

Revisiting Ihde’s Fourfold “Technological Relationships”: Application and Modification

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Abstract The question of how we relate to the world via technology is fundamental to the philosophy of technology. One of the leading experts, the contemporary philosopher Don Ihde, has addressed this core issue in many of his works and introduced a fourfold classification of technology-based relationships. The conceptual paper at hand offers a modification of Ihde’s theory, but unlike previous research, it explores the functional compositions of Ihde’s categories instead of complementing them with additional relational categories. The result is a simplification and reduction of the analytical categories of Ihde’s theory, where *alterity* and *background relations* are ontologically reduced to ratios between the *mediated relationships*. The paper uses cutting-edge robotics as a hermeneutic tool in order to present this point and concludes with a discussion of the usefulness of applying static categorization to complex technology and of various challenges and limitations.

Keywords Philosophy of technology · Human–robot interaction/relation · Phenomenology · Robotics

1 Introduction

Within philosophy of technology, the question of how technology connects us not only with each other but also with our surroundings has given rise to a number of responses and controversies. As I will try to demonstrate in this paper, the use of cutting-edge technology such as teleoperated robotics raises issues that force us to rethink this question in new ways and develop some of our existing conceptual tools in pace with the technological innovations. Based on a concrete example from cutting-edge robotics—the *Telenoid R2*¹—this paper offers a novel, critical, and constructive investigation of the premises of the prominent standard classification of technological interactions developed by Don Ihde.

¹Hereafter: Telenoid or *T*.

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The underlying guiding question for this investigation is: *What kind of relationship are we dealing with in the case of Telenoid-facilitated communication?*

The answer is far from self-evident. The potential interaction capabilities of the Telenoid, which serves as a conceptual case, highlight the inherent classification problem that has motivated the two main contributions of this paper: a simplification of Ihde's fourfold relational theory (resulting in a formalization and reduction) and an investigation of relational dynamics. More concretely, I will (a) present an analysis of the relational status of the Telenoid in the context of Ihde's relational theory, (b) argue that the aspects of mediation in human–technology interactions are pivotal with respect to technological relationships and should be emphasized in the theoretical context—bootstrapped with (c) an introduction of a formal modification to Ihde's fourfold relational theory, and finally I will (d) explore the dynamic nature of relations by problematizing stability issues with respect to static categorization in this context. After the concluding remarks, I will present some of the remaining challenges including a brief stress test of the developed theory.

Although the discussion of the special ontological status of robots in contrast to other artifacts is a highly relevant issue in itself, it is beyond the scope of this inquiry.

2 Relating Through Technology

In order to explore the status of the teleoperated robot Telenoid as a technological device that connects sender and receiver in human communication, it is necessary to elaborate on the relations between two persons interacting with each other via the mediation of the robot. The nature of this paper is conceptual; nevertheless, the empiric case I will rely on, as a hermeneutical tool, is a pilot study of the Telenoid in care centers and homes for elderly people in Svendborg Municipality, Denmark (2011). I will take as the starting point my own phenomenological experience of participating in this study. The theoretical point of departure for the analysis of these human–technology relations will be Don Ihde's classification in *Technics and Praxis* (Ihde 1979) and *Technology and the Lifeworld* (1990), which is considered a theoretical standard within the area². Since Ihde's work is well-known among philosophers of technology, the following is only a brief recapitulation of his central ideas, which will subsequently be applied to the case of the Telenoid.

Ihde introduces four types of technological relationship between humans and the world through technology. A schematized summary can be found in the Table 1, followed by a brief recap of the theory.

The most straightforward way of explicating the distinctions between Ihde's four relations is by considering some of his concrete examples. Let us start with the concept of *embodiment relations* by elaborating on hearing aids.

“But once learned, the embodiment relation can be more precisely described as one in which the technology becomes maximally ‘transparent.’ It is, as it were, taken into my own perceptual-bodily self experience [...]” (1990, p. 73)

² For readers not familiar with Ihde's work, the book chapter *A Phenomenology of Technics* (Ihde 2004) presents the main points of his theory, relevant for this paper.

Table 1 Human–technology–world relations (Ihde 1979, p. 14; 1990, p.107) slightly modified with examples, etc.

Relation	Notation	Example
Embodiment relation	(I—technology)→world	Hearing device
Hermeneutic relation	I→(technology—world)	Instruments in nuclear power plant
Alterity relation	I→technology—(world)	Artificial opponents in computer game
Background relation	I (—technology world)	Cooling/heating system, submarine

After an adaptation phase, a hearing aid is so *united* with the user's body that it becomes an integrated part of their sensory apparatus. Ihde does not hesitate to refer to Merleau-Ponty's blind man here (e.g., 1979, p. 7). When we are no longer aware of the technological artifact in our everyday life, it is completely embodied, and we relate to the world through this filter that is artificially added to the body. Examples such as corrective glasses and hearing aids suggest that the technology involved in *embodiment relations* is always of a corrective nature, i.e., adjusting external stimuli to the type of signal that is normally processed by the brain. However, as recent experiments have shown, even dramatic modifications of external stimuli (such as vertical inversions of the optical input) are—after a period of *sensorimotoric* habituation and training—fully accommodated and become part of the *normal* bodily experience (e.g., O'Regan and Noë 2001). Hence, in the course of an *embodiment relation*, the technology becomes an integrated part of the body.

In contrast, a *hermeneutic relation* through technology is more closely linked to the *relata*. Here, the agent interacts with the environment, using an interfacing technology (e.g., the position on a dial) to represent the feature of the environment with which the agent wishes to interact.

