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# DIGITAL INSTRUMENTS: EXTENSIONS OR MEDIA?

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A large and bright room is where we walk into. We find five performers standing next to five instruments, evenly spaced out.[1]

1. a Steinway & Sons grand piano from 1893
2. a Duo-art reproducing roll from 1914
3. a Neo-Bechstein grand piano from 1930
4. a Minimoog Model-D analogue synth from 1970
5. a Nord Grand: digital piano from 2010

Here is the subsequent sequence of events:

### Scene 1 (S1)

A performer seats in front of the Steinway & Sons grand piano and begins to play. His fingers move and press the keyboard keys. The sound reverberates in the room. Music flows beautifully and effortlessly.

### Scene 2 (S2)

A performer approaches the Duo-Art piano. She grabs a paper roll with many holes; it is a musical score. She threads the paper-roll into its housing device, which sits above the keyboard. She sits down and uses her feet to move the pedals underneath the piano. The movement of her feet initiates the Duo-Art mechanical engine, and the roll begins to unfold. The mechanical parts moving produce a low-frequency hum that can be heard. The music starts after a few seconds, with the noise of the mechanism remaining in the background. Each time a hole on the paper roll meets the hole on the tracker, a note is triggered. As if a ghost is attending to them, the keys on the piano move automatically. Music flows beautifully and effortlessly.

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### Scene 3 (S3)

A performer sits in front of the Neo-Bechstein piano. She begins to play. Her fingers move flawlessly when pressing the keys on the keyboard. The sound spreads in the room, but not as loudly as one would expect from a grand piano. Simultaneously, a 'louder' sound is perceived through a loudspeaker situated near the performer and away from the piano. This sound is derived from the amplified sound of the piano's strings, which is amplified by electric pickups whose signal has been transmitted via radio to the speaker. Music flows beautifully and effortlessly.

### Scene 4 (S4)

A performer is sitting in front of the Minimoog Model D synth. He begins to play. His fingers move flawlessly when pressing the keys on the keyboard. One can observe that the keys on the keyboard are not as weighted as those on a grand piano. The fingers appear to meet less resistance in pushing the keys down. Sounds are heard coming from an external PA system. Music flows beautifully and effortlessly.

### Scene 5 (S5)

A performer seats in front of the Nord Grand piano. She begins to play. Her fingers move flawlessly when pressing the keys on the keyboard. The keys appear to have the weight of those found in a grand piano. Sounds are heard coming from an external PA system. Music flows beautifully and effortlessly.

## Introduction

How we tell each other stories is important. Beyond their identical conclusions, the five scenarios presented suffer from a lack of narrative variations. More variety would be desirable, but it is difficult to find it unless we look at the intricate connection between musicians and their own musical instruments. Yet, this complex relationship is often untold because music, and art in general, is primarily presented as a way of listening/experiencing, in which performers, audiences, composers/artists, cultural histories, instruments, social functions, and many other factors work as relational nodes.

Instead, I argue that there are critical differences to be told, not only for narrative improvements, but also, and more importantly, to highlight key aspects of the practice of the performer. To do so, the inner private (thus, highly subjective and in many respects hidden) space of the performer and their relation with their instrument must be brought to the fore.

Media theory, phenomenology, and post-phenomenology will play a major role in the way the argument will be laid out hereafter. In the first section, I contrast two views of musical instruments: as mediating tools between artistic intent and sound, and as embodied extensions of the performer. Media theory emphasizes technological mediation, while phenomenology sees no separation—instrument and body form a unified whole, making music an immediate, lived expression rather than a mediated act. In the second section, I draw on post-phenomenology to show how musical instruments can be both embodied extensions and mediating tools. Ihde's

account illustrates how instruments shape not only sound but our understanding of music. Technologies mediate experience, influencing cultural meaning and performance. Mediation and embodiment coexist, revealing the performer's active role in co-creating music with evolving tools. In the third section, the focus shifts back to the performer's embodied experience, emphasizing the body's central role in artistic creation. Drawing from Malafouris and Ihde, I propose two categories of instruments: embodied and hermeneutic. In the fourth part, I will show how embodied and hermeneutic relations emerge from the use of two classes of instrument: analogue, where instruments act as bodily extensions (e.g. acoustic pianos), and hermeneutic, where instruments translate action through layers of mediation (e.g. digital pianos). In the final section, I reflect on how this mediation inherent in digital instruments may result in a form of disembodiment, helping explain digital scepticism in the arts as something raising from ontological questions about self, materiality, and embodiment in contemporary artistic practice.

## Tools, media, and the body

To begin with, I would like to suggest that one of the primary obstacles in appreciating the remarkable variety of the five case scenarios lies in the ambiguous identification of musical (or artistic) instruments as media; an umbrella term that, often uncritically, encompasses both analogue or digital instrumentation. This identification comes from extensive philosophical and media theory research of the 20th century, in which the sophistication of modern technology appears to afford something more than what mere tools do. It is a common perception to perceive a hammer as a tool; however, when examining contemporary devices—e.g. computers, synthesizers, tablets, cameras, tracking devices, sensory-motor instruments—their utilitarian attributes become increasingly intricate, resulting in a fundamental shift in the question of who holds responsibility for what. Tools become media when they begin to create, and occupy, a space between human intentions and actions. We could easily refer to all the simplest parts of a television set as tools,[2] but once they're all bundled together, we're looking at a highly sophisticated technological artefact, one that's displaying infrastructures and interfaces and whose complexity is barely reflected in the word 'tool'. Thus, we are starting to see technologies of mediation through which we now question our sense of control and supremacy. Marshall McLuhan's iconic work titled *Understanding Media: The Extensions of Man* ([1964] 1994) is an eminent example in this direction. McLuhan appraised how an 'examination of the origin and development of the individual extensions of man should be preceded by a look at some general aspects of the media, or extensions of man, beginning with the never-explained numbness that each extension brings about in the individual and society' (24). It is this notion of numbness that encapsulates the dilemma discussed here, wherein we, as Narcissus for McLuhan, have failed to comprehend that technology mirrors us, and thus we have become the 'servomechanism' of our extended or repeated image. In other words, we have begun to objectify ourselves within a technological infrastructure that uses us more than what we might think we use of it. This objectification of the subject is particularly evident in contemporary aesthetic theories informed by the philosophies of Deleuze ([1980] 1987) and Latour ([1991] 1993), such as speculative realism (MacKay 2018).

