Induction Of Sonic Distance: Active Noise Cancelling Headphones And The Imposition Of Sonic Realities

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Abstract

This text presents a series of theoretical examinations of concepts such as induction, noise and space as they pertain to a broader ongoing artistic research project entitled Noise Re(in)duction that explores the possibilities of noise reduction technologies as sonic material for artistic practice. The central argument of the project is that by artificially *reducing* acoustic noise and digitally cleansing sonic environments, Active Noise Cancelling (ANC) algorithms *induce* a different kind of noise into our perception of reality. This paper further explores this notion by arguing that the induced noise is manifested as a parallel sonic reality (a *sonic distance*) which, although sensible, is contingent to the biases embedded in the algorithm. Thus, the broader implications of the conceptualization of noise, distance, sound and reality itself are negotiated through noise reduction technologies and the induction of a sonic distance. These theoretical frameworks therefore seek to establish a solid foundation for an artistic and phenomenological exploration of the nuances found in contemporary audio technologies.

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Introduction

The increasing prevalence of Active Noise Cancelling technologies in our everyday life (from headphones to smartphone devices, smart speakers, virtual assistants, hearing aids and hearables, among many others) has a direct impact in the ways in which perceive and relate to our sonic surroundings. By actively processing, modifying, and (re)producing acoustic environments, these technologies create an alternative sonic reality that is presented as actual, but that is in fact a representation of a soundscape that further alienates the listening subject from an unmediated sensory experience. In the pursuit for an optimal signal transmission, the advancement of noise-cancelling technologies has paradoxically led to the emergence of other forms of noise that extend beyond the boundaries of its intended cybernetic and informational system. Despite being grounded on the wave physics' fundamental principle of destructive interference, the implementation of the relevant noise-cancelling algorithms within the digital realm remains opaque and complex, which is also further exacerbated by the dynamics of patent acquisition and competitive market forces. As it is the case with many other computational processes that are a part of our everyday lives, there is an element of faith in the accuracy and representational capabilities of these devices. However, how much can we really trust our perception, when the perception itself gets mediated? How do digital algorithms mediate the impositions of perception? And how could they reinforce and induce preconceived social biases of race, gender, ability, and class into the perception of soundscapes?

This paper sets a theoretical ground for understanding the ways in which ANC technologies induce a form of noise that is manifested in a sonic distance which is also contingent to the biases of predeterminate algorithms. That is, in order to understand the broader consequences of ANC technologies in our interconnected and hypermediated social dynamics, the concepts of induction, noise and space are in need of a re(definition).

The text first briefly describes the phenomenon of electromagnetic induction, as related to the functioning of audio technologies such as microphones and speakers, to then explain it in action on ANC technologies, including the different modalities that can be found in some of today's most common devices such as Sony's WH-100XM5 and the Apple's Airpods.

Theoretically, induction makes part of Gilbert Simondon's ontological framework of individuation, where *transduction* (different than induction or deduction) becomes the main process by which beings emerge (Simondon). In the understanding of the act of listening as a transductive process, ANC them becomes an affront and a hinderance to the nuances that allow this form of sonic individuation. Instead of allowing a transductive process ANC algorithms *induce* a different kind of noise into our perception of reality. Noise is therefore not only understood in relation to its acoustic and technical modalities, but also in its social, cultural, and aesthetic

dimensions. Supported on Olga Gurionova's and Henri Lefebvre's discussions of distance and space respectively, I argue that, in the case of ANC, noise is manifested in the form of a *sonic distance* which affects the perceptual relation of sonic spaces, understood in its broader spectral, architectural and personal dimension.

Following Mack Hagood's examination of contemporary soothing sound technologies, including ANC, I ultimately offer a perspective in which the transductive quality of the act of listening is truncated by the algorithm, thus inducing noise that manifests itself in sonic alienation and distance. *Sonic distance* is then presented not only as an act of acoustic isolation, but also as a technological affront to our sonic reality. This is archived through the deliberate prioritization of the cybernetic conceptualization of noise as an objective entity and the subsequent possibility of control and personalization that restructures social dynamics.