“[...] T]he immediate perceptual focus of my experience is the control panel. I read through it, but this reading is now dependent upon the semi-opaque connection between the instruments and the referent object [...]”³ (Ihde 1990, p. 86)

In many cases, we have developed technologies and scientific theory in lockstep, which only allows us to know certain phenomena through the narration of technology (cf. 1979, p. 22). Ihde uses the instruments (technology) of nuclear power plants, which safely disclose information about hazardous, inaccessible areas (*relata*), as an example of this type of relation (1990, p. 87). Here, technology and intended phenomenon coalesce in one system.

The third kind is the *alterity relation* “[...] in which the technology becomes quasi-other, or technology ‘as’ other to which I relate” (ibid., p. 107). Here, a technological artifact is somehow perceived as independent from the rest of the world. As an example, Ihde uses the virtual opponent in a computer game who is not relating us to anything in the real world. Technology here becomes the *relatum* and not a mere means to access the world.

³ Throughout the paper, square brackets indicate modifications to the quotes.

The fourth kind of technological relation, the *background relation*, is based on the following insight:

“If focal activities are central and foreground, there are also fringe and background phenomena that are no more neutral than those of the foreground.” (ibid., p. 108)

The difference from the other three types has to do with the technologically designed deflection regarding the focal attention of the end user toward the technology (e.g., ibid., p. 109). Technologies to which we relate as background are devices that we are not consciously aware of, even though they may be essential for constituting or sustaining the very conditions of human life. Ihde illustrates the relationship with the life-supporting technology on spaceships and submarines, but less extreme examples, such as heating and cooling systems, water supply systems, and canalization, are equally relevant.

Although these relations⁴ are presented as four distinct classes in *Technology and the Lifeworld*⁵, it is important to maintain that they also form a *continuum* (ibid., p. 107). This assumption⁶, while noticed by various commentators (e.g., Bernhard 2007; Verbeek 2005), has not been examined in the literature with respect to its reductional potential and far-reaching consequences. Instead, Ihde’s categories have frequently been criticized for blackboxing intentionality (Verbeek 2008) or for being ambiguous with respect to their *relata* (Søraker 2012). This generally pertains to the criticism that some relations are not adequately grasped by his theory and therefore extensional or substituting categories should be supplied. I will briefly return to the criticism in the concluding section. Meanwhile, this inquiry will take us in the very opposite direction. It will make use of the *continuum assumption* and demonstrate how *alterity* and *background relations* can be conceptually reduced to a combination of *embodiment* and *hermeneutic relations* (the latter two are also collectively referred to as *mediated relations*).

In order to make this far-reaching systematic point, however, let us start by looking at a concrete example that is not Ihde’s own. I will briefly describe a novel technological artifact—the Telenoid—and try to understand it by using Ihde’s classification of human–technology relations. The section will outline a decisional problem, which motivates a formal modification of Ihde’s theory.

3 Relating Through a Robot—Applying Ihde’s Theory to the Telenoid

A special approach to telepresence technology is *teleoperated robotics*. The famous *Geminoid HI* and *Geminoid F* from the ATR⁷ in Kyoto, Japan are two examples of this type of robot (for more details, see, e.g., Nishio et al. 2007). Meticulously crafted to resemble real persons (Hiroshi Ishiugro and an anonymous woman,

⁴ It is worth noting, as Paul-Peter Verbeek has done in *What things do* (Verbeek 2005, p. 123ff.), that technology in the first two relationships functions as a mediator, where in the third it is a *relata* in itself.

⁵ The *alterity relation* is not formulated separately in his earlier work *Technics and Praxis*.

⁶ Hereafter: *continuum assumption*

⁷ Advanced Telecommunication Research Institute International



Fig. 1 The Telenoid

respectively), the intention is to transmit an operator's human presence to a remote location. In other words, these robots facilitate the operator's remote embodiment, in certain relevant senses of this term. An even more radical robot design by the ATR is the Telenoid (see Fig. 1), which is one of their recent attempts to "effectively transfer peoples' presence" (ATR 2010). Before describing its appearance, we need to understand the basic interaction setup that it operates through⁸. Assume that *Alice* would like to communicate with *Bob* by using the Telenoid as a communication channel. *A* can operate *T* by using a computer that registers neck movement, speech, etc. and manifests these in *T*. Via a touch screen, the operator can move the arm-limbs in one direction creating gestures like "waving" and "hugging," *B* can consequently interact in propria persona from a different location with this surrogate of *A*, who in turn receives audio and video feedback from *B*'s location. For instance, while *B* is talking to *A* via the robot, *A*, who is listening to the live audio and video transmission, e.g., in another room, can nod to indicate that they are actively listening. The operator's neck movement is recorded via the webcam, processed, and the robot immediately emulates the body language at *B*'s location. Using a simple graphic representation, we can distinguish four direct human–technology relations and two indirect relations between humans, mediated by technology: $A \rightleftharpoons T \rightleftharpoons B$ (see Fig. 2 below).

⁸ The practical application context is, however, beyond the scope of this paper—for more information in this regard see, e.g., Yamazaki et al. (2012). Furthermore, a more detailed description of the Telenoid's functionality can be found on the homepage of the ATR's Hiroshi Ishiguro Laboratory (<http://www.geminoid.jp/projects/kibans/Telenoid-overview.html>).