Somehow, this appreciation of the power struggle between man and media remains underplayed within the pair performers—technological instruments where the idea of medium is often used for its perhaps less problematic meaning, namely, a means by which intents are mediated. The technological determinism of much media theory finds here its opponent in the social constructivism of aesthetic theories.[3] And yet, if an instrument is thought of as the intermediary between a sender and a receiver, or intentions and their realization, a notion of medium comes to the fore. A medium is a forum by which two parties connect and negotiate their differences. I present here the case of musical instruments, well aware that the discourse can be extended to the relationship performer—instruments defining many other art practices, to then ask: which musical instruments listed in our five scenarios function as mediators? Are they media? And if so, what do they really mediate? In what ways does such a mediation affect a practice?

If, in a somewhat romantic manner, we desire to consider our musical instruments as a means by which we can establish a connection with the realm of musical ideas, then it is true that all of our instruments are media. This notion holds a significant position in contemporary literature, particularly with regard to digital art in general and not solely music (Dixon 2015; Manovich 2001; Paul [2003] 2015; Wardrip-Fruin and Montfort 2003). Our instruments serve as a medium between our ideas and their concrete realization. Thus, musical instruments facilitate the production of contingent instantiations of musical objects, such as music compositions, derived from some ideal musical forms (either metaphysical or concrete according to one's own philosophical preferences). From this perspective, the manner in which such a mediation may occur remains largely irrelevant. This is the genesis of the narrative suffering that underlies the depiction of our five scenarios. As all instruments are media through which the artist's ideas and intentions materialise for aesthetic enjoyment and discourse, the only thing that matters is that music flows beautifully and effortlessly.

In this context, it should also be appreciated how this predilection for the object of art, which relegates tools to serving as intermediaries in its realization, does not belong to traditional aesthetics only. It also belongs to research concerned with the constitutive features of experience in a conscious subject, phenomenology. The passage below is from Merleau-Ponty's *Phenomenology of Perception*:

> Between the musical essence of the piece such as it is indicated in the score and the music that actually resonates around the organ, such a direct relationship is established that the body of the organist and the instrument are nothing other than the place of passage of this relation. From then on, the music exists for itself, and everything else exists through it. There is no place here for a 'memory' of the location of the stops, and the organist does not play within objective space. In fact, his rehearsal gestures are gestures of consecration: they put forth affective vectors, they discover emotional sources, and they create an expressive space, just as the gestures of the augur define the templum. (Merleau-Ponty [1945] 2012, 147)

Merleau-Ponty considers the body and the instrument as a place of passage, where what is to be passed are gestures that, as affective vectors, become music.[4]

The similarities between what Merleau-Ponty calls 'place of passage' and a generic definition of media as mediator (e.g., McLuhan) or a means to an end (see contemporary literature referenced above) are unavoidable. Yet, it must be noted, the phenomenological perspective offers us something more nuanced as a medium or tool: the body and the instrument, as a whole. For Merleau-Ponty, our experience of the world is always the inexhaustible synthesis made by our bodily being-in-the-world (140). Our instruments are not apprehended through the definition of an a priori cognition and execution of individualised facts or rules. We do not move around procedurally as computer code would while executing the list of instructions comprising a program. To play a note on any of the pianos in our five scenarios, the performer does not have to go through a sequence of objective spatial positions for their fingers, arms, and body (e.g. raise the arm by x°, make a 90° angle with your elbow, extend the index finger, etc.) nor manually programme some device. The same thing happens when I act on the pedals of a reproducing piano. My body never relates to an external, objective, spatial reality. My body is the expressive means by which I am-in-the-world.

When Merleau-Ponty asserts that my body serves as 'the general means for having a world' (147), he is not implying that my body functions as a mediator between myself and the external world. Rather, he states that my body serves as the instrument through which I can have a world.[5] Under this light, the instrument becomes an 'extension of man' with a whole new meaning from the one proposed by McLuhan for whom extension is effectively mediation purporting a degree of 'numbness' in its user (i.e. technological determinism). Its extensive character now refers to a new and expanded capacity for the body to direct an intentional arc towards a musical object, e.g., a music composition.

According to this reading of Merleau-Ponty, then, my relationship with an instrument, as an object of the world into which I am thrown in, is not mediatable because there is no gap to be filled nor to be mediated between my body and the world. Instead, I embody my instrument and the world. Similarly to the cane for the blind person (144) or the organ for the organist (146), the instrument becomes, in unity with the body, 'an appendage of the body, an extension of the bodily synthesis' (154). Likewise, when the performers attend to each of the five pianos, their respective instruments become an extension of their bodies through which they expressively experience *their own* bodily being-in-the-world. Embodiment necessitates immediateness, and for that purpose, embodiment is not only immediate, but in fact, *unmediatable*.

Through this brief exposition, we have brought to attention two distinct perspectives. One perspective considers the instrument as a medium because it mediates between the artist's intentions and the musical outcomes (performer → instrument → music). A second perspective, which is more phenomenologically oriented, regards the embodied unity between performer and instrument (which is now thought of as an extension of the body) as a media because it mediates between score and music, or intents and outcomes (musical idea → performer-instrument → music).

## Either and both

There are two ways to understand mediation: one where the medium appears as the instrument, and another where the medium appears as the embodied unity of the non-mediable compound body-instrument. And yet, the question on the table is: can musical instruments be at once media and an extension of a body? Post-phenomenological literature provides some interesting suggestions on the matter. This is mainly due to an approach in which, by connecting phenomenology and philosophy of science, a more pragmatic understanding of technology emerges. In this context, Don Idhe's relational ontology would schematically depict the events of our five case scenarios as follows:

$$\text{human} \Rightarrow \text{piano} \Rightarrow \text{music}^{6}$$

Ihde's schematisation hints at a definition of technological instruments as tools of mediation, with a slight distancing from the notion of instruments as extensions of the body. He describes this as a multipart relation guided by an 'intentionality which is directed, mediated through a material instrument—a technology' (Ihde 2007b, 11). Ihde explains that the way an instrument acts as a mediator is especially evident during the learning process. The pupil will initially struggle to reconcile their musical intentions with their musical results. Time and practice will allow for obstacles to be overcome. Yet, one must consider that the instrument is not solely played. Through such a co-creative relationship, we come to shape what music is or could be. Musical instruments aid and influence us in creating music while also having a significant impact on our understanding of what music is, just as technology aids us and influences our questions in our pursuit of an understanding of the universe. Ihde always emphasizes the intentional arc between performer and sound, but the instrument is a medium because it is both a means to make music and a tool that shapes our understanding of what music is. For this reason, by acknowledging the non-neutral character of technology, Idhe affords technological instruments a form of material hermeneutics that is historically situated (Ihde 2009, 75).