Ultimately, I present noise reduction algorithms not as an invisible tool to improve a prescriptive listening practice imposed by tech corporations, but rather as a visible and tangible tool that can be challenged through its reorientation as musical and artistic material, as referenced in my ongoing artistic research project "Noise Re(in)duction."

Active Noise Cancelling (ANC)

The fundamental underlying principle of noise-cancelling technologies is grounded on the phenomenon of destructive interference, which occurs when a signal is summed with a phase-inverted copy of itself. In its most basic form, ANC Headphones function by capturing environmental sound through a few tiny microphones, inverting its phase and summing it to the desired signal (e.g. music or speech). Most contemporary devices use a combination of microphones both outside and inside the headset, creating system of feedforward and feedback. The exterior microphones are responsible for capturing ambience noise, while the inside microphones capture the desired signal and the inverted ambient noise (see Figure 1).

The digital processing signal differs from traditional methods of damping noise (such as headphones or earplugs for noise protection), in that not only they aim to block directly the physical passage of sound to the timpani, but also in the lack of control on the amount of noise or signal that is damped. Conversely, the advent of more efficient and compact technology has facilitated the integration of computationally intensive spectral processing algorithms into consumer-grade devices. Digital signal processing enables a precise selection of the spectral characteristics of noise by applying methods such as least mean square (LMS) adaptive filters, noise profiling, spectral analysis and Wiener filtering, each of which is more or less effective against different manifestations of noise. For example, noise profiling is primarily employed for cancelling predictable and repetitive noise,

such as that generated by aircraft turbines or heavy machinery. Adaptative filters are frequently used for more unpredictable and sporadic noise, such as street noise or by-passer conversations. Contemporary solutions that rely on artificial intelligence models are often trained by gathering data on the user's surroundings and habitus. This creates a "scene" that anticipates the context of noise in specific environments. For example, the system can expect to hear dogs and babies in parks, telephones or doorbells in offices, and announcements in airports.

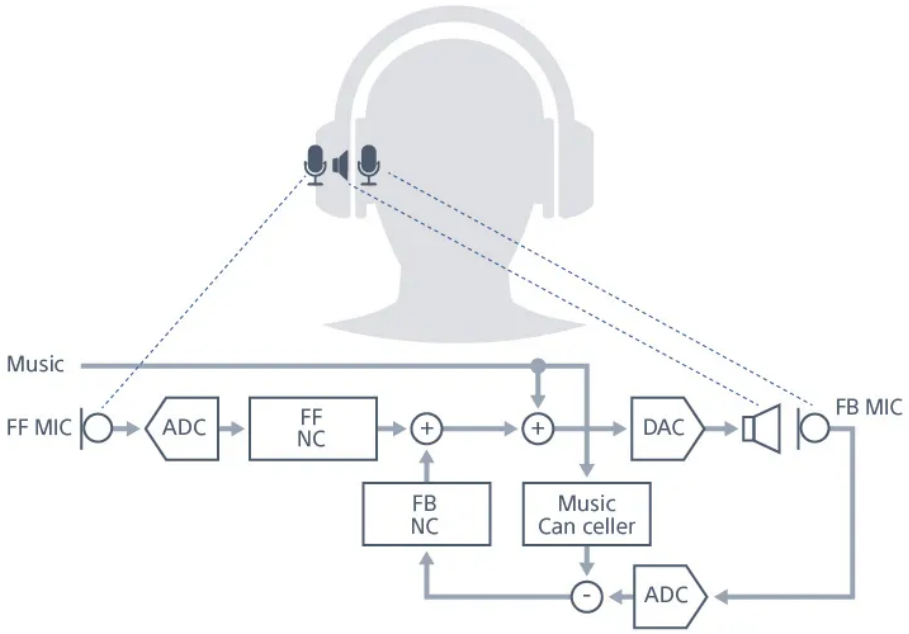

Figure 1: Sony's ANC technology for Audio. https://www.sony-semicon.com/en/technology/audio/index.html

ANC headphones can create accurate acoustic profiles of both the spatial soundscape as well as personal hearing profiles for bodies though a simple impulse-response process, which usually happens when turning the headphones on, by playing an initialization sound. Furthermore, ANC headphones offer a variety of functions and features, including personalised equaliser options, Spatial Sound Optimization for consumer-based spatial sound formats such as Dolby Atmos, based on data gathered from gyroscopes and accelerometers included in the devices circuitry, and the creation and selection of different quotidian soundscape profiles (e.g. home, office, jogging, gym, etc.). ANC headphones often provide the possibility of additional experiences through personalization through an accompanying mobile phone app. This includes Active Noise Awareness, voice interactions, and virtual assistance. The user interface of the app becomes a sonic interface thought the use of headphones.