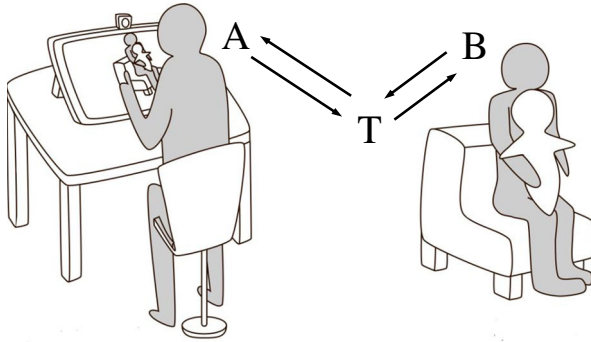


Fig. 2 Conceptual interaction scheme

Disregarding for the moment the fact that Ihde formulates relations from the perspective of an *I*, in contrast to the person's *world*, one might wonder how to analyze this complex interrelationship between *A*, *T*, and *B* by *bracketing* the terms according to Ihde's four categories—as in Table 1.

However, before we try to find out where the *brackets* should go—i.e., the type of relationship in play—it is necessary to contemplate the design implications in order to fully appreciate the Telenoid. The robot represents Hiroshi Ishiguro's and his team's interpretation of minimal human design. The intention is to provide the least common dominator capable of alluding to human essence/existence and establish a neutral platform, a *nucleus*, which *B* can mentally *dress* with the past and present associations of *A*, triggered through the interaction with *A*'s surrogate. Adding more specific features to the Telenoid, such as hair and clothes, would—according to the theory—interfere with the free play of *B*'s associations, influencing and possibly interrupting *B*'s natural projections and their articulation during the interaction sequences. To put this in less abstract terms, we could imagine a grandparent communicating via a Telenoid operated by their grandchild. If, for instance, the robot had a very adult appearance, this would interfere with the robot's intended function—to be a representation of the grandchild. Consequently, even the limbs are highly stylized (cf. Fig. 3 below).

As indicated in the “Introduction,” it is not the objective of this paper to work out the differences between robots and other artifacts. Hence, hopefully the following brief remark will suffice as a motivation for the choice of study object. What makes the Telenoid particularly interesting is that it functions as an interface for human–human relationships, presenting itself as an interaction partner, in addition to the inherently asymmetric setting (considering that *A* is sitting in front of a computer and *B* in front of the surrogate). Consequently, the complexity of the interaction should potentially be different from reading a dial on a wall, speaking on the telephone, or driving a sports car; it should be able to bring technological relationships to their limits. The consequences of this will be discussed in the final section but in a different context.

Having introduced the robot and Ihde's fourfold theory, the next step is to combine the two and ask *what kind of relationship does the Telenoid facilitate?*

Let us begin by exploring the phenomenological situation of *A*, the person who operates the Telenoid, more closely, and investigate a realistic encounter by analyzing



Fig. 3 Interaction scenario

some of the functionalities of the Telenoid as isolated phenomena: (a) neck movement and (b) hugging functionality. In addition to illustrating plausible or at least hypothetical, possible classifications within the realm of Ihde's theory, these elaborations will provide us with a fruitful vantage point.

1. Sitting in front of a laptop equipped with a microphone and headphones, *A* watches and hears the interaction mediated by the surrogate and can consequently respond to *B* by controlling *T*. After a short time of getting used to the various actions controlling the Telenoid—in this case, the neck movement, which is controlled by the neck movements of the operator—these actions become *second nature* to the operator. The duration of the adaption phase could depend on such factors as how deeply *A* is absorbed in the conversation or *A*'s level of proficiency with respect to operating the robot. Focusing only on the control of the neck movement, it would seem that the relation between operator and Telenoid can definitely be classified as an *embodied relation*: $(A-T) \rightarrow B$.
2. The *hugging* functionality, on the other hand, which is activated by pushing a button on the touch screen of the computer, might best be described as a *hermeneutic relation*: $A \rightarrow (T-B)$. That is not to say that it does not evoke some of the feelings a human hug would induce, especially in *B*, as the following quote from the pilot testing in Svendborg (Denmark) in 2011 indicated:

“In another situation during the session, he [a test subject in the position of *B*] established not only verbal but also nonverbal contact with Telenoid by giving it a big, silent hug while standing up. This big hug was one of his characteristic behaviors. He seemed to feel this himself right as if he were getting such a reward as a sense of reassurance and greater comfort from his experience with the robot.” (cf. Yamazaki et al. 2012, p. 434)

Nevertheless, returning to the position of *A*, we might very well argue that *A*, due to the lack of received *haptic* information, has to consciously interpret the ongoing action as a hug (in the same way as reading the temperature on a thermostat) and, therefore, we are dealing with an actual *hermeneutic relation*.

Having exemplified and dissected the phenomenon into a conjunction of two selected functional parts, which could then be slotted into Ihde's classifications, it is now time to consider the interaction as a whole.

Before doing so, I would like to stress the following methodological points. The types of technology relations Ihde highlights are, as outlined above, prototypes of a continuum of relations. This implies (a) an essential overlap between the categories and (b) that they are mutually comparable. Furthermore, I will assume a *distributive law for the continuum*, meaning that we, by evaluating the relational types of the respective functionalities or individual *sub-relations* of a technology, can deduce the predominant relationship of the technology as a whole without additional information (at a given moment)⁹.

“[...] Driving an automobile encompasses more than embodiment relations [...]”
(Ihde 1990, p. 74)

Although the relation is constituted by various sub-relations (changing gears, steering, interpreting the traffic, etc.), driving a car can become an *embodiment relation*. The axiomatic assumption of a *distributive law* ensures that if we analyze a relationship in a frozen moment from the first person perspective, an evaluation of the individual constituting relations enables us to deduce the nature of the total relation for that particular moment.

