xCoAx 2022 10th Conference on
Computation, Communication, Aesthetics & X
2022.xCoAx.org
Coimbra, Portugal

No noise, no party! On Shannon, Aesthetics and one reason for the love of random in digital art practices

Giuseppe Torre
giuseppe.torre@ul.ie
University of Limerick, Ireland

Basil Vassilicos
basil.vassilicos@mic.ul.ie
Mary Immaculate College, Limerick

Fabio T. Pellizzer
fabiopellizzer@gmail.com
University of Cologne, Germany

The notion of communication system as presented in many humanities scholarly works is rooted in engineering and the seminal work of Claude E. Shannon titled "A Mathematical Theory of Communication" - published in 1948. In all, the narrowness of a mathematical understanding of communication, as presented by Shannon, presents severe limitations but also, as it will be shown, possible openings, directions or bridges towards the non-mathematical. In particular, the analysis presented here depicts any notion of communication as being inseparable from any noise. In fact, moving at or beyond the clearly defined mathematical limits that are explicit in Shannon's theory means to invalidate the very possibility of a communication system at all. It is by looking at these limits, it is argued, that a discourse between a theory of communication and aesthetic theories of digital arts is energised. This is not least because in that dialogue might be found a plausible explanation for the ever-growing love of random functions and statistical modelling by many digital art practitioners..

Keywords noise, Claude Shannon, communication theory, Aesthetics, random, statistical modelling, order, digital art practices

DOI 10.24840/xCoAx_2022_68

1. Introduction

"A Mathematical Theory of Communication", published in the Bell Systems Technical Journal in 1948 (Shannon 1948), is the seminal work of Claude E. Shannon with which, building on the work of Nyquist and Hartley, the domain of information theory is often told to be born. Following its publication, the influence of Shannon's work was soon felt outside the engineering domain and reached the arts and humanities disciplines.[1]

1. As a notable example in the arts, we mention Bense and Moles' Information Aesthetic theories. For an introduction and critical appraisal of these theories, see Nake (2011).

In media theory and media arts studies, Shannon's work is often introduced to authoritatively sketch out the basic elements of a communication system. In non-mathematical terms, Shannon's schematics of a communication system are simple to comprehend. The system includes a sender - a person, a lighthouse, a computer or anything else able to "send" something - who wishes to convey a message to a receiver - another person, a sailor, another computer or anything else able to "receive" something. In order to do so, the message needs a carrier, a channel or more generally a medium. This entails that noise can affect the system. From these basic premises, a wealth of discourse has been generated. It has concerned itself with the interfering power of the medium, the meaning of the message, the interpretative capacity of the receiver and, not least of all, the hierarchical structure that defines the relationship between technological media and society, where the question is which one controls the other.

Truth to be told, the fact that Shannon's theory is first and foremost a *mathematical* theory is a fact that much of the humanities discourse has, perhaps, underplayed a bit. One notable exception to this "overlook" is certainly a recent work by Cécile Malaspina, titled "An Epistemology of Noise" Malaspina 2018). There she offers an eminent example of how an appreciation of some of the tensions and nuances emerging from Shannon's mathematical model can help broaden its scope to a philosophical questioning of the ideas of information, entropy and noise. In particular, such an analysis brings to the fore an idea of communication as one defined by uncertainty and entropy. In order to take that idea seriously, moving beyond and yet departing from a mathematical understanding of Shannon's theory helps to evade "the Manichean opposition between information and noise, echoing that between order and disorder, life and death" (p.18).

Along the lines of such a methodological approach, this paper presents some considerations relating to the aesthetic of digital art practices on the basis of a preliminary analysis of the strictly mathematical meaning of Shannon's theory.