From an Ihdean perspective, our five scenarios would present differences that relate to the various possibilities each instrument affords in embodying sound while also mediating our understanding of what music is or could be. Our five case-scenarios are *phenomenological variants* (Ihde [1976] 2007a, 263), each of which is characterised by the presence of musical instruments of various order of technical and relational complexity. Within this approach to the history of technology that Ihde calls 'technoscience', three categories are identified within the human-instrument-music triad: a 'direct bodily production (singing-dancing variants), a body-instrument variant, and then the "constructed" add-ons to simple instruments which includes recording technologies (260). The five pianos in our five case scenario can be found to belong to either the category of 'body-instrument variants' or the 'constructed add-on of recording means'. Via these two categories, an Ihdean-technoscientific study would present an interesting history line. Indeed, if the discriminatory factor is some sort of recording technology, we would then have:

- ‘body-instrument variant’
  - a Steinway & Sons grand piano (1853)
  - a Neo-Bechstein grand piano (1930s)
  - a Minimoog analogue synth (1970)
- ‘constructed add-on of recording means’
  - a Duo-art reproducing roll (1914)
  - a Nord Grand digital piano (2010)

However, two elements, at least, are disrupting an otherwise linear history of piano instruments. The first is that the Neo-Bechstein and the Minimoog, despite their ‘electrification’ of sounds, are incapable of recording them. From this perspective, it would appear that the impact of analogue and digital synthesizers on music would be of a minor magnitude in comparison to the one attributed to recording technology. While orders of magnitude are debatable, this perspective does appear to favour certain technical affordances, e.g. the capacity to record over the one of increasing sonic possibilities (Eno [1979] 2004) for no clear reasons. The second element is that the Duo-Art is a recording device that, though rudimentary in its deployment of paper rolls, largely expands the possibilities of both what can be done with a piano and what piano music is. For example, the piano roll ‘Shepherd’s Hey’ for Pianola from 1914 arranged by Percy Grainger pushes the limits of piano-playing beyond the possibilities of the human hands (Gupta 2009). Under this light, this experimentalism is equivalent to the one adopted by Frank Zappa in *Jazz from Hell* (1986) for which he used a computer operating a Synclavier (a digital synthesiser).

My point is that *postmodernity* (Ihde [1976] 2007a, 260-261), an important landmark in Ihde’s technoscience that identifies a new era in technological development, can hardly be signposted by recording technology. This landmark is too loose and misses too much within the highly diverse history of musical instruments.

At the same time, it is fair to say that Ihde’s true interest is not to reconstruct a linear history of music’s technologies. Furthermore, his post-phenomenological approach does not necessitate it. He uses phenomenological variants to illustrate how instruments mediate between musical intentions and musical outcomes without abandoning the embodiment of that instrument. Technoscience is an approach that aims to show how technological complexity produces many questions that neither embodiment nor mediation alone can answer. On one hand, we must acknowledge the validity of the phenomenological theories of embodiment; yet, on the other hand, we must account for some form of mediation that such tools bring back because of their sophistication. Hence, I would in the end contend that Ihde’s emphasis on recording techniques only demonstrates an implicit predilection towards the perspective of the listener rather than that of the musician/performer. As his work wishes to provide useful insights into the musicians’ inner experience of embodiment with musical instruments, the accent ultimately falls on musics as perceived by spectators and embodied by (other) humans.[7] This is, perhaps, the most important aspect to keep in mind in the present discussion, and something we will attempt to overcome by refocusing on the perspective of the performer.

To summarize, musical instruments can be embodied, yet, thought of as media, they connect not only score and music (as in Merleau-Ponty), but also continuously intervene in the cultural processes that define what music is (as in Ihde). From a post-phenomenological perspective, a musical instrument can perhaps be embodied, but this must go hand in hand with the cognitive and socio-cultural aspects that it brings with it. This is to say, the instrument *mediates*, though it does so without suffering the kind of technological determinism a la McLuhan.

## Aesthetics and pragmatism

One problem with Ihde's idea of the musician-instrument-technology triad is that it can be mistaken for a phenomenology of music or an alien phenomenology a la Ian Bogost, where the aliens would be either the musical instruments or music.[8] Yet, I claim that Ihde's relational ontology remains relevant for an analysis of the performer-instrument relationship and for a questioning of the embodiment and/or medial processes at hand—at least in some respects. We need, though, a narrower attentional shift. The departure point for a relational ontology of aesthetic practices should at least remain close to the perspective of the performer. We must reconnect with the hands and the body of the performer as they manipulate the instrument. We need to recuperate the centrality of the human body and the significance of its movement (van den Berg [1955] 1987). Likewise, we require an approach that, stirring away from the primacy of the output and the primacy of the idea/concept that we have learnt to emphasise since at least Duchamp,[9] follows a path similar to that offered by Lambros Malafouris' (2013) studies on the primal material aspects subtending the relationship between artist and clay. Rather than wanting to de-throne the subject (MacKay 2018), we need to recuperate the centrality of the self and the ways in which art is a practice that interrogates it.

Within this framework, it becomes important to identify those elements that mediate an otherwise embodied experience in the performer-instrument relationship. Ihde's four-parts schematisation of the human-technology relation remains , to some extent, a step in this direction. Though relating to a discourse that concerns scientific tools, Ihde (2009, 43-44) accounts for four types of relations: embodiment relations (extension of the body, i.e. looking at the sky through the lenses of a traditional telescope), hermeneutic relations (interpretative thus mediating, i.e. looking at the sky through an infrared telescope), alterity relations (apparently dialogical but de facto means to act in the world, i.e. human-robot relation) and background relations (technology becomes seamlessly part of the world, i.e. acting on a light switch).[10]

For the remit of the present discussion on musical instruments, I will now consider only the embodied and hermeneutic types of relations. The reason is that, as Ihde sees alterity relations as ultimately leading to hermeneutic ones, so I would be inclined to see background relations as ultimately leading to bodily ones. To say that technology disappears in the background means that, for a body, there is no difference between flicking a light switch and throwing a stone. Ihde makes a distinction on the basis that a stone isn't a technological artifact. However, my inclination is to accept true disappearance only when the category of technology disappears too. From a performer's perspective, the difference between a stone and a musical instrument is an

afterthought that does not interfere with the pre-cognitive immediacy of the experience or its intentional form. Anything and everything takes part in the co-construction of their bodily being-in-the-world. One can throw a stone without aiming to make a ripple in a pool, just as one can flick a switch without wanting to turn the light on or hit a string without wanting to play a solo concerto.[11]

## Embodied instruments

Our post-phenomenological analysis has led us to two modes of describing the performer's relations with a musical instrument: an embodied modality in which the instrument is an extension of the body and a hermeneutic modality in which the instrument mediates our relationship with music. Hence, in embodied relations the instrument is extension, while in hermeneutic ones the instrument is a medium.