To facilitate the comparison of relations in this continuum, it will be helpful to define some kind of theoretical measure for the individual aspects of *embodiment/hermeneutic relations* with respect to their degree. I will denote

$$\text{deg}(E) : = \text{total degree of embodiment}$$

$$\text{deg}(H) : = \text{total degree of hermeneutics at a given moment}$$

Ihde notes that “[...] the embodiment relation can be more precisely described as one in which the technology becomes maximally ‘transparent’. It is, as it were, taken into my own perceptual-bodily self experience [...]” (ibid., p. 73). $\text{Deg}(E)$ represents a hypothetical measure for this *becoming* at a given moment, where the word *total* takes into account that complex technology can establish multiple *embodiment relations* at the same time. We gradually learn to drive a car and it becomes more and more second nature during this process. As Ihde points out, “one’s bodily sense is ‘extended’ to the parameters of the driver-car ‘body’” (ibid., p. 74)—the car becomes part of our body, so to speak. By driving, we feel the distance, traction, etc. through our various senses. The “sum” and extent of all these *embodied relations* is denoted $\text{deg}(E)$.

Moving my eyes over my desk on their way to the monitor, I might notice my watch and the current time (more or less precisely). This relation seems superficial or at least not as intellectual and intentional as reading the watch on purpose. How conscious we are about reading the clock, or for that matter when we try to grasp the concept behind what the hands mediate at a given moment, indicates that the hermeneutic experience is not simply a binary experience but finely nuanced. As a

⁹ This does not necessarily conflict with Ihde's theory as such; however, his theory has a different emphasis, which does not provide enough information to directly affirm or reject this conjecture.

consequence, the quality of a *hermeneutic relation* might differ. $Deg(H)$ denotes the measure of this quality of the total *hermeneutic relations* mediated by a given technology.¹⁰

Returning to the example of the Telenoid, let us for the sake of simplicity assume that the only functionalities the robot provides are neck movement and hugging functionality. As argued, the former can involve a high degree of embodiment and the latter a high degree of hermeneutics. Bringing the two together, what happens if we in this hypothetical moment imagine that an operator moves their head and performs the hugging at the same time? *What kind of technological relationship would we be dealing with?* A brief answer to this question—hereafter Q1—could be to take the strongest relation to be dominating and defining. That is, if $deg(E) > deg(H)$, we would say we have an *embodied relation* or, in case the sign is reversed, a *hermeneutic relation*.

Yet, this cannot be the only answer to Q1, for *what do we make of the extreme cases where both factors (the total degree of embodiment and hermeneutics) are equally strong? Does this give rise to an essentially new relation?* Hereafter Q2.

Let us assume that we can plot $deg(E)$ versus $deg(H)$ into a coordinate system, as illustrated below in Fig. 4, where one axis is denoted $deg(E)$ and the other $deg(H)$. The values of interest for Q2 can be represented by the dashed line where $deg(E) = deg(H)$.

It is important to note that this graphical representation (as well as the one following in Fig. 5) is only a heuristic tool. It was chosen for its simplicity and in order to illustrate the ideas behind this paper. Finding a more suitable or even more correct representation would be a very interesting topic for further research, but it is beyond the scope of this paper, which is entirely conceptual and tries to facilitate a new way to inquire into Ihde's theory.

The dissecting strategy applied here to determine relational types differs, to some extent, from Ihde's approach found in, e.g., *Technology and the Lifeworld*. This might account for the absence of the decisional problem presented here in his theory. Nonetheless, the borderline case provides an interesting access point to a different take on Ihde's relational theory, which deserves further consideration. It will motivate a modification of Ihde's theory, where *alterity* and *background relations* will be worked out as exhaustively describable in terms of the mediated relationships.

4 Modification

Let me now present my attempt to modify Ihde's *embodiment* and *hermeneutic relations* in terms of mediation. In addition to providing a new take on the theory, this setup should enable us to approach the decisional problem raised by Q2 in the concluding section. For the sake of clarity, I will use a *pseudo* mathematical representation/analogy without committing to an extensional, quantitative interpretation. A similar heuristic approach can be found in other works, such as Masahiro Mori's article *The Uncanny Valley* (Mori 1970) in which the author attempts to describe our

¹⁰ Assuming that the *total degree of alterity* and the *total degree of background relations* can be formulated analogously.

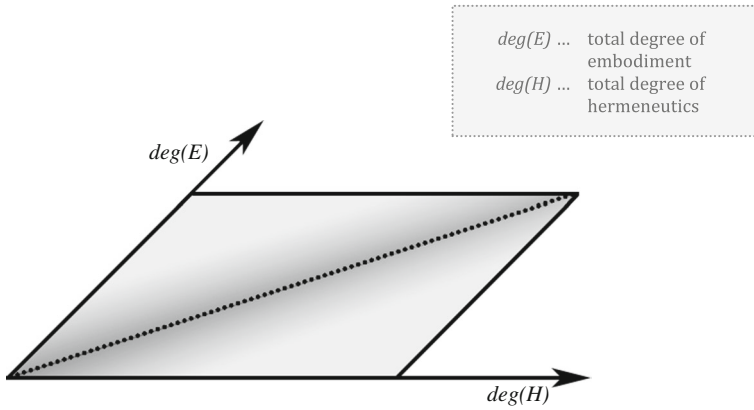


Fig. 4 The $deg(E)$ axis is tilted as another axis will be added later

experience of robots with the help of mathematical functions in an effort to illustrate a design recommendation.