2. There is no meaning

A close read of Shannon's famous paper is in order. The second paragraph describes succinctly the problem at hand. Here is the excerpt:

> The fundamental problem of communication is that of reproducing at one point either exactly or approximately a message selected at another point. (Shannon 1948, p. 379)

In this sentence we can find the now classical understanding of communication as information or data travelling from a sender to a receiver. Such simplicity of the enunciation is achieved at the expense of insight into the complexity intrinsic to all kinds of communication, for instance as highlighted by pragmatic theories of the early and mid-20th century. This is to say that the problem of communication thus proposed was limited in its scope as an engineering problem and nothing more. On the other hand, Shannon was very clear with regards to the remit of his work. Any use of his theories outside that remit has to confront the narrowness of its original scope:

> 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. (p. 379)

This is important. Shannon's theory of communication is not concerned with meaning or semantics but only with the probabilities involved in the successful conveyance and interpretation of data parsed from one point to another through a medium.

Communication is to be understood as a mere parsing of data via a medium. This is something that seems to have pleased many, even when what is at stake is our relational stance with the medium. McLuhan's motto "the medium is the message" (McLuhan 1994), for example, states that the medium is what really counts in communication. Any message conveyed through a medium by a conscious subject, and any meaning extricable from a conscious individual at the receiving end, is inexorably altered by the overpowering presence of the medium itself. In this sense, the importance of senders and receivers is minimised in relation to the organising power of the medium, for instance in the way the presence of electrical light organises visual data within a room. Kittler, as another notable example, also pushes for a view highlighting this dominating aspect of technology over human affairs. At the same time, he also defends a position in which meaning should not be thought of as something given a priori, as McLuhan does, but rather as something emerging from our relationship with the materiality of the medium. Meaning, if one wishes to be concerned with it, is only the result of the reading of a system, or network, parsing information (Gane 2005).

3. There are only variables

The elegant graphical conceptualisation of the process of communication offered in Shannon's paper has offered much food for thought to humanities scholars. Figure 1 shows such a graphical map (with original caption included).

Fig. 1. Original schematics of communication system as depicted in (Shannon 1948, p. 381).

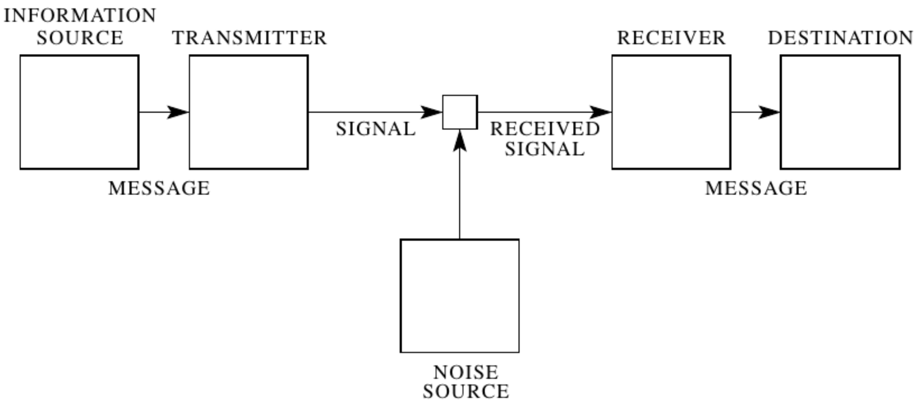


Fig. 1—Schematic diagram of a general communication system.

Shannon describes the figure as made up of five parts: 1) an information source e.g. a teletype sentence, TV/Radio signal etc. 2) a transmitter - essentially a coder 3) a channel enabling the transmission of the coded signal 4) a receiver - i.e. a decoding device 5) "the person (or thing) for whom the message is intended".

The reason why Shannon's theory can do away with meaning and semantics is because an information source can be anything (a person, a computer etc.). In fact, because the sender, as information source, is identified with the message itself, for Shannon it hardly matters who or what sends it. What concerns Shannon is then not the meaning or intentions behind what is communicated, but its form. For example, a sentence is only a group of words and letters put together according to the rules of the system to which they belong (i.e. a syntax and morphology). The fact that Shannon considers the destination as being either a person or a thing is only a veiled, unexplored and possibly naive gesture towards the possibilities of cybernetics.