However, even to this point, our question remains unanswered. Are musical instruments extension or media? I argue that Ihde's post-phenomenology fails to provide the answer because it falls victim to an excessive romanticisation of music and arts. In a similar critique to that which Ihde reserves for Heidegger's romanticisation of technology, I am critiquing Ihde for his romanticisation of aesthetics. Instead of considering instruments in relation to their ability to make music, as Ihde does, we should consider the performer's relationship with their instrument as a practice, detached, at least initially, from aesthetic issues and/or intents. On this path, I propose to reduce the performer's practice to a simple intentional act directed towards the world, or an act, perhaps, in which the manipulation of the world is oriented towards (or inform) a renewed sense of self.

My (existential) pragmatism does away, then, with notions of skills, virtuosity, and alike. This is not to suggest that there is no difference between the novice and the master. Rather, it is to say that skills are a consequence of a long-lasting relationship with the instrument rather than a defining character of the relation or condition for embodiment. Skills are not a prerequisite for embodying the world, since we are always thrown into it. From this perspective, the performer's instrument should be seen like the blind person's cane (see Merleau-Ponty) or Galileo's telescope (see Ihde). For the blind person, the cane is an extension of their own body for navigating the world. For the astronomer, the telescope is an extension of the body to see what is further away. And for the performer, the piano is an extension of the body in ways that account for the way in which the entire sensory apparatus of the body dialogues with the materiality of the instrument. That is to say that the priority is given at the level of the body-instrument material relation first, sounds comes after, and music certainly comes last.[12] The performer, the blind person, and the astronomer embody their instruments as a means for having/exploring a world. This type of embodiment is distinguished not by mediation but rather by a pre-reflective synthesis and a direct engagement with the instrument and the environment. There exists a unity between the performer and their instrument, implying that, as an extension of the body, the instrument cannot serve as a medium simply because there is nothing requiring mediation.

Ihde's embodied relations are grounded on this understanding too. Certain technologies are integrated into the physical experience of the individual by directly engaging their perceptual apparatus. For instance, Galileo observes the stars through his telescope rather than directly gazing at them. As Ihde (2009, 42) says, in embodied relations, technology 'is a means of experience, not an object of experience in use.' Technology is somehow transparent while at once mediating our understanding of the world. For me, however, the unity between performer and instrument does not mediate an understanding of musics but only expresses the *bodily being (certainly in-a-sonic-world, too)* of the performer. Embodied relations are transparent and pre-reflective, and for which the engagement with the sensory apparatus of the body is immediate and unmediated.

## Hermeneutic instruments

Hermeneutic relations, instead, require a form of translation. As we have seen, Ihde talks about hermeneutic relations when highly sophisticated instruments help humans to understand the world beyond the limits of their sensorial apparatus. The modern telescope, for example, is more than just a series of lenses as it was in Galileo's time. Infrared telescopes are capable of sensing frequencies beyond the observable range of the human sensory system and converting them into visible images, thus making them perceivable to humans. It is this kind of major technological advancement that defines, for Ihde, postmodern times. And it is this translating capability between different orders of perception that defines hermeneutic relations. In Ihde's (2009, 56) words, modern telescopes translate in that they bring about 'a technological transformation of a phenomenon into a [human] readable' one.

> So the first postmodern capacity, as I shall call it, of the second revolution is the capacity to image phenomena not able to be experienced by the body, not perceptible at all—to direct bodily sensory capacities. But such phenomena are able to be do [sic.] become experienced if they are technologically, instrumentally mediated. Allow me to make the point much more strongly: without instrumental mediation, no experience of such phenomena is possible at all—no instruments, no science. (Ihde 2009, 57)

Ihde draws attention to the unique and non-bypassable capacity of modern technology to affect our field of perception while placing itself between us and the world. If in the antiquities we could only look at the sky with our naked eyes (embodied relation with the world), from Galileo's times, a series of lenses made the sky bigger and closer to us (extended embodiment). In modern times, the technology at our disposal begins to register phenomena beyond the capabilities of our own eyes, such as infrared telescopy. This latter technology does not extend the limits of our sight abilities, but it rather extends our apprehension of the world through the very readings that those 'advanced' instruments provide to us. This relation, for Ihde, is both embodied and hermeneutic at once. Thus, the post-phenomenology of Ihde seeks to account simultaneously for both the mediating and embodying aspects of this relation by introducing skills (where he sees embodiment) and musics (where he sees media).

Despite the aforementioned factors, it is evident that, from an Ihdean perspective derived from his studies on science (and not music), there are no discernible distinctions between the five pianos in the scenarios presented at the outset. If one is content with the statement that instruments are means to create music, then the intrinsic properties of the instruments are secondary. To summarize, if the objective is to create music, the decision of whether to label instruments as a medium or an extension may be intriguing from a scholastic standpoint, but not from a pragmatic one. Nonetheless, it has been observed that a post-phenomenological approach distinguishes, at least more noticeably in the realm of science studies, between instruments that can be embodied and those that necessitate hermeneutic efforts. This difference is important for both theory and practice when seen from the performer's standpoint. Would a performer be more comfortable in claiming that they embody their instrument or that it mediates their gestures? Are there any musical instruments that can be referred to as hermeneutic, so that our musical instruments can be referred to as media?

## Inner mechanics

The only way to answer these questions is to look at the mechanics of the five pianos, which is to look at the mechanical principles behind the co-creation of sounds. A close-up look at the five pianos of each case scenario will reveal that the operational mechanisms in each of the five pianos are:

- Steinway & Sons grand piano → mechanical
- Duo-art reproducing roll → mechanical[13]
- Neo-Bechstein grand piano → mechanical and electrical
- Minimoog Model-D → mechanical and electrical
- Nord Grand → mechanical and electrical

The analysis indicates that there are two kinds of instruments: mechanical and mechanical-electrical. Nevertheless, this classification would not help us to answer our question because neither of the two classes would, by this very definition, be said to bring about hermeneutic relations. In fact, one might see again only embodied relations, since such a broad comprehension of the forces at work fails to offer us anything relevant to the potential deployment of translating efforts. In S1 and S2, the human body's energy flows through the mechanical parts of pianos. But the same can be said for S3, S4, and S5, where mechanical forces are turned into electrical ones. In other words, the performers see and perceive that when a finger acts on the key, a corresponding sound is created. Once again, we are confined to the realm of embodied relations, and no piano can be considered a medium in the eyes of the performer.