The modification of Ihde’s theory will supplement the more formal comments with explanatory remarks, which carry most of the semantic weight of the proposal.

- A1 *Alterity relations* and *background relations* are technological relations where the ratio between the *total degree of embodiment* and *hermeneutic relations* equals or approximates 1. In other words, what I suggest here is that whenever the total degrees of the *mediated relations* are identical or almost equal, we could interpret this as what Ihde refers to as *alterity* or *background relations* (pertaining to the dashed line in Figs. 4 and 5 and its surrounding, represented by the darker shading in the same figures).
- A2 The difference between an *alterity relation* and a *background relation* is determined by the *total degree* of the *embodiment* and *hermeneutic relations*. If the latter two are high, it is an *alterity relation*; if they are low, it is a *background relation*.

Figure 5 below is a graphical illustration of the effect of these assumptions based on Ihde’s theory, outlining the proposed categorical reduction. Under A1 and A2, the four

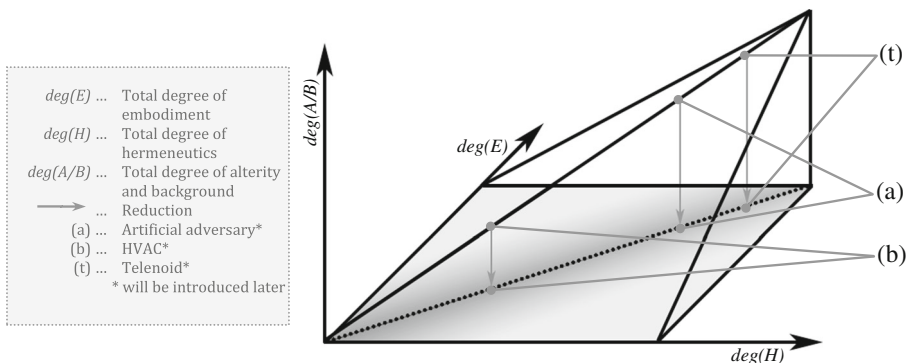


Fig. 5 Graphical illustration of the effect of assumptions A1 and A2

categories of Ihde's model can in some sense be visualized by adding a new axis representing the total degree of the alterity and background relation—denoted $deg(A/B)$. This representational merging of the two relations into only one axis seems tenable as they only differ in degree of mediation; from a certain threshold, onward *background relations* transform into *alterity relations* (represented by the vertical incline along the ridge) and vice versa (regarding the respective decline). Like Ihde, who does not present any objective thresholds for terms like “very transparent,” “closer to invisibility” (cf. 1990, pp. 47, 74) etc., no actual threshold for the transition between high and low is given here. This construct resembles, to some extent, an auxiliary line in geometry, and an exact value determination will not be needed to extract the theoretical main point. The mediated relations describe the other two exhaustively, which is represented by the arrows in the figure.

Admittedly, in modifying Ihde's framework, which ultimately is a reduction, this interpretation twists Ihde's theory to the extreme and further explanation is needed.

If we look at the fourfold relational theory, as presented in *Technology and the Lifeworld* as well as in *Technics and Praxis*, it is heavily built on exemplification. I will stay true to this strategy of qualitative phenomenological analysis and revisit two of Ihde's prime examples of *alterity* and *background relations*. By evaluating these two representative cases only with respect to $deg(E)$, $deg(H)$, and the respective ratios, I hope to demonstrate the correlation with Ihde's classification.

4.1 Case 1: The Artificial Opponent in a Video Game

The relation between a gamer and the world, mediated through an artificial opponent in a video game, was previously cited as an example of an *alterity relation*. The *world* vanishes into the background and the technology becomes the focus of our attention.

“In actual use of video games, of course, the embodiment and hermeneutic relational dimensions are present. The joystick that embodies hand and eye coordination skills extends the player into the displayed field. The field itself displays some hermeneutic context (usually either some ‘invader’ mini-world or some sports analogue) but this context does not refer beyond itself into a worldly reference.” (Ihde 1990, p. 100)

Absorbed in a video game, we react spontaneously and instantly to a good virtual opponent, and consequently, a high degree of *embodiment* can be found here. Consider how games seem to affect our breathing pattern or how people sometimes sway their entire body while playing, although they are using a handheld controller that is indifferent to this kind of movement¹¹. Additionally, by interacting with our artificial adversary/partner, we are always in a highly *hermeneutic relation* to the world. In this case, since both the *embodiment* and *hermeneutic* aspects are rather predominant, this—in accordance with A2—implies an *alterity relation*—represented as (a) in Fig. 5.

Since this interpretation to some extent diverges from Ihde's position, further explication is needed. Two characteristics regarding *alterity relations* are of particular

¹¹ Recently, game designers seem to have noticed this end user pattern, since new systems also react to the controller's positioning in space.

relevance here: According to Ihde, (1) it is the technology itself that is in focus and (2), as quoted above, the hermeneutic context of the technology might not refer beyond itself into a worldly reference¹².