4. Channel as mathematical uncertainty

There is a curious discrepancy in Shannon's text and it concerns noise. Noise appears in the picture as an element/player in itself but, curiously, in the text is presented as disturbance under what appears listed as "channel". Here is the full definition:

> The channel is merely the medium used to transmit the signal from transmitter to receiver. It may be a pair of wires, a coaxial cable, a band of radio frequencies, a beam of light, etc. During transmission, or at one of the

> terminals, the signal may be perturbed by noise. This is indicated schematically in Fig. 1 by the noise source acting on the transmitted signal to produce the received signal. (Shannon 1948, p. 381)

Noise, it seems, *acts on* the medium (the wires, the cables etc.). While not necessarily precise as a definition, we now know what noise does - i.e. it disturbs - but not what it is or where it comes from. Noise disturbs the transmission of a message between a transmitter and a receiver. A sort of trick of God who decided to throw a spanner in the works. A definition though comes at page 19. It states:

> The noise is considered to be a chance variable just as the message was above. (Shannon 1948, p. 406)

For Shannon, noise is nothing more than a mathematical variable, just as a variable is the information source in his analysis. The narrowness of his scope requires such a synthesis. His words are, once again, direct in their purpose:

> We wish to consider certain general problems involving communication systems. To do this it is first necessary to represent the various elements involved as mathematical entities, suitably idealized from their physical counterparts. (p. 381)

Perhaps this sentence epitomises what Husserl famously described – in relation to modern physics – as the "mathematisation of nature" (Husserl 1984, p. 23) ...[2]

Beyond this last remark and at the risk of sounding ridiculous, it is obvious that a theory of communication grounded on statistical analysis cannot accept certainty. Theorem 2 states exactly that:

$$H = -k \sum_{i=1}^{n} p_i \log p_i$$

H is the "measure of how much "choice" is involved in the selection of an event or of how uncertain we are of the outcome". In other words, *H* is the probability with which we can tell what the sent message is and the rate with which information is produced. *H* is the measure for the information source in probability terms. That is, it is the measure of the choice and uncertainty between possible messages without considering any medium of transfer. The interesting part is that *H* must always be positive - i.e. there must be some uncertainty. This also means that in the limit case of $H = 0$ we would have certainty and with certainty we nullify the need for any channel - i.e. no uncertainty means no channel or medium. For example:

> If a source can produce only one particular message its entropy is zero, and no channel is required. (Shannon 1948, p. 404)

2. In the Crisis (§ 9), Husserl devotes some important pages to the impossibility, in modern physics, of a "direct mathematisation" and formalization of sensible qualities (plena). Husserl's distinction – in Ideas I (Husserl 1980), § § 72-75 – between, on the one hand, "exact" and "ideal" sciences (operating through formalisation and idealisation, at the basis of "defined multiplicities"), and on the other, "morphological" and "inexact" sciences (which includes botany, as well as his phenomenological philosophy), enriches the conceptual framework which could be used in a philosophical approach to noise. However, we must leave open the question of whether and how Husserl's theory can illuminate the kind of mathematization carried out by information theory (e.g. the way in which noise is reduced to a mathematical variable, and the limits of such operation), but also the way in which noise is dealt with in contemporary digital practices. It should be considered whether ours 'computers' are 'calculators' in the same way as the minds of the physicists and how differences might require a different conceptual framework.Cristopher Durt (2020) emphasizes the analogy between the process of mathematization of the nature described by Husserl in the Crisis and the digitalization of world. He remarks: "Husserl did not speak of a 'digital' world, but since the 'mathematical world' of modern science is made of data, it is a digital world. The mathematization of nature is a digitization and digitalization of nature. Husserl's insights on the relation between

intuitive experience and the mathematical world thus also apply to the relation between intuitive experience and the digital world. Husserl's account of mathematization explains why it is easy to overlook the fact that the mathematical or digital world is fundamentally different from the lifeworld".

Following from the previous formula, H is 0 "if and only if all the p_i but one are zero, this one having the value unity. Thus only when we are certain of the outcome does$H$ vanish. Otherwise H is positive."