Regardless, the path we have chosen has not yet ended. Let's then look at the deeper details of how the pianos work. In S3, the mechanical energy flows from the finger via the piano key to the mallets and hammers that hit the strings. As in S1 and S2, the sound of the vibrating string resonates throughout the room. But in S3, there's something more. The mechanical energy of a vibrating string is converted into electric energy by tiny pick-ups. This electrical signal will traverse

a path that will ultimately result in its transformation into mechanical energy, which will propel the cone of the speaker, amplifying the sound of the vibrating string. The transformation from mechanical to electrical (and back) is said to be *analogous*, meaning that there is a continuous and directly proportional relationship between the two forms of energy transduced.

In S4, the two-way transmutation from mechanical to electrical type energies also occurs, but in different places. The mechanical energy moves from the finger to the piano key, which in this instance, acts as a trigger mechanism to alter the current flow.[14] The current flow can also be manually adjusted using the numerous dials and switches usually found on many synths. The electrical signal will then proceed along a path that will eventually lead to its re-emergence as mechanical energy, thereby influencing the speaker's cone and generating sounds. In the case scenario discussed here (S1, S2, S3, and S4), we are in the presence of *analogue instruments*, where the direct proportionality of the energy and forces at play allows for a fully *embodied relation* and, hence, the instruments can be thought of as an *extension of the body*.

Something different can be said about S5, however. Mechanical and electrical energy are flowing, but the electrical flow undergoes a different manipulation. In a Nord Stage, the finger triggers a mechanism that actuates a current flow in a more complex fashion than the one present in a MiniMoog Model D. In a Nord Stage, the keys are attached to circuitry that will transform an electrical signal into data. The electrical signal is encoded through a process of quantification of the voltages measured at brief intervals of time that are regulated by a central clock. The energy of the finger pressing a key does not directly connect to the sound production mechanisms of the piano. There are no strings, no hammers, no continuous flow of electricity standing in a constant and direct proportionality with the force exerted by the fingers. Instead, when a finger presses down a key, it triggers electrical switches hosted beneath the keyboard, which create small voltages. These voltages are converted into numerical values by an analogue-to-digital converter (ADC). From this point on, the gesture becomes a number represented by a sequence of high and low voltages (binary digits, i.e. bits). A numerical sequence that the digital circuitry manipulates through means that are largely autonomous from the performer's actions. The fact that these binary sequences will be converted back into a continuous electrical signal, causing the speaker's cone to oscillate and thus generating sound, should not be taken at face value. If our gestures make sounds instead of sending an email, it is just a coincidence (or incidental, to use a McLuhan's informed language) and only demonstrates our faith in the manufacturer's goodwill. A number can do many things, but it is the essence of nothing in particular!

The fundamental mechanism of all devices that we refer to as digital expresses the forces at work through logico-numerical processes. Digital instruments do not operate through the principle of direct proportionality as analogue instruments do. Furthermore, whereas in analogue instruments the path that the flow of energy follows is explicit and can be inspected by the hardware circuitry in use, in digital instruments the hardware circuitry can offer little clues as to its internal operations. One needs to examine the software. And it is this software that then brings and bridges to the senses another order of reality, one that is solely mathematically driven. In S5, we are in the presence of a *digital instrument* whose operational mechanics translate from one register to

another. In S5, the relationship between performer and instrument is a *hermeneutic relation* and, hence, the instrument can be called a *medium*.

## Analogue vs digital—again

Our search for potential elements that could bring to the forefront forms of hermeneutic relations between performers and musical instruments culminated in a distinction between analogue and digital instruments. In doing so, the present study revitalises the old analogue digital debate (Goodman [1968] 1978; Lewis 1971) in ways that more recent literature has done too (Fazi 2018, 2019; Galloway 2021, 2022; Maley 2011; Massumi 2002; Torre 2020; Torre and Pellizzer in-press).

We have achieved these results after abandoning a post-phenomenological understanding of embodiment in which, as Ihde (2009, 45) says, 'all science, in its production of knowledge, is technologically embodied.' Furthermore, Idhe's understanding of embodied-hermeneutic relations is only viable if we introduce socio-cultural elements to the relational triad, namely musics. Only in these cases, all relations, including hermeneutic ones, are, for Ihde, also embodied.

We, on the other hand, employed a slight variation on the post-phenomenological approach, focusing on the exclusive interaction between a musician and their musical devices, without regard to the sociocultural contexts in which the sounds produced come to be. The focus was solely on the physical interaction between the body of the performer and the materiality of the musical instrument. In doing so, we identified a new landmark of postmodernity within a reworked technoscience of musical instruments: the advent of digital musical instruments (DMIs). Not recording technologies, then, nor 'gobbledygook', as Ihde would describe digital data (Ihde, 2009, p.57). Our landmark was instead given by the peculiar mechanism that is intrinsic and essential to all digital devices: a time-sensitive and logico-quantitative encoding of voltage flows.

In analogue instruments, such as those in S1, S2, S3, and S4, there is a direct and unmediated relationship between the performers' gestures and the sound produced. There is no logocentric translation deployed in their use. The fundamental essence of the instruments lies in the continuity and transparency of their cause-effect mechanisms. The absence of any translation apparatus makes analogue instruments conducive to embodied connections. The symbolic domain is not a central feature of our experience. An analogue instrument facilitates a body-instrument unity, which is pre-conditioned to thought. As long as the relationship between mechanical and electrical energy is analogous, an instrument is an extension of the performer's body.

In the presence of digital instruments, instead, the idea of embodiment becomes problematic. This is especially so within the phenomenological framework of a mind-body unity and an engagement with the materiality of the instrument at hand. This is because, the mechanical forces exerted by the performer's fingers on the keys of the digital piano (S5) do not stand in an analogous or directly proportional relation with the electrical signals. In fact, they are not in relation because the subtending translation mechanics from one register (physical) to another (physical-numerical)

renders the performer's gestures largely anonymous. Simply put, a gesture given in numerical form cannot be said to belong to anyone specifically or uniquely.[15]

Digital musical instruments are the only instruments capable of generating hermeneutic relationships, as the correlation between gesture and sound is mediated by time-sensitive quantities that are made accessible to arbitrary logico-quantitative methods of manipulation. To put it simply, if the sound of a grand piano string is a necessary outcome of an unmediated cause-effect mechanism linking performers and sound, in digital instruments the sound is merely an incidental outcome of the performers' gestures. Once a gesture is translated into numbers, it can then be mapped to anything at all while anything that cannot be described by numbers simply does not exist in and for the digital universe.