I do not dispute claim (1) under the following new and central assumption/definition: *Focus is the simultaneous manifestation of a high degree of embodiment and hermeneutic relation at a given moment.* However, since I understand *hermeneutic relations* as always having a referential relation to the world—that is, to some immaterial or material phenomenon—I do not endorse Ihde’s suggestion that *hermeneutic relations* could occur without reference to the world. Let us in the following examine (2) more closely with respect to the *alterity relation*. As Ihde notes:

“In extending bodily capacities, the technology also transforms them. In that sense, all technologies in use are non-neutral.” (ibid., p. 75)

Consequently, even a virtual opponent must by default relate us to something else in the world in order to be an opponent—otherwise, they would have no effect on us and hence be *neutral*. An *alterity relation* to Ihde is characterized by technology being the central focus. However, in spite of the strong focus on the virtual opponent in the *alterity relation*, we are always also explicitly related to the world in this relation.

As human beings are not only the end users of computer games but also their designers, direct reference to the world is built into the games (physical and/or psychological). Players would be at sea if they were simply confronted with lines of code. Game, opponent, shape, color, and movement are all taken from the world; we would not be able to play if what we encountered during a game session was completely unrelated to our world of experience and thus beyond our comprehensibility. The boundaries between the fictional and the real are notoriously difficult to draw. According to David R. Koepsell, “[t]he term ‘cyberspace’ is misleading to the extent that it connotes a dimension apart from that of ordinary experience. Electrical charges take up ordinary space as atoms take up ordinary space” (2003, p. 124). As a consequence, our relation with an artificial adversary via materiality refers the player to something in the physical world. However, here I would like to outline a different argument.

We cannot understand artificial opponents in a game without interpreting their features and moves from within the game world, and we cannot understand the features of the game world without relating them to features of the real world. Some features of the game world might be completely fictional, but others—bridges, castles, swords, and ambushes—are real features in a fictitious world. Ihde also seems to overlook gamers’ relation to themselves through the interaction with the artificial opponent. Just think of the feeling induced by victory over an opponent and remember that focus is not limited to intellectual contemplation, or Miguel Sicart’s game ontology, where games can be “moral objects [...] affecting the player’s experience” (2009, p. 48). The gamer constantly reinterprets themselves through the game, which differs from Ihde’s position:

¹² Ihde does not claim that there is no relation to the world in an *alterity relation* per se (see for instance Ihde 1990, p. 107), but he does in this particular case and therefore it must be addressed here.

"His [Ihde's] analysis appears to suggest that he takes as a point of departure humans already given as such and a world already given as such, in between which one can find artifacts." (Verbeek 2005, p. 129)

In other words, Ihde sees the *I* and *World* as disjunctive entities. This view that is in stark contrast to other descriptions of the ontology of games, which emphasize the interaction between fictional and real entities, is illustrated by the quote below:

"As players, we compare the virtual environment with the real world because physical reality is a reference point that makes the learning process easier. [...] This comparison implies that there are actually connections made between the real world and the game world in the mind of the player." (Sicart 2009, p. 34)

Having argued for the hermeneutic aspect in *alterity relations*, it is necessary to decide upon its degree. Given that we are—while playing—constantly interpreting the artificial world (which is, of course, also part of the world), I take the degree of *hermeneuticity* to be rather high.

Although the table as I have represented it is not yet finalized, it should be sufficient to facilitate an understanding of a virtual opponent as constituted by a *high degree of embodiment* and *hermeneutics* at the same time. Moreover, I also hope to have shown that gaming involves relations to the real world, thus containing genuine *hermeneutic relations*. As a side comment, we might also note that this could challenge Søraker's (2012) argument that virtual worlds are beyond Ihde's classifications. However, Søraker is looking to support an "ought" in his article, whereas in this paper, we are only considering the phenomenological first person perspective.

Now that we have seen how an artificial opponent in a video game could be placed in Fig. 5, let us continue with an example of a *background relation*.

4.2 Case 2: Air Conditioning

Being acclimatized, in the word's truest sense, to an air conditioning system, we tend not to be aware of it running in the *background*. Therefore, Ihde refers to it as a *background relation* (e.g., 1990, pp. 108–109). In the following, I will outline how this case translates into the suggested modified version.

The moderately used air conditioning system relates us to a hotter or colder world. When the temperature reaches our comfort zone, we barely notice the humming of the HVAC and the discrete airflow. Our intentionality towards this type of technology, when working properly, converges towards zero, as we adapt to it until it finally becomes almost indifferent to us. Hence, in regard to the relationship between the world and us, the degree of hermeneutic interest is rather low. In relation to embodiment, however, the issue seems more complicated. It is tempting to define the *total degree of the embodiment relation* as rather high, since the modified air is integrated into our bodies. The sensory experience is mediated to us—just think of how temperature affects our mood—and arguably the machine becomes rather transparent to us; we get used to its noise and take the temperature for granted. These primary explicit indicators of an *embodiment relation* are nonetheless a bit misleading, since the

technology cools the air, but the cool air is properly part of the world domain¹³. The stationary box mounted to the wall, or the HVAC unit on the roof, is the technology that is supposed to create a comfortably tempered living environment in the rooms to which it is either connected or in which its ducts allow an outflow of air, creating a *mediating relation*. The vast majority of air conditioning systems we find in real life, however, lack an intimate connectedness to our individuality, insofar as their thermostats are not under our control. Offices or supermarkets are thermally regulated according to standard institutional specifications. Furthermore, even though we regulate the temperature of our air conditioners at home, they do not follow us around—neither are they synchronized to our impulsive or immediate needs. In this sense, they are *part of our bodies* only to a minor degree. Due to this lack of embodied integration, the *embodiment relation* is also of a minor degree¹⁴. If we combine these observations with A2, the air conditioning system represents a *background relation*; consequently, I marked it (b) in Fig. 5.