Interestingly, all this is explained in a chapter that Shannon titles as "Discrete Noiseless Systems". In fact, in this preliminary part of his analysis Shannon is only concerned with information source and destination while discarding the channel. And yet we need uncertainty to be able to talk about communication and channels. In doing so, what he is implicitly telling us is that **"noiseless" is another word for "channel-less"**. In other words, noise is neither a dispensable element of a system of communication nor a medium, nor something whose presence we have to begrudgingly live with. Rather, it is a necessary and intrinsic element of communication for at least two reasons: 1) statistical methods are useful as long as noise is present (i.e. $H < 0$) and 2) there can be no channel without uncertainty/noise.

Hence, can there be mediation (as in the act of negotiating and parsing data) without noise? No, because "there would be nothing to mediate". Ultimately, can there be communication without noise? No, because there would be nothing to share or say.

All of the above, of course, is only valid within the clear constraints of another limit case, namely, the one in which any degrees of certainty is forbidden. This is the case presented in Theorem 2,

$H =- k \sum_{i=1}^{n} p_i log p_i$, where all instances of $p_{i1,i2...in}$ would equal 0. In such circumstances, H becomes undefined[3], meaning that H is only an ever-approaching but never-reaching mathematical idealisation of *pure* noise/uncertainty/chaos - where *pure* means "beyond any possible mathematisation of the phenomenon".

3. log0 is undefined.

In between the boundaries of certitude and irreparable uncertainty lies our channel. Perhaps, and in light of what has been presented so far, the following will suffice as a definition for channel: **a channel is a mathematically described conduit of noise, while the uncountable totality of all noise transcends/ exceeds any possible channelisation . A message, on its part, is that identifiable pattern that survives the passage of the conduit.**

5. Noise as mathematical variable

The second part of Shannon's essay is concerned with discrete channels of communications in the presence of noise. In this part of the essay Shannon includes noise as a mathematical variable (rather than being a necessary and implicit element of the system as I cared to argue previously). By including noise as mathematical variable, the received message E at the receiving end is described as a function of two variables: the sent message S and the channel's noise N.

$$E = f(S,N)$$

The probabilities intrinsic to the communication channel are described as the combination of the entropy of both the information source and the receiving end. In short, we are applying H across all the elements described in Fig.1. The formula is:

$$H(x, y) = H(x) + H_x(y) = H(y) + H_y(x)$$

where:

- $H(x)$ is the entropy (i.e. noisiness) of the information source;
- $H(y)$ is the entropy (i.e. noisiness) of the receiving end;
- $H_x(y)$ is the entropy of the output when the input is known;
- $H_y(x)$ is the entropy of the input when the output is known and it is also called “equivocation” - the average ambiguity of the received signal.

In this instance, noise characterises the whole communication chain. Noise is present at the input, output and in the channel bridging input and output. Shannon’s theory, faithful to the title of his paper, is a *mathematical* theory that aims to establish within what probabilities we can successfully establish a communication between two parties.

Following from the previous formula, Shannon introduces Theorem 10 where he states that:

> If the correction channel has a capacity equal to $H_y(x)$ it is possible to so encode the correction data as to send it over this channel and correct all but an arbitrarily small fraction of the errors. This is not possible if the channel capacity is less than $H_y(x)$. (Shannon 1948, p. 408)

This means that in order to enhance the probability of reconstructing correctly the message sent we need to ensure that the capacity of the channel is greater than the entropy of the input when the output is known. As Shannon then states, “$H_y(x)$ is the amount of additional information that must be supplied per second at the receiving point to correct the received message.”