The point is that digital music instruments necessitate signification and translation (i.e. time sensitive logico-quantitative encoding) as a prerequisite for their existence and relational affordances. Thus, a lack of digital syntax means that there are no sounds, gestures, or anything at all. As a performer of the digital, one cannot simply claim a direct connection to sound because the connection is arbitrary. The cause-effect mechanism is interjected in the middle by a mediator, for whom nothing can exist without being expressed in numerical terms. This logocentric spiral that digital instruments create makes it difficult to accept that hermeneutic relations are also embodied. Or perhaps, as many might be inclined to say, embodiment and the unity between body and world is established with the output generated by the digital instrument (e.g. sound) and not the servo mechanisms that generated it. However, if so, we should either stop talking about media, or clarify why many digital tools and/or infrastructures are media while digital (art) instruments are not. To claim that a digital instrument is a medium means to acknowledge the importance of hermeneutic relationships over embodied ones, with all the positive or negative consequences that this might bring about. The interpretative and mediating nature brought about by digital instruments disrupts and undermines the otherwise seamless, pre-cognitive, and unified relationship with the instrument at the very material level which said relationship originates from.

This state of affairs may be at the heart of a widespread distrust of digital devices in many art practices. For example, it is rare, if not impossible, to see digital pianos used in the public execution of classical piano and/or orchestral repertoire. This is not necessarily because one wants to be faithful to a past. If that were the case, Beethoven's piano repertoire would be played on a piano with 76 keys, whereas most modern pianos have 88.[16] It is also not because the sound of a digital piano isn't as good as that of a grand piano; nowadays, it is hard for many to tell if what heard comes from a digital or a grand piano. The non-negotiability of the use of a grand piano in classical concerts is due to an implicit recognition of that special relationship between the performer and the analogue/embodied affordances of the grand piano. This is a material relationship that emphasizes the agential supremacy of the performer, and that digital instruments cannot offer because their mediating nature flattens agency to a middle/egalitarian point between performer and technology.[17] The emphasis, indeed, that contemporary aesthetics places on notions of network, rhizome, intermedia spaces, object-agency, and latency speaks to the unavoidable

ontological flattening that hermeneutic/digital tools force upon the relationship between performer and instrument.[18]

But it should be evident that a relational egalitarianism does not imply a unity of the parts relating. It is in this context that the mediating essence of digital instruments renders embodiment highly problematic. Perhaps the most striking evidence of this tension comes from an acclaimed body performance artist such as Orlan, who, towards the conclusion of her career and well into the digital era, regards a 3D digital rendering of her body as 'representative of all [her] work' (delle Zattere 2014). This is certainly a strange claim for a body performer. However, it is one which, as Orlan claims, is informed by a desire to escape the decay of the body by betraying its physical/embodied form to offer it to the numerically driven (representational, thus external) digital realm. This is to say, Orlan must disembody her body and put faith in the immortality of numbers, even if this means forever dissociating those numbers from the conscious/embodied subject that they represent.

Digital instruments act as mediators, and thus they are media. However, it is also important to emphasize that digital embodiment may remain an illusion—caught between a denial of physical reality and a diminishing appreciation for the distinction between reality and the limits of how we choose to represent it.

## Case scenarios—again

I would like to end by presenting a revised version of the five stories at the beginning of this article. This version uses the first person, as often required by phenomenological studies, and gives a more nuanced look at the different relationships discussed so far.

### Scene 1* (S1-Grand Piano)

I take a seat in front of the piano and sit down. I commence my playing. I perceive the touch of the keys beneath my fingertips as I press them. Through their weight, I feel the energy I exert on the strings, which begin to vibrate. The sound spreads throughout the room. The sound and movement of the strings also reverberates throughout the body of the piano, down to my fingertips and my entire body. In this continuous flow, the piano is not a medium, but an unmediated extension of my body. In my playing, I perceive through the piano as I perceive through my body. I embody the piano, and in this unity I can express my musical intentions. With my body and its extension, I sense and coexist in a pre-reflexive unity. Within this unity of body and instrument, I express my bodily being-in-a-sonic world.

### Scene 2* (S2-Duo Art Piano)

I take a seat in front of the piano and sit down. I take a paper-roll. I realize that it has many holes on it, and I know they represent a music score. I thread the paper-roll into its housing device, which is above the keyboard in the body of the piano. I start to move the pedals underneath the piano with my feet. This will move the clogs and rolls internal to the Duo-Art. I listen to the low-level noise of the mechanical part moving while the paper is unrolled. After a few seconds, the music starts

while the noise of the mechanism stays in the background. The piano's keys move automatically, as if a ghost were attending to them. The keys move the hammer, which hits the strings and makes the sound like a grand piano would. I feel almost detached from the instrument, as if I were a spectator to it, but my foot movement makes it feel like mine. I breathe with the piano and in this unity of body and instrument, I express my bodily being-in-a-sonic world.[19]

### Scene 3* (S3-Neo-Bechstein)

I take a seat in front of the piano and sit down. I commence my playing. I perceive the touch of the keys beneath my fingertips as I press them. Through their weight, I feel the energy I exert on the strings, which begin to vibrate. The sound spread throughout the room, though not as loud as I would expect from a grand piano. The sound and movement of the strings also reverberates throughout the body of the piano, down to my fingertips and my entire body. At the same time, a louder sound comes back to me through a loudspeaker placed near me. This sound is the result of the piano strings being amplified by electric pickups, whose signal was transmitted through radio to the speaker. In this continuous flow, the piano is not a medium, but an unmediated extension of my body. In my playing, I perceive through the piano as I perceive through my body. I embody the piano, and in this unity I can express my musical intentions. With my body and its extension, I sense and coexist in a pre-reflexive unity. Within this unity of body and instrument, I express my bodily being-in-a-sonic world.

### Scene 4* (S4-MiniMoog)

I take a seat in front of the piano and sit down. I commence my playing. I perceive the touch of the keys beneath my fingertips as I press them. I feel their weight, even though I recognize that they are not weighted like in a grand piano. I cannot feel the power of my hitting the keys translating to anything mechanical. Indeed, the act of pressing the key initiates an electrical signal whose flow will affect a whole range of oscillators and gates, thereby generating sounds. The sound that is generated makes my body reverberate, but that reverberation is not coming from the instrument itself, but from the PA system. I cannot help but notice the fact that the lack of direct transformation of my mechanical energy into some mechanical form prevents an important tactile mode of feeling the instrument as truly an extension of my body. In this continuous flow, the analogue synth is not a medium, but an unmediated extension of my body, even though parts of my body have been displaced to some point away from my touch and closer to the speakers. In my playing, I perceive through the analogue synth as I perceive through my body. I embody the synth, and in this unity I can express my musical intentions. With my body and its extension, I sense and coexist in a pre-reflexive unity. Within this unity of body and instrument, I express my bodily being-in-a-sonic world.