I have tried to refine Ihde's fourfold categorization of technological relations by expressing *alterity relations* and *background relations* in terms of the ratio between the *embodiment* and *hermeneutic relations*. Consequently, in cases where the respective degrees of the mediated relations approximate each other or are equal (Q2), there is no sudden jump to an *essentially* different or new relation that cannot be exhaustively described in terms of our two categories of mediation. But where does this leave us with respect to the Telenoid? A further inquiry will reveal additional complexity.

5 Dynamics of Relations and Conclusion

The following will continue the meditation on the philosophical implications of the technological relation between *A* (the operator) and *B* via the Telenoid. I have previously argued that the degrees of *embodiment* and *hermeneutic relations* could be rather high in terms of neck movement and hugging functionality. In that case, A1 and A2 render the relationship an *alterity relation*, as the quotient would approach one, providing us with an initial answer to Q2. However, a thorough investigation cannot not stop here.

Since the operator is placed behind a monitor, but has a greater range of technologically supplied sensory input and output possibilities, the Telenoid—denoted (t) in the graph—could potentially be placed above (a) in Fig. 5. However, is this really a fixed position?

This question goes straight to the core of a fundamental issue, which cannot be stressed enough. So far, the presented selection of Ihde's theory, as well as my modification, has mainly focused on making sense of the relationship between two persons interacting via the Telenoid at a particular moment in time. However, in order to make further progress, we will have to adequately address temporality in this context. It is a rather well-known fact that there can be huge discrepancies between the intended and actual usage of new inventions (see for instance Tuomi 2002, p. 9ff.), something that is also central in one of Ihde's latest works, *Ironic Technics* (2008).

¹³ In accordance with Ihde's distinction between *I*, *world*, and *technology*.

¹⁴ The degrees can never be zero, as this would conflict with the continuum assumption.

Since the Telenoid is still in the test phase, it might be too soon to draw any conclusions about the relationship it facilitates, both with respect to its further development (the *designer–materiality relation* in Ihde's terminology, *ibid.*, p. 29) and with respect to usage (the *artifact–user relation*, *ibid.*). However, we do not need not open the temporal gap quite so wide. For this paper, it should suffice that during actual use of technology, progresses such as learning curves, feedback loops, etc. influence the formed relationships. More concretely, transformations of phenomena from one relational type to another have to be accounted for in further detail if we aim to create a robust theory. The issue addressed in this paper goes far beyond the problems of an initial phase; it brings us face to face with the limits of static categorization as a tool for understanding technology. Again it is not the case that Ihde is unaware of this dynamics; on the contrary, he addresses it via the continuum hypothesis and in his discussions on multistability of relationships (e.g., in *ibid.*). Nevertheless, it is necessary to translate this issue adequately to the modified version.

Returning to the Telenoid, as the operator of the Telenoid acquires more proficiency in using the robot over time, we would also expect an increase of embodiment. However, other factors are clearly of equally significant influence. Consider, for instance, being a caretaker sitting in front of the monitor and imagine the difference between on the one hand being involved in a lively conversation with one patient—*B*—and on the other hand interacting with a reluctant patient—*B'*—who is indifferent or negative toward the robot. In the former instance, it would seem easier to *absorb* the technology (embodiment), whereas it seems likely that we in the latter case would be more aware of the presence of the technology, making the signals from the screen something external to us, something we had to interpret (hermeneutics). Changing the *relata* undoubtedly also alters the entire relationship. The crucial point is that from the phenomenological standpoint of *A*, the relationship facilitated by the Telenoid is a different one, although the technology as such remains the same. This is also the case the other way around. A non-gesticulating or mute *A* might lead to a different relation compared to an extremely verbally expressive person, as this would translate directly to the Telenoid and affect *B*. However, the emotional relationships between the communication partners *A* and *B*, and the history they have in common or are establishing, are equally important. Hugging a loved one differs phenomenologically from hugging an acquaintance or stranger. Like in real human–human encounters, relationships emerge and develop over time.

As Ihde points out on various occasions, all technology is non-neutral (e.g., Ihde 1979, p. 53), as it amplifies/reduces our natural abilities (see for instance p. 21). Consequently, we must not forget that the soft and hardware that *is* the Telenoid, and its *flexibility* to adapt adequately to the interaction scenario, represent an additional parameter, which makes a unique, static classification of the relational category difficult/shaky.

The relationship that both *A* and *B* can develop with each other and *T* might vary to a great extent, depending on the communication partners' capabilities, preferences, moods, etc. Other crucial factors are the partners' mutual (voluntary and involuntary) *sensitivities* to communicational clues as well as the *flexibility* and *modifying impact* of the Telenoid through the processing and execution of data. As the worldly *relata* is a human being, the complexity of the interaction mediated by the robot is inherent to the relationship and, therefore, so is its ever-changing dynamics. These elaborations

indicate that the scope of the Telenoid's capability to create two-way communication makes the relational ratio potentially highly dynamic in regard to *mediated relations*, and consequently, we would be mistaken if we were to link it exclusively to a single type of relation.

From a phenomenological perspective, the way we relate to each other is not either continuously changing or continuously invariant, but dynamic in the sense that it varies over an interval (for a refreshing take on this issue see for instance Dōgen 2007). This may not be as obvious in other types of technologies, such as contact lenses or hearing aids. However, cutting-edge technology, such as the Telenoid, which is highly adaptable to the particular psychological features of individual operators, creates the need for a richer theory.