From another perspective, if we are ready to consider this additional information as **pseudo-noise** (i.e. man-made/controlled/correlatable noise), it would seem that we have yet discovered another reason for **the unavoidable necessity of noise in communication. Communication just seems to be a pattern-searching process within a field of noise.**

6. Nature's wants money back

Towards the end of the first part of the paper, **Shannon defines the capacity** C **of a noisy channel as the maximum rate of transmission achievable** and defines it as:

$$C = Max(H(x) - H_y(x))$$

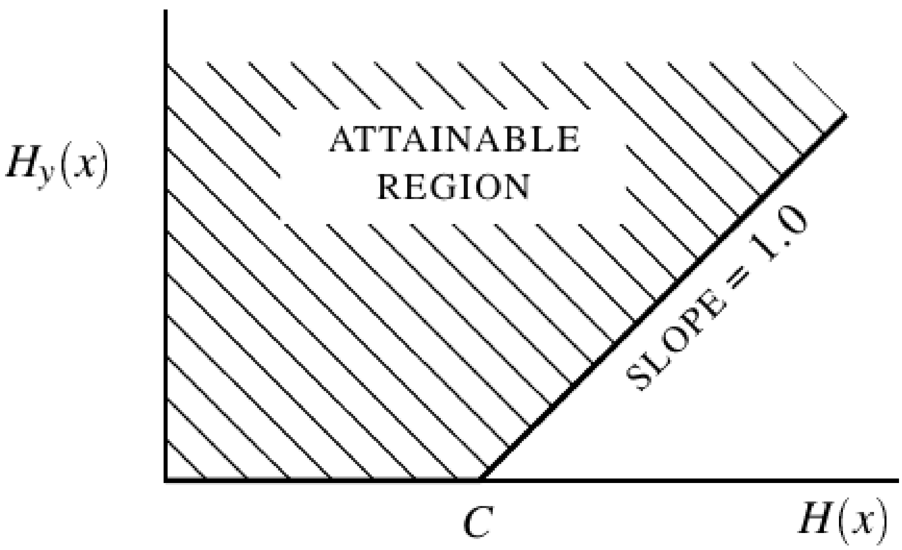
where, to be sure:

- $H(x)$ is the entropy of the information source alone; and
- $H_y(x)$, also called the equivocation, is the average ambiguity of the received signal.

Two things should be born in mind here: the relationship between the entropies and the rate of transmission. From this perspective, the capacity C is both the statistical value determining the probability for a variable to be in one state rather than another and the rate with which that value can change.

The relationship between $H(x)$ and $H_y(x)$ is explained by Shannon via the figure presented below:

Fig. 2. The equivocation possible for a given input entropy to a channel. (original caption).



Perhaps more clearly than in the formula, this picture tells us that the **rate of information produced by a source** - $H(x)$ - **is always greater than the rate (and certainty) with which the receiver will be able to interpret it** - $H_y(x)$ **or equivocation.** This is in line with what has been stated so far. Indeed, in order to maximise the capacity C we need to have $H_y(x)$ approaching (but never reaching) 0 so that the rate of successful (certitude of correctness) transmission approaches $H(x)$

- the original source. In other words, we increase pseudo-noise with redundancy while attempting to minimise (but never eliminate completely) uncertainty or statistical noise. The limit case of $H_y(x) = 0$ would again be a case of a noiseless (and hence channel-less) system.

It is at this point that Shannon states something exceptional:

> Actually the capacity *C* defined above has a very definite significance. It is possible to send information at the rate *C* through the channel with as small a frequency of errors or equivocation as desired by proper encoding. This statement is not true for any rate greater than C. If an attempt is made to transmit at a higher rate than *C*, say $C+R_1$, then there will necessarily be an equivocation equal to or greater than the excess R_1. Nature takes payment by requiring just that much uncertainty, so that we are not actually getting any more than *C* through correctly. (Shannon 1948, p. 410, emphasis added)

In what highlighted in red lies a very important acknowledgment by Shannon: there is noise outside mathematical noise that cannot be claimed by or accounted for by humans, nor by their technology, logos or culture.

7. The many ways (yet not all) in which noise can be said

The second part of Shannon's essay extends the discussion to continuous channels of transmission (as opposed to the discrete channel discussed so far). While this section is also important, no new interpretations of the idea of noise, nor of communication, are introduced. Hence, this brings to a stop this analysis of Shannon's essay in order to pause the discussion for a quick recapitulation.