A compelling feature of contemporary ANC headphones is the implementation of a so-called *Transparency Mode* (in Apple's Airpods) or Ambient Sound Feature (in Sony's WH-100XM5). Unlike traditional noise cancellation, which aims to suppress environmental audio in order to create an optimal acoustic environment for the transmission of a signal, transparency mode actively captures and enhances certain external sounds, allowing the users to remain aware of their surroundings

without removing the devices form their ears. The implementation of a transparency mode depends on a complex process of digital signals in which the physical isolation provided by the headphones must be compensated for by the (re)creation of ambient sounds, ensuring that the user perceives these sounds "as if" they were not wearing the headphones. Transparency mode is one of the main features that differentiates current ACN headphones from previous models. It is, therefore, one of the main features marketed by Apple, Sony and many other developers. While previous models marketed the access to a private sonic space, where silence and tranquillity was the norm, current models are directed towards the possibility of a sonic ubiquity, where the individual could switch at will between different sonic profiles.

The experience of listening though noise cancelling algorithms then varies from device to device. However, in both pure noise cancelling and transparency mode, there is a double process of *transduction* in real time, from acoustic to digital and back to acoustic, which aims to make the device that produces the medium invisible. To explain the intricacies of the ANC and its consequences on the listening experience, a discussion of some basic concepts that permeate the functioning of audio technology is needed.

Induction

Electromagnetic induction is a phenomenon through which an electric voltage is generated by a changing magnetic field. This is the basic underlying principle in the functioning of microphones and speakers. In dynamic microphones, variations in sound pressure move a coil around a magnetic field, *inducing* an electrical voltage which is then transmitted as an audio signal. In dynamic speakers, variations in electrical voltage on a coil induce a magnetic field which results in the movement of an attached diaphragm, producing changes in air pressure. i.e. sound. These two inverse processes are indeed manifestations of a single phenomenon known as *transduction,* where one type of energy is transformed into another, in this case, acoustic energy to electrical energy and vice versa[1].

Gilbert Simondon draws upon these physical concepts to develop his theory of physical individuation, where a metastable system is resolved by developing its potential into a structure (Simondon 5). For Simondon, induction is a unidirectional epistemological process that generates plausible generalizations derived from individual observations, therefore requiring a loss of information (15). In ANC, the unidirectional inductive process is exemplified by the transformation of ambient sound into a simulacrum of reality. The outcome of this process is pre-determined by the observations embedded in the algorithms and then presented as a virtual reality, disregarding the information that has been cancelled as unnecessary.

Conversely, transduction provides the basis for an explorative form of thought which is not necessarily teleological or linear. Simondon expand this definition to include “a physical, biological, mental, or social operation through which an activity

propagates incrementally within a domain" (13), which also allows for reconfigurations of new structures without loss or reduction (15). Furthermore, transduction is the main process through which individuation is afforded, thus being able to actualise the multiple possibilities of a metastable system.

ANC's inductive algorithms that process the acoustic environments therefore negate the processes of transduction, not only by producing a loss of information, but also by negating the process of individuation, replacing potentiality with determinacy. In Simondon's words: "the veritable limit of induction is plurality in its simplest and most difficult form to cross: heterogeneity. As soon as inductive thought is faced with this heterogeneity that it must resort to transductive thought" (Simondon 127).

