Noise itself is of course not new; similarly, contemporary glitch art relates to a long history of noise art and artists battling in different ways against media forms and their flows and conventions, including especially what I have outlined as the convention of transparent immediacy.

While not being new, noise art arises unpredictably in new forms across different technologies and cultural scenes. Over time, noise artists have migrated from exploring the grain, the scratching and burning of celluloid (for example, A COLOUR BOX by Len Lye, 1937) to the magnetic distortion and scanning lines of the cathode ray tube (a significant work by Brian Eno was "White Noise" in MAGNETIC MOVEMENTS, 1978). Subsequently, glitch artists wandered the planes of phosphor burn-in, as Con Arefeldt did in PANASONIC TH-D42P6D8K PLASMA SCREEN BURN, in 2007. With the arrival of LCD (liquid crystal display) technologies, dead pixels were rubbed, bugs were trapped between liquid crystals or plastic displays and violent screen cracking LCD performances took place (of which my favorite is &SCR2, by Jodi, under the Pseudonym webcrash 2800 in 2009).

To some artists, myself included, it has become a personal matter to break the assured informative flows of media. While normally, transparent media screens generate conventional impressions of immediacy, there is a desire to force the viewer to think beyond his comfort zones. Glitch artists make use of the accident to "disfigure" flow, image and information, or they exploit the void – a lack of information that creates space for deciphering or interpreting the process of creating (new kinds of) meaning. Through these tactics, glitch artists reveal the machine's techne and enable critical sensory experience to take place around materials, ideologies and (aesthetic) structures. Their destructive or disfiguring processes have no technological name, definition or explanation (yet). For this reason, it is necessary to not only define and categorize glitch at technological levels, but also to look closely at how specific media are exploited on a more complex techno-cultural level. The artists I discuss here include Ant Scott, S.VOLTCORE Gijs Gieskes and Jodi. Of course many other artists whose practices are invested in the moment(um) or culture of glitch could have been included here. An actual historiography would for instance also include signal processing artists like Karl Klump, Loidif, Morgan Higby-Flowers and Max Capacity, aesthetic glitch-tricks like Jon Satrom, Jon Cates, fabric artist Melissa Baron, and databend generative artists such as stallhol, glitch-ironi Pixelnoiz and Hellocatfood. This historiography is still unwritten (partly because it is still in progress).


https://reas.com/mathematical_theory/
“Signal to Noise”, Casey Reas (2012)

https://reas.com/signal_to_noise_s/
“Control Room (You Haven’t Won)”, Casey Reas (2013)

https://reas.com/control_room/
Sound Synthesis

Select Image Region → Raster Scan Pixel Values → FFT → Apply Filters → Filtered Spectrum → IFFT → Filtered Pixel Data → Audio Wavetable → Rescale → Spatialize → Multi-Channel Sound → Final Sound and Image
“Milch, 10 Hz, 20 Hz, 25 Hz, 40 Hz, 95 Hz, 110 Hz”, Carsten Nicolai (2000)

http://www.carstennicolai.com/?c=works&w=milch

http://www.carstennicolai.com/?c=works&w=unitape


https://www.lissongallery.com/exhibitions/tatsuo-miyajima-innumerable-life-buddha
“data.tron” (WUXGA version), ryoji ikeda (2011)

http://www.ryojiikeda.com/project/datamatics/#datatron_wuxga_version
“data.flux” (12 XGA version), ryoji ikeda (2017)

http://www.ryojiikeda.com/archive/works/
“data.tron” (3 SXGA+ version), ryoji ikeda (2009)

http://www.ryojiikeda.com/archive/works/
Brownian Motion in Nature: https://www.youtube.com/watch?v=89LP5pHWxM8

Vasulka: Transformations | Digital Images | Artifacts

Casey Reas: https://vimeo.com/144161213

Voice of Sisyphus: https://vimeo.com/239322215

Carsten Nicolai: a [alpha] pulse


Rioji Ikeda: Data-verse | data.matrix | code.verse
To be continued…