We have seen how the idea of channel, of medium and, more generally, of communication systems is inseparable from an idea of noise. Many and diverse uses of the word "noise" have been mentioned by Shannon up to this point. It might be useful to divide these definitions in three macro groups - one for which noise is a mathematical concept ( ), one for which it is not ( ) and one for which ( ) a clear attribution may require at least further questioning - as follows:

× ( ) Noise as disturbance.

× ( ) Noise as unavoidable and necessary feature of a channel.

× ( ) Noise as mathematical variable.

× ( ) Noise as chance variable.

× ( ) Noise as entropy of an information source.

× ( ) Noise as entropy at a channel's receiving end - aka equivocation.

× ( ) Noise as error.

× ( ) Noise as redundancy.

× ( ) Noise as uncertainty.

Noise is a mathematical variable and as such it is described in terms of the entropy of a system or the many parts thereof. Noise is a stochastic variable concerned either with the probability of a given outcome or, conversely, with its uncertainty. In broad terms, entropy is the measurement of uncertainty in a given system. For that, entropy connects to the randomness with which something might occur (or not). Under this light, any definition of noise blurs across multiple terms such as entropy, randomness, uncertainty, chaos and more generally disorder. All these terms have different and precise meanings. These are not matters of literary caprice. Mathematics requires the narrowness of its definitions for the consistency of its reasoning. For Shannon, noise is primarily a mathematical idealisation of communication. For him, noise is experiential in so far as it is measurable. Noise enters his phenomenal sphere if, and only if, it can be computed. Hence, it does not matter what the real source of that noise is, as long as "what it is" is measurable or countable in statistical terms. Shannon deals exclusively with a calculable world where communication has been mathematicised.

And yet Shannon also hints at noise as something else, something extra, something disturbing and interfering with an otherwise "clean" process. Figure 1 depicts this by placing noise outside the linear left-to-right flow of information. There is no concern for the origin of noise. Shannon is simply concerned with visualising what happens, namely "something" that at once pervades, affects and defines a communication system. Noise, it seems, is everywhere so that perhaps a more faithful drawing would see communication as the mere leftover, or discoverable pattern, or negative image, within a nois-e/y field. Noise would then not be an extra-partes affecting the communication process but something intrinsic and necessary to it - as indeed Shannon's formulas highlight too (i.e. no noise means no [need for a] channel or medium).

Repetitia juvant: can there be mediation without noise? No, because "there would be nothing to mediate". Ultimately, can there be communication without noise? No, because there would be nothing to share.

Furthermore, a communication system can exist only within two boundaries that define noise: certitude and irreparable uncertainty.

Certitude, meaning "lack of noise", makes sender and receiver coalesce into one entity (or subject, if one wishes). No channel at this point is required nor, as Shannon's theorems prove, does it have any reason to exist. Noiseless becomes synonym for channel-less and communication-less. Communication, if taken to mean "making something common", would not without noise be able to accomplish its mission; there would be no sharing possible in the first place.

On the other hand, if we increase the rate of transmission to or beyond the maximum capacity of the channel, message and noise coalesce into an absolute chaos. A chaos from which it becomes impossible to recuperate any meaningful difference between message and noise. To be sure, such an irreparable uncertainty does not lead us to uncover a presumably chaotic structure of reality - or what Meillassoux calls Hyper-Chaos. If *Hyper-Chaos*[4] existed, as Meillassoux acutely observes, it would invalidate any attempt to ground any sort of scientific discourse. Similarly, hyper-chaos would invalidate any effort to ground a theory of communication (and perhaps any attempt to communicate too). The irreparable uncertainty introduced here, rather than implying a "menacing power", refers instead, and solely, to the limits within which it is possible to logically construct a mathematical theory of communication based on a differentiation between message and noise.

In all, noise is something that needs to be carefully handled within a communication system. Too much noise brings greater uncertainty; too little brings us redundancy.[5]

8. For the love of noise

In light of the analysis offered to this point, it is clear that the implications of Shannon' theory of communication for aesthetic discourse must take into account a study of noise. This expanded analysis, bringing to the fore the inalienability of noise in communication systems and media, may prove particularly useful for understanding certain peculiarities in those art practices characterised by the overpowering presence of technological media and digital media in particular.