Within this framework, the act of listening is regarded as a fundamental transductive act, not only in the actual transformation of acoustic energy into electrical neural signals, but also as a process of individuation: as the potential of creating auditory scenes by resolving the metastable possibilities that the soundscape provides. The act of listening as a transductive process involving intuition, discovery and becoming, serves as the basis for an exploration that "discovers and generates the heard" (Voegelin 4). In contrast, the inductive method imposed by ANC delegates the potentiality of the soundscape to the algorithm, becoming the arbiter of perception, and thereby negating access to the nuances of noise and the soundscape itself.

Sonic Distance

Considering listening as a fundamental Simondonean transductive act invites to conceptualise *sonic distance* from a phenomenological perspective that prioritises spatial and embodied listening and negotiates between malleable relationships of different acoustic realities. Similar to Olga Goriunova's conceptualization of *distance* as a non-representational notion that negotiates "between digital subjects and the human entities and processes they are connected to" (128), I consider *sonic distance* as a relation between two distinct modes of perception: a commonly perceived reality, and an algorithmically altered one, the last one which is only accessible by the inductive processes embedded in ANC. While Goriunova is interested in the distance between the "digital subject"[2] and the human being, the distance generated by ANC occurs between a "digital *acoustic* subject*"* (a digital representation of the data gathered and processed by ANC Headphones) and the sonic actuality of soundscape. ANC not only encourages a *sonic distance* through sonic alienation and the imposition of an inductive sonic reality already determined by technology, which carries the implicit biases of its teleological functioning. ANC also introduces a form of distance that goes beyond a pure physical realm and affects directly the sonic profile and footprint though which human and non-human agents create a relational dynamic through sound.

Following Henri Lefebvre's categories of space (Lefebvre 38-9), I would further argue that ANC disrupts the perception of space at its three main levels: spectral (conceived space), architectural (perceived space), and personal (lived space).

From a technical perspective, ANC headphones disrupt the conventional conception of spectral acoustic space through a series of digital processes that include analogue-digital and digital-analogue conversion, adaptative filtering, and destructive interference, all of which modify the and spectral and spatial qualities of audio signals and surrounding soundscapes. The cancelled spectral space of the signal subsequently becomes a negative space deemed as noise, which favours the idealised signal through a deterministic process of deconstruction and objectification, a signal that exists between the real and the synthetic, where information is actualised as the ideal entity of the cybernetic project: immaterial and disembodied.

This spectral space is analogous Lefebvre's conceived space, an abstract representation of audio and soundscapes as numbers, samples and digital processes. ANC challenges this conceived space by obscuring its processes of transformation, and by altering the pre-conceived forms of capture and reproduction of audio signal. In the context of speech transmission and telecommunications, ANC creates an enhanced form of "acousmatic" or schizophrenic voice, by taking it out of its context and (re)creating it as a purer form of itself. (see Kane). In the musical context, ANC attempts to replicate the High Fidelity conditions prevalent in recording studios such as acoustic isolation and controlled reverberation time. In listening to ANC, the user has access anytime anywhere to the HiFi promises of experiencing music "as if" it was listened in the recording studio. These spectral modifications and re-creations do not reconstruct a real space, but rather simulate one based on the references of its acoustic and spectral configurations, i.e. create a simulacrum.

The spectral non-space that alludes to the HiFi audio quality and optimal recording studio acoustics, negates the context of environmental sound, and thus challenges the conception of architectural space. For Lefebvre "the spatial practice of a society is revealed through the deciphering of its space" (Lefebvre 38), that is, the quotidian relations between private and public sphere are revealed through the activation of places and forms of transit, leaving behind a sonic trace characteristic of their sonic persona (Schulze 123). ANC's negates access to these spaces and practices, which is achieved not only by confining the individual to their own headspace, but also by creating a negative architectural space, a *non-space*, in which only sounds deemed worthy of containing information are allowed to be reproduced. Non-spaces are described by Marc Augé as "a space which cannot be defined as relational, historical, or concerned with identity" (Augé 63). Consequently, the non-space offered by ANC also negates a phenomenological perception of space, by separating not only the signal from its context, but also the listener from his spatial context, from his embodied experience.