### Scene 5* (S5-NordGrand)

I take a seat in front of the piano and sit down. I commence my playing. I perceive the touch of the keys beneath my fingertips as I press them. I sense their weight, despite my inability to perceive the force of my pressing the keys translating into mechanical action beyond the very key itself. There is no mechanical force emanating from the sound-generating mechanism to my fingertips. My body feels the sounds as coming from the PA system. In such circumstances, the piano feels like an extension of my body, although parts of my body feel displaced away from my touch by the

speakers' presence. I embody the piano, and in this unity I am able to express my musical intentions. With my body and its extension, I sense and coexist in a pre-reflexive unity. Within this unity of body and instrument, I express my bodily being-in-a-sonic world.

But at one point, I realise the representational, and thence arbitrary, nature of the entire sound-producing mechanism at the heart of my digital instrument. I stop. That awareness is paralysing. I now know that all of my gestures are encoded and translated within a logico-numerical register that anonymises my gestures. My actions on the keys are nothing more than a triggering of commands. Those commands open a gap between the input (my gesture) and the output (the resulting sound). Those commands mediate. My relation with the instrument is hermeneutic. Through the digital medium, the indissoluble unity of the cause-effect mechanism linking gesture and sound is lost, and it becomes a vicarious illusion—that is, virtual. The embodiment vanishes in this figment. How can I effectively bridge this gap to perceive myself in sound?

## Notes

[1] The intention is not to suggest a hierarchy between instrument design, but rather to give the reader the chance to discover the inner workings of each instrument. Those technical aspects will become of paramount importance in this article. The instruments chosen work as a case in point for a larger class of instruments of the same kind.

[2] For instance, a hot cathode, which is a component of an electron gun, and is present in a CRT device in a television set, is a tool or instrument that facilitates the generation of electrons from heat.

[3] The debate between technological and social constructivism is presented extensively in both media theory and philosophy. The main question is whether technology is causing social changes or the other way around. While McLuhan is considered a proponent of the former, an important voice that has advocated for the latter is Adorno ([1970] 2020; [1977] 1986). The depth of the debate can be appreciated through an analysis of the works of Heidegger ([1954] 1996), Marcuse (1964), and Feenberg (1999).

[4] In a similar vein, Heidegger recognized poetry as the medium of excellence for conveying the deeper connections that attest to our being-thrown-into-the-world. In his 1954 essay titled "The Question Concerning Technology", Heidegger ([1954] 1996) posits that the essence of technology transcends mere technicality, implying that it encompasses more than mere instrumentality or a means to an end. Rather, technology is a destining of revealing (Enframing) that necessitates our attention to discover an escape route for the entrapment of technology within its own metaphysical reading and history. This escape route is provided by art, specifically 'poetic revealing' (35). Moreover, in this particular context, Feenberg (1999) critiques this perspective by describing it as 'quasi-transcendental', implying that Heidegger perceives reality as a structured object under control, to which humans are subordinated.

[5] Merleau-Ponty's work is an attempt to reposition the transcendental nature of consciousness that was derived from Cartesian thought into a 'transcendental field' wherein experience and consciousness are co-created within the inextricable unity of a subject, their body, and their world.

[6] Ihde (2007b, 10) uses a flute to exemplify his argument hence: human ⇒ flute ⇒ music.

[7] 'Musics', in its plural form, is used by Ihde to stress the manyfold ways in which its culture can take shape.

[8] As mentioned in the introduction, much contemporary literature tends to flatten the hierarchy between

conscious subjects and the world of things (e.g., Bogost 2012). From postmodernism to posthumanism, from object-oriented ontology to speculative realism—and, in certain respects, post-phenomenology—the subject is increasingly seen as embedded within a network of things, losing its dominant position. Relations *between* things (or "agents") become more significant than the human relationship *with* things. This tension is particularly evident in the debate between phenomenology and speculative realism (see Zahavi 2016). Although I acknowledge that these two schools of thought share more common ground than one might expect (see Girardi 2016), my perspective is predominantly phenomenological. Humility toward the world should not result in the annihilation of the self—especially in the arts. Art cannot exist without a conscious subject performing it.

[9] I define the attitude of aesthetic studies, which gives primacy to digital output, such as sound, visual, and tactile, as 'output essentialist' (Torre 2020).

[10] One might wonder why Ihde's schematisation of the 'human-flute-music' relation does not comply with any of the formal schematics offered in his larger and most famous body of work that is concerned with science. The publication dates of the two works are too close to consider the Peking University lectures (Ihde 2009) as a further advancement in Ihde's philosophy.

[11] In this instance, I am not arguing against the intentionality of an action, but rather stating that the intention of an action does not necessitate explicitness nor any teleological framework. We shouldn't confuse intention with intent. The first describes a general feature intrinsic and pre-cognitive of our bodily being-in-the-world, while the latter describes a conscious motivation for a given action.

[12] Perhaps the case of Evelyn Glennie (1993; 2003) might help to understand the sort of material relation in which the performer's body and their instrument are engaged in. Or perhaps, it is worth mentioning the pedagogical emphasis that Oscar Ghiglia placed on the body when playing/touching the guitar. I received this teaching from Marco Cappelli, a pupil of Ghiglia.

[13] Or mechanical and electrical since, some models of Duo-Art could be operated electromechanically too.

[14] In the Minimoog, the keys are contact keys, which are essentially switches.

[15] Similarly, the issue of anonymity of internauts is not a result of the web infrastructure tout court, but of the logico-quantitative essence of its infrastructure.

[16] Those who are interested in the faithful reproduction of music should look into the field of historically informed performances. An eminent example is the work of Tom Beghin (2024).

[17] In a different vein, this mediation presence has long been a concern for engineers too, with a focus on the time gap created by the mediation process and the recurrent solution to reduce latency below the thresholds of perception (McPherson et al. 2016). However, perceivable threshold of latency are irrelevant in the present discussion where the focus is on an onto-epistemological order.

[18] From this perspective, and in light of the present digital era, rhizome informed theories have simply come to acknowledging a status quo rather than presenting a political alternative (for context, see also footnote 8).

[19] Further details on the working mechanics of a reproducing piano can be found in Reblitz (1985).

## Works Cited


Adorno, Theodor W. (1970) 2020. *Aesthetic Theory*. University of Minnesota Press.

Adorno, Theodor W. (1977) 1986. *Aesthetics and Politics*. Verso.

Beghin, Yannick. 2024. 'Declassifying the Classics: Rhetoric, Technology, and Performance, 1750–1850.' Accessed 1 September 2024. https://orpheusinstituut.be/en/projects/declassifying-the-classics.

Bogost, Ian. 2012. *Alien Phenomenology, or, What It's Like to Be a Thing*. University of Minnesota Press.