By bridging the outcomes of our analysis of Shannon's work with the necessary contingencies of an aesthetic discourse, the balancing act of noise becomes both increasingly difficult and ever more fascinating.[6]

If communication is taken – not uncontroversially – as a model for aesthetic discourse and practice, this should certainly not be explored, as in Shannon's paper, in terms of the possibility of "reproducing at one point either exactly or approximately a message selected at another point". One important reason for this divergence from Shannon is that artists are not concerned with stating something in unequivocal or approximate terms ....[7]. Instead, artists wish to share, to gift someone despite knowing in advance that the way their gift will be received cannot be identical to the way in which they intended it in the first

4. "...what we see there is a rather menacing power - something insensible, and capable of destroying both things and worlds, of bringing forth monstrous absurdities, yet also of never doing anything, of realizing every dream, but also every nightmare, of engendering random and frenetic transformations, or conversely, of producing a universe that remains motionless down to its ultimate recess, like a cloud bearing the fiercest storms, then the eeriest bright spells, if only for an interval of disquieting calm." (Meillassoux 2009, p. 64).

5. As discussed previously a noiseless system (or one that aims to be so) can be achieved by either lowering the complexity of the system (e.g. sending only the letter "a" rather than the entire alphabet) or by adding correlated noise to the signale or by sending multiple copies of the same signal – aka pseudo noise). Any message is conveyable only within this careful balancing act.

6. Once again, we do that at our own risk while acknowledging that Shannon's concerns were exclusively mathematical. In fact, if we were to consider the meaning/s of a given message conveyed through a communication system, we would then have to consider also subjects and intentions; in all, something at the heart of all art practices and foreign to Shannon's discourse.

7. To put it with Adorno, "stating" is for science, art asserts (Adorno 1986, p. 168).

place. The implication here is that, in contrast with the nature of communication systems depicted thus far, uncertainty can energise rather than threaten or extinguish aesthetic discourse. This uncertainty, or ambiguity, of the message and the whole system is the "salt" of any social interaction involving arts *in primis*.

Furthermore, from the perspective of an individual's private practice, the same uncertainty is what provides the opportunity for a life-long exploration of one's own artistic practice with and through the body or an instrument. All artists know that the learning and exploratory journey that defines their own practice is unbounded. Only death can put an end to that path. From this perspective, an art practice is defined by an endless exploratory process in, through and in relation with, an overwhelmingly complex and noise-pregnant reality. For that, art practices can be conceived as a wish to command the non-command-able, to tame the untamable, to bring order to chaos.

Yet within this picture there is perhaps one crucial exception, namely the one provided by those art practices defined by an engagement with digital technology. To be sure, the exception here is not given by the blatantly obvious presence of the medium (i.e. the digital); every art practice has their own medium: the body, the guitar, the synth, the brush, the chisel etc. Rather, this exception is provided by the mode of existence of the digital - a mode that is rooted in the most abstract mode of existence of any entity subject, namely, as something countable or calculable. Put concisely, "digital" means "to discretise a flow of electrons in time so as to count things one wants to give a number to" (Torre, 2021, p. 23). This number-game, however, is played in a manner that aims to reduce noise - in fact, erase it[8]. The digital, in the way it is thought today, is entrapped in an ideology of efficiency and performative excellence that wants noise to be minimised to its closest point of disappearance. As Shannon's theorems show, this can be achieved (if one wishes) by either minimising the entropy of the system (e.g. reducing the possible numbers of conveyable messages) or by increasing the redundancy of the system (e.g. creating pseudo-noise). This choice or course of action would move us towards the boundaries of Shannon's channel. Boundaries in which any message, discourse or communicative intent risk becoming mere tautology; no-noise means no channel and, in turn, no communication.