For Lefebvre, space is produced in time, i.e. it is historical. Therefore, the non-space of ANC is not produced in time, it is always already there. While the soundscape of the non-space may be contingent to the nuances of its particular context, the results are always the same: the user is transported to a ubiquitous ahistorical, non-space of noiseless purity where time and space do not exist. As it is the case in malls and shopping centres, the sonic non-space produced by ANC it's the consistent across locations, and its expectations and experiences are the same whether the listener is located in Berlin, Bogotá or Bandung, listening today or ten years ago. The negation of architectural space is even more present in transparency mode, where the reproduction of the environment is outsourced to the algorithms, presented as pure information which is disembodied and non-relational. This non-space becomes non-existent in re-produced signals, alienating the signal from both its original source and its context.

Third, ANC presents an affront to personal space. Through transparency mode, the transformation of personal space it is not a simple negation of a social space, but rather an active awareness of one's surroundings, enabling its re-productions and the actualization of a non-place. Isolation and personalization thus negate the social relational dynamics that take place in urban and social contexts. ANC then negates the relation with the lived spaces of Lefebvre through "associated images and symbols" and challenges the "more or less coherent system of nonverbal symbols and signs" (Lefebvre 38). This is exemplified by the mediation of interactions afforded through transparency mode; when users engage with conversation while wearing headphones, there is a disruption in the nonverbal cues and expectations of communication.

Furthermore, ANC intersect with other forms of sonic technologies in what Mack Hagood calls "orphic" sounds (Hagood, "Hush"), that is, soothing mechanisms to combat the increasingly noisy environments and stressful lives of post-industrial societies. These include not only ANC technologies, but also natural soundscapes, various forms of drones and noise, and so-called binaural beats. Wellness-embedded sound devices also provide an experience of noise cancellation, an optimization not only of the signal, but of the subject itself. By cancelling out noise, the user protects his ears, is more productive, more relaxed, more themselves. Ultimately, it is a manifestation of identity politics in the form of an internal wellness culture.

The creation of this architectural, spectral and personal non-space afforded by ANC, brings implicitly and unintentionally attention to what is not there. For Simondon, indeed, "resolving transduction operates the inversion of the negative into the positive" (Simondon 15). Transductive listening then turns the negative (noise) into the positive.

Noise

Implicit in the design of ANC algorithms is a conceptualization of noise as an objective entity, based on a definition of noise as a measure of the probability of information, as proposed by Shannon and Weaver (1964). The quest for a "pure" signal has encouraged communications engineers to devise methods for optimizing message transmission. The relationship between noise and signal (c.f. signal-to-noise ratio) can thus be measured, quantified, and objectified, positioning noise as the opposite of signal: an unwanted, *othered* entity. Noise-cancelling algorithms participate in a dialectical relationship between imposed social and cultural binaries, reinforcing these very demarcations.

The ideological consequences of conceptualizing noise as informational entropy account for biases gender, race, and class biases, among others (see Malaspina). Tina Tallon points out how the signal filtering implemented in the early days of mass landline telephony was optimised with the white male voice in mind, producing undesirable (shrill) results for female voices. (Tallon). Similarly, current digital voice communication technologies such as Zoom or Facetime implement significant processes of filtering, compression and noise reduction, as well as anti-feedback algorithms that modify their input for optimal transmission. Likewise, digital compression codecs such as MP3 have compressed and filtered parts of the recorded audio that are considered irrelevant in a psychoacoustic sense, in favour of a smaller, more portable and efficient data format for transmission (Sterne).

Noise, therefore, needs to be expanded into a broader definition that goes beyond the acoustic and informational, and that includes its social and cultural manifestations. For instance, Cécile Malaspina (2018) distinguishes between noise as a qualitative measure of sound and a quantitative measure of information in relation to noise, the former measuring noise as an object of perception, the latter measuring a relation of probability. Within sound studies, the phenomenon of noise is often seen as culturally and historically contingent (see Attali, Hegarty, Voegelin, Hainge). As Mack Hagood puts it: "Noise is othered sound, and like any othering, the perception of noise is socially constructed and situated in hierarchies of race, class, age, and gender." (Hagood, *Quiet Comfort* 574). Meanwhile, for Jacques Attali noise is violence, disruption and disconnection, an interruption of a transmission (Attali 26) that denotes relations of power and control (Attali 123).