I do not think that the modification of Ihde's theory presented in this paper is necessarily inconsistent with his version¹⁵. Nevertheless, qua formal reduction of two categories to a ratio of the *mediated relationships*, the dynamics is more inherently and explicitly hardwired into the relational theory—we can no longer think of *background* and *alterity relations* as essentially different (providing us with a negative answer to Q2). From this perspective, nevertheless, one difference worth noting is the emphasis on dynamics beyond the innovation process, highlighting the insufficiency of our inflexible everyday categorizations for describing reality—granted that they are invaluable practical tools in real life. From the phenomenological standpoint outlined in this paper, Q1 cannot be uniquely determined as this would violate relational potential and the flux of the technologically mediated relationships.

Finally, returning to Fig. 5, let me try to incorporate these findings into the graph. If we denote the shaded area as some kind of *phenomenological, plastic field*, we can account for temporality by acknowledging that the points representing the experienced relationships are by no means stationary over time and across contexts, but are best thought of as potentially and multidirectionally mobile. In other words, any static picture is nothing more than an intellectual interpretation of a moment. This resonates very well with Ihde when he writes (concerning innovation of new technology):

“The indeterminacy here is multistable in terms of the possible range of uses fantasized or actualized.” (2008, p. 29)

6 Further Discussion and Limitations

As mentioned in the beginning, Ihde's theory generated many comments, and the four categories were criticized for being unable to adequately contain certain phenomena. Since the outlined modification of Ihde's theory is an attempted reduction, it is susceptible to the same type of criticism. Unfortunately, an adequate stress test would far exceed the limitations of this conceptual paper. Therefore, I will only address Peter-Paul Verbeek's recent criticism of Ihde's theory (2008).

Verbeek provides us with valuable insights into Ihde's theory. Although it is very difficult to embrace his ideas fully in this short article, the basic conclusions should not

¹⁵ Although highly interesting, the question of isomorphism is beyond the scope of the paper.

go unnoticed. Arguing that Ihde's *mediated relations* blackbox intentionality, and by granting technological devices some sort of *technological intentionality*, he divides his criticism into two additional categories. Let us for the sake of the argument accept Verbeek's notion of *technological intentionality*. He argues that a *new* entity occurs in what he terms the *cyborg relation* and that it is not possible to make "a distinction [...] between the human and the technological 'share' in the mediated experience" (ibid., p. 391). Nevertheless, the obscuring or absence of a clear delineation between who/what is experiencing does not necessarily qualify for a new category on the same level as Ihde's. The human "part" of a cyborg, which does not make this distinction, is in an *embodiment relation* to the world through its *nonhuman/technological* part. If, however, it tries to make the distinction, or in other words, when it becomes conscious about the non-neutral technological narration through which it (partly or exclusively) experiences the world, it is moving towards a *hermeneutic relation*. This does not exclude the human from at the same time also being in an *embodiment relation*, at least not in the modified version of Ihde's theory. It is in this *interplay*, we find the *cyborg relation*—not as a new fifth category on the same level as Ihde's, but rather as a sub-category. In other words, we do not need to expand the continuum to include Verbeek's relational type. This is also the case when it comes to Verbeek's *composite relation*: "They aim to reveal a reality that can only be experienced by technologies, by making accessible technological intentionalities to human intentionality" (ibid., p. 393); they even "construct reality" (ibid.). The prime example would be a radio telescope, which relates us to something otherwise unobservable. Verbeek does not explicitly define this as a sixth category. However, from the first person perspective, an *I* being aware of the *composite relation* is truly engaged in a *hermeneutic relationship*, as this being is trying to make sense of what it is that is mediated and how this is done. If not, we could say that the *degree of hermeneutics* is rather low or that we might be in an *embodiment relation* more or less in union with, e.g., the modern artwork generated by the mediation of the radio telescope. Generally, the modified version is responsible for the same blackboxing as Ihde's theory is accused of. As a consequence, it embraces technologies regardless of whether or not they are capable of possessing some sort of *intentionality* or *directedness*. However, as I have tried to outline, Verbeek's two categories could be regarded as special instances of, and contained within, the modified version (and consequently also relate to Ihde's *mediated relations*). With his additional assumptions, Verbeek is able to acquire more information, but the assumptions are on a different ontological level as they move away from the first person perspective.

There is, however, no doubt about the value of Verbeek's ideas. They are highly interesting and relevant for further research, and a more thorough test of the sub-categories in the modified version would be fruitful. In addition, as soon as we accept notions like *technological intentionality*, we might wonder about all kinds of relations and the nature of them. For instance: (*technology*→*technology*)→*world* or *technology*→(*technology*→*human*) relations, etc. How do we place them into the modified version?

As Verbeek is far from alone in commenting on Ihde's work, further comparison of how the modified theory fares when meeting Ihde's critics would be a very interesting topic. Søraker's argument, that the *relata* of technology becomes ambiguous when it comes to virtual worlds, seems challenging (cf. Søraker 2012 p. 504). It could be

interesting to investigate if there is a certain ratio interval between the *degrees of embodiment* and *hermeneutic relations* that supports his notion of *extravirtual* and *intravirtual consequences*.

In this paper, I have used ad hoc representations of functions like $deg(E)$ in order to emphasize a broad conceptual point. One of the many open questions is whether or not these functions could be determined further and consequently if we can find a better graphical representation.

I have tried to show that we can reduce four categories to two. Obviously, this begs the question whether or not the two can actually be reduced to one. In addition, as mentioned above, we constantly change; this line of thought deserves a more thorough investigation. In other words, are human beings, technologies, and the world adequately addressed by static categorization?

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