Deleuze, Gilles, and Félix Guattari. (1980) 1987. *A Thousand Plateaus: Capitalism and Schizophrenia*. Translated by Brian Massumi. University of Minnesota Press.

delle Zattere, Olivia. 2014. 'Orlan vs Nature.' Accessed 1 September 2024. https://www.youtube.com/watch?v=-cgYvHNSNQM.

Dixon, Steve. 2015. *Digital Performance: A History of New Media in Theater, Dance, Performance Art, and Installation*. MIT Press.

Eno, Brian. (1979) 2004. 'The Studio as Compositional Tool.' In *Audio Culture: Readings in Modern Music*, edited by Christoph Cox and Daniel Warner, 127–130. Continuum.

Fazi, M. Beatrice. 2018. *Contingent Computation: Abstraction, Experience, and Indeterminacy in Computational Aesthetics*. Rowman & Littlefield.

Fazi, M. Beatrice. 2019. 'Digital Aesthetics: The Discrete and the Continuous.' *Theory, Culture & Society* 36 (1): 3–26. https://doi.org/10.1177/0263276418770243.

Feenberg, Andrew. 1999. *Questioning Technology*. Routledge.

Galloway, Alexander R. 2021. *Uncomputable: Play and Politics in the Long Digital Age*. Verso.

Galloway, Alexander R. 2022. 'Golden Age of Analog.' *Critical Inquiry* 48 (2): 211–232. https://doi.org/10.1086/717324.

Girardi, Lorenzo. 2017. Phenomenological Metaphysics as a Speculative Realism. *Journal of the British Society for Phenomenology* 48 (4): 336–349. https://doi.org/10.1080/00071773.2017.1362778.

Glennie, Evelyn. 1993. 'Hearing Essay.' Accessed 28 May 2025. https://www.evelyn.co.uk/hearing-essay/.

Glennie, Evelyn. 2003. 'How to Truly Listen.' TED Talk, February. https://www.ted.com/talks/evelyn_glennie_how_to_truly_listen.

Goodman, Nelson. (1968) 1978. *Languages of Art: An Approach to a Theory of Symbols*, 2nd ed. Hackett.

Gupta, Rohan. 2009. *The Greg & Grainger Project*. Accessed 1 September 2024. http://www.griegpianoconcerto.com/grainger/biog.cfm.

Heidegger, Martin. (1954) 1996. "The Question Concerning Technology." Translated by William Lovitt. In *The Question Concerning Technology and Other Essays*, 3–35. Harper & Row.

Ihde, Don. (1976) 2007a. *Listening and Voice: Phenomenologies of Sound*. 2nd ed. State University of New York Press. Originally published 1976.

Ihde, Don. 2007b. "Technologies—Musics—Embodiments." *Janus Head* 10 (1): 7–24. https://doi.org/10.5840/jh20071012.

Ihde, Don. 2009. *Postphenomenology and Technoscience: The Peking University Lectures*. SUNY Press.

Latour, Bruno. (1991) 1993. *We Have Never Been Modern*. Translated by Catherine Porter. Harvard University Press.

Lewis, David. 1971. 'Analog and Digital.' *Noûs* 5 (3): 321–327. https://doi.org/10.2307/2214671.

MacKay, Robin. 2018. *Speculative Aesthetics*. MIT Press.

Malafouris, Lambros. 2013. *How Things Shape the Mind: A Theory of Material Engagement*. MIT Press.

Maley, Corey J. 2011. 'Analog and Digital, Continuous and Discrete.' *Philosophical Studies* 155 (1): 117–131. https://doi.org/10.1007/s11098-010-9562-8.

Manovich, Lev. 2001. *The Language of New Media*. MIT Press.

Marcuse, Herbert. 1964. *One-Dimensional Man: Studies in the Ideology of Advanced Industrial Society*. Routledge.

Massumi, Brian. 2022. *Parables for the Virtual: Movement, Affect, Sensation*. Duke University Press.

McLuhan, Marshall. (1964) 1994. *Understanding Media: The Extensions of* Man. MIT Press.

McPherson, Andrew, Robert Jack, and Giulio Moro. 2016. 'Action-Sound Latency: Are Our Tools Fast Enough?' *Proceedings of the International Conference on New Interfaces for Musical Expression*, 20–25. https://doi.org/10.5281/zenodo.3964611.

Merleau-Ponty, Maurice. (1945) 2012. *Phenomenology of Perception*. Translated by Donald A. Landes. Routledge.

Paul, Christiane. (2003) 2015. *Digital Art*. 3rd ed. Thames & Hudson.

Reblitz, Arthur A. 1985. *Player Piano Servicing & Rebuilding: A Treatise on How Player Pianos Function, and How to Get Them Back into Top Playing Condition If They Don't Work*. Vestal Press.

Torre, Giuseppe. 2020. *An Ethico-Phenomenology of Digital Art Practices*. Routledge.

Torre, Giuseppe, and Pellizzer, Fabio Tommy. In-press. 'Selfhood and Artistic Individuality in "Bits" — What Gets Lost in the Translation from Analogue to Digital.' In *Finding our Place in the Digital World: Essays in Technology, Phenomenology, and the Environment*, edited by Ian Werkheiser and Michael Butler. Springer.

van den Berg, Jan Hendrik. (1955) 1987. 'The Human Body and the Significance of Human Movement.' In *Phenomenological Psychology: The Dutch School*, edited by Joseph J. Kockelmans, 55–77. Springer. https://doi.org/10.1007/978-94-009-3589-1_4.

Wardrip-Fruin, Noah, and Nick Montfort, eds. 2003. *The New Media Reader*. MIT Press.

Zahavi, Dan. 2016. 'The End of What? Phenomenology vs. Speculative Realism.' *International Journal of Philosophical Studies* 24 (3): 289–309. https://doi.org/10.1080/09672559.2016.1175101.

Zappa, Frank. 1986. *Jazz from Hell*. Barking Pumpkin (US)/EMI Records (UK).

## Biography

Giuseppe Torre's work investigates the ethical and aesthetic dimensions of digital technologies. Using generative systems and live coding, he transforms algorithmic environments into spaces for critical reflection. Drawing on phenomenology and media theory, his practice embraces Free/Libre and Open Source Software (FLOSS) as both a creative method and an ethical commitment, promoting transparency and collaboration.

As a performer, Torre has exhibited and performed internationally. His 2024 EP, *Incidental Effects*, reflects his focus on minimalism and real-time computation. His scholarly work, published by several presses, includes *An Ethico-Phenomenology of Digital Art Practices* (Routledge 2021), where he explores the ethical potentials and phenomenological limits of digital creativity.

Torre currently serves as an Associate Professor at the University of Limerick, Ireland.