This socialization of noise is most present in the demarcation and construction of human bodies, and it is even more present in the control and regulation of racialised and queer bodies. Salome Voegelin compares the bodily effects of noise and silence, positing them as opposites: "Noise pushes vertically down my body, compressing my chest and propelling me outward into my breathless bodily fantasy. Silence, on the other hand, enters me and pulls me inward and outward, stretching my nervous system through thin layers of skin, hooking my inner flesh to the outer edge of my body" (Voegelin 86). The numbness caused by noise is then turned

inward, creating an individual space of self-protection without the possibility of relating to the outside world. The elimination of this noise is then desired, with a longing for its opposite, silence, which creates an outward awareness of our surroundings.

Nevertheless, Noise Cancelling Algorithms do not provide the experience of silence, but of "non-noise."The possibility of a "Cagean" silence that expands listening into a possibility of meaning, as described by Voegelin, is denied in the resynthesis processes of noise cancelling algorithms. ANC imposes its own version of reality by assigning a predetermined meaning and preventing the possibility of exploratory listening. This is presented to the user as a form of control that is also pre-established in the (sonic) user interface. As Joseph Klett notes, "'Silence' does not mean silence 'out there' so much as it represents control over one's hearing 'in here.'" (Klett 124).

Contrary to the oppositional approach presented by Voegelin, noise and silence can be viewed as part of an ever-evolving continuum based on perception. The opposite end of this continuum is information, or the desired signal. However, in contrast to Shannon and Weaver's objectification, information can be conceived as a perceptual manifestation, based on a phenomenological approach to listening that prioritises attention and bodily experience as epistemic tools. By negating the complementarity of the noise-silence continuum, noise cancelling technologies have achieved the same phenomenological results as Voegelin's conceptualization of noise: “noise now, in its quasi inertia, is not about mass movement and progress, but about private and isolated fixity: listening on a heavy spot and pondering that position.” (Voegelin 43). That is, ANC force the listener into a unidimensional and homogeneous listening reality that avoids any potential for multiplicity and thus negates a perceptual perception of information. A reconceptualization and repurposing of its technologies is therefore needed to achieve ANC’s aesthetic, exploratory, and transductive potential.

Reduction

Musically, noise has evolved from the antithesis of music to a more affective and disruptive method of conveying numbness, discomfort, and discontent. (Voegelin 86). From Luigi Russolo's proto-fascist manifesto to the digital synthesis techniques of Iannis Xenakis to punk and Japanoise, various forms of "noise music" have developed their own aesthetic and confrontational discourse (see Hegarty) As such "noise-in-itself" is positioned as an artistic methodology, that implicitly valuates noise positively and positions the existence of "noise-music" as an aesthetic oxymoron, a metastable phenomenon.

Nevertheless, within the pervasive negative valuation that is ubiquitous in our cultural milieu, noise as the other has been the subject of several levels of systematic control and regulation mechanisms, of which ANC is the most recent example. The concept of *noise pollution* has been employed as a pretext to

pathologise and regulate loud and chaotic sonic environments, and even to present them as an aesthetic threat to the ecological preservation of soundscapes, as evidenced by the practice of R. Murray Schafer (Schafer). The purist form of listening encouraged by noise regulations is a direct consequence of the cybernetic objectification of noise and is one of many factors that reinforce the social and cultural paradigms underlying the development of noise reduction algorithms.

While R. Murray Schaffer proposes a return to purer soundscapes and the contamination of the environment by industrial noise pollution, Marie Thompson notes that the ways in which noise is represented take on a form of universalization, where all noise is seen as impure and immoral (Thompson). Thompson presents a series of counter-examples to the noise-silence ethical binary: Solitary confinement and silence are used as forms of punishment, and natural soundscapes such as the Amazon rainforest can be incredibly loud and disturbing (Thompson 100-1). Access to silence is then not only mediated by public order laws, by acoustic, architectural or urban dispositions, but rather refers to an access to control. The mediation of a digital process embedded in ANC is therefore not only a form of environmental control, but also a hyper-real actualization of an acoustic imaginary and its embedded aesthetic moralism.