What would the meaning of any art practice be in such circumstances defined by an explicit antagonism towards noise by digital technologies? Little to none, is the argument. Digital art practices, contrary to any other form of art practice and in order to retain an ability to communicate, must then move in the opposite direction, namely, from order to chaos. Here is then the reason for the abundant love that many digital art practitioners share for random routines and statistical modeling techniques. These methods appear to re-introduce noise in an effort to move away from the "dangerous" boundaries/case-limits of the system. After all, it seems to be the only way to hide the unrewarding precision of execution of a mere sequence of commands given to a digital machine.[9] Random

8. For integrity, it may be worth mentioning that there are examples of computer science research that attempt to move in the opposite direction of an efficient and redundant digital realm. Perhaps one of the most famous research is the "best effort" architecture devised by Prof. Akley https://www.cs.unm.edu/~ackley/.

9. Our interaction with the digital is nothing but mere sequences of instructions given under the form of "execute!"

functions and statistical models are the only way, or hope, to strive away from those tautologies visible at the horizon of one's own practice.

In the name of this necessary love for noise which digital tools deny, digital art practices are increasingly defined by a wish to un-command the command-able, to un-tame the tameable, to bring chaos to order.

Still, in all that, it remains to be seen whether such a love for random routines and statistical models are sufficient to re-inject meaning – via an 'injection' of noise - into digital art discourse and practices. After all, digitally constructed randomness is, like any list resulting from any statistical model, correlated noise; noise that remains (or at least wishfully appearing to be) "sealed off from" the noise as uncertainty claimed by Nature.[10] It is noise in a vacuum, then, and entrapped in a solely numerical existence; an existence distant from the necessary uniqueness of self, the subject, the artist. But this is a question for another time.

10. Bar the cases of unpredictable glitches and power outages.

References

Adorno, Theodor Wiesengrund.
1986. Aesthetics and politics. Radical thinkers. Verso. ISBN: 9781844675708.

Durt, Christoph.
2020. "The Computation of Bodily, Embodied, and Virtual Reality: Winner of the Essay Prize 'What Can Corporality as a Constitutive Condition of Experience (Still) Mean in the Digital Age?'" Phänomenologische Forschungen 2020, no. 1.

Gane, Nicholas.
2005. "Radical Post-humanism: Friedrich Kittler and the Primacy of Technology." Theory, Culture & Society 22, no. 3 (June): 25–41. ISNN: 0263-2764, 1460-3616. https://doi.org/10.1177/ 0263276405053718 http://journals.sagepub.com/doi/ 10.1177/0263276405053718

Husserl, Edmund.
1980. Ideas Pertaining to a Pure Phenomenology and to a Phenomenological Philosophy. Third Book. Phenomenology and the Foundation of the Sciences. Translated by Ted E. Klein and William E. Pohl. Martinus Nijhoff.

Husserl, Edmund.
1984. The crisis of European sciences and transcendental phenomenology: an introduction to phenomenological philosophy [in eng]. 6th pr. Translated by David Carr. Studies in phenomenology & existential philosophy. Evanston, Ill: Northwestern Univ. Press. ISBN: 9780810104587 9780810102552.

Malaspina, Cécile.
2018. An epistemology of noise. Bloomsbury Academic. ISBN: 9781350011786.

McLuhan, Marshall.
1994. Understanding media: the extensions of man. 1st MIT Press ed. Cambridge, Mass: MIT Press. ISBN: 9780262631594.

Meillassoux, Quentin.
2009. After finitude: an essay on the necessity of contingency [in eng]. Pbk. ed. London ; New York: Continuum. ISBN: 9781441173836.

Nake, Frieder.
2011. Information Aesthetics: An heroic experiment. Journal of Mathematics and the Arts. Journal of Mathematics and the Arts, 6:2-3, 65-75, DOI: 10.1080/17513472.2012.679458

Shannon, C. E.
1948. "A Mathematical Theory of Communication" [in en]. Bell System Technical Journal 27, no. 3 (July): 379–423. ISNN: 00058580. https://doi.org/10.1002/j.15387305.1948.tb01338.x https://ieeexplore.ieee.org/document/6773024

Torre, Giuseppe.
2021. An Ethico-Phenomenology of Digital Art Practices, Routledge, London/New York. ISBN 9780367406295