From a phenomenological standpoint, beyond creating an optimal acoustic signal, ANC algorithms provide an *experience* of noise cancellation, regardless of the content of the signal. For instance, Spike Jonze's advertainment shot film “Someday” (Jonze 2025) exemplifies the ways in which ANC headphones are not just a technological advance or a Hi-Fi device, but rather providers of an experience of isolation that is made to be displayed in public: a kind of isolationist voyeurism that is at once individualistic and social. Mark Hagood considers noise-cancelling technologies as mechanisms through which personhood is created and reinforced, enclosing the self and protecting it from the increasing sources of environmental noise (Hagood, “Hush”). Hagood also distinguishes between traditional narrative media that entertain or inform, and current forms of media that not only seek to make the medium invisible, but also seek to make the content itself invisible, creating a perceptual absence (Hagood, “Hush” 22). That is, the digital signal processing of environmental sounds is presented as invisible, as an experience, even though a mediation is taking place constantly. Indeed for Hagood, media does not function as an invisible medium to carry information, but is rather an affective tool that alters “how the body feels and what it perceives, controlling our relationship to others and the world, enveloping ourselves, and even disappearing ourselves.” (Hagood *Emotional Rescue*). In Jonze’s commercial, when the ANC is turned on, Pascal is not transported to a completely new reality, but to an enhanced reality, more vivid, playing with the promise and hope of a better future.

Conclusions

The induction of sonic distance could be understood as an imposition rather than an unexpected consequence of a new convenient technology. The difference between regular headphones and ANC is analogous to the difference between Virtual Reality in which the subject is completely immersed in a produced reality, and an "Augmented Reality" where a see-through camera renders the landscape and adds and positions virtual elements into it. A regular stereo experience, such as that of the Walkman, can create a personal soundtrack or a "secret" that can only be experienced by the headphone listener. (Hosokawa).

Conversely, ANC, through a "hear-through" microphone (i.e., transparency mode), reproduces the soundscape and adds virtual elements to it (music podcasts, phone calls, etc.) This kind of "Sonic Augmented Reality" or "Sonic-Extended Reality" provides a fundamentally new experience, avoiding the isolation of the individual while directly affecting the perception of their "sonic reality." According to Hosokawa, the mystery is still there, but the listener can also eavesdrop on the shared reality (Hosokawa).

Rather than negating the environment by replacing its acoustic content, (i.e. replacing a soundscape with prerecorded sounds), ANC relegates the listening process of transduction and individuation to the contingent biases of the algorithm. The promise of an experience of individual calm is only archived through the simultaneous violent and disruptive imposition of predetermined biases of algorithmic mediation, i.e. the induction of noise. By replacing exploratory listening with a synthetic experience, this induced sonic distance not only alters our relationship to our surrounding soundscapes, but also induces "noise" in the form of alienation of our senses.

In ANC algorithms, Attali's noise as violence and disruption is manifested in the forced modification of everyday environmental sounds, such as crowds, traffic, soundscapes, that are predefined as noise. Nevertheless, taken noise as socially and historically contingent, ANC devices have the potential to reconfigure the sensory experience of noise, challenging its established socially constructed boundaries. The expansive nature of my ongoing artistic research project *Noise Re(in)duction* resulted in a non-linear basis for a diversity of outcomes and media manifestations. What started as an interest for the inner workings of noise reduction technologies has turned into an intermedial non-linear research project that manifests in lectures, performances, essays, installations around the topic of noise reduction. Some preliminary results have been presented in the form of lecture-performances and audiovisual installations. By making sensible these forms of sonic distance, the conceptualizations presented in this text acquire and additional dimension. This dimension is only be perceived, manifested and embodied within the scope of a speculative artistic practice that are being and will continue to be explored (see Daleman).

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Biography

Nico Daleman (Bogotá 1989) is an sound artist and researcher based in Berlin. His research explores the influence of music technology on current practices of contemporary music and sound art, focusing on machine listening, artificial intelligence, sonification, noise reduction algorithms, neuroaesthetics and trans-traditional music. He is an active member of the sound art

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