GENERAL NOTE

Toward an Ontology of the Interface
Identifying the Interface as a Mediation Entity

CRISTINA SÁ

ABSTRACT

The interface is more than an assemblage of processes and effects; it is more than a pure relational instance. The interface can be identified as an entity in itself and in relation to other entities. In this article, the author presents an ontological work on the interface, defining what it is and how it exists, and discussing its relation to other entities. The interface is defined both abstractly as a mediation complex—by identifying characteristics present in its multiple instantiations—and in relation to other entities—by observing the case of the human-computer interface.

The interface is a system or device through which nonrelated entities can interact [1]. From this definition, I conclude that the interface must have some characteristics that are common to each of the entities it puts in connection, since it must communicate with each of them. Still, the interface is more than simply a relational space that inherits properties from the systems it connects: It is itself an entity with its own features that emerge from the interaction occurring through and by means of itself. Finally, the interface has features of its own apart from the interaction it facilitates—features that produce or shape experience [2]. On another level, the definition of the interface also encompasses the ubiquity and variability of the interface: It is present between diverse entities, so it can take on virtually any form or function—a graphical user interface or a public transportation hub, for instance.

The main objective of this article is to define what the interface is and how it relates to other entities, thus advancing the construction of its ontology. The first section below defines the interface and its mode of existence abstractly—i.e. valid for any of the interface's multiple instances. The second section discusses how the interface relates to other entities by concentrating on a particular instance: the human-computer interface.

Cristina Sá (educator), Universidade Católica Portuguesa, CITAR—Centro de Investigação em Ciência e Tecnologia das Artes, Escola das Artes, Rua Diogo Botelho, 1327, 4169-005 Porto, Portugal. Email: csa@porto.ucp.pt. ORCID: 0000-0003-3143-420X.

See www.mitpressjournals.org/toc/leon/52/5 for supplemental files associated with this issue.

Interface is defined within the theoretical framework of mediation and experience [3]. According to Kittler [4], from Aristotle onward ontological studies have dealt only with things—their matter and form—and not with the relations between things in time and space, therefore leaving mediating entities out of such studies. Because I study the interface as a mediating entity, we must begin our discussion by defining the interface and describing its relationships in space-time (and matter, which can no longer be separated from space and time).

WHAT IS AN INTERFACE?

Definitions of interface often consider its space and actions (time), thus contemplating its relational and emergent characteristics. Most definitions of interface, however, ignore its substance (matter), thereby ignoring certain characteristics [5]. In this section, I study the interface as a complex [6], acknowledging its space-time-matter.

Interface and Space: Between, Discontinuous, Adjacent

Space has been defined in distinct ways throughout history. Some of these definitions have become important conceptual tools [7]: Plato's work on space provides aids for defining the interface's "in-between" mode of existence, quantum physics demonstrates the pervasiveness and fundamental role of the interface in sustaining the discontinuous complex of reality and Foucault's experiential work on space exposes adjacency as fundamental for relational occurrences.

Space, for Plato, is in between *being* and *becoming* [8]. It operates as a receptacle for things and beings. The interface also stands between ontologically different realities, distinguishable by their conception, genesis and apprehensibility. It is a receptacle for beings: beings in formation and transformation, passing from one world to another.

To apprehend Plato's space, one needs "a kind of spurious reason," which is also the case for the interface, as is discussed in the following section; Plato describes space as a portal "which we behold as in a dream" [9]. The interface is also a provocative agent, a space that invites us to move to another

reality. Moreover, dreams as emotional landscapes put the interface within the realm of fantasy and desire. By going beyond the fulfillment of a need, the concept of interface is connected to the Lacanian concept of *object petit a*: facilitating and promoting access to another reality by means of continuous satisfaction [10]. In short, the interface is a space of perception, action and desire—a space of agency in Hookway's terms: "the will and means to action" [11].

Since Einstein, understanding space-time implies considering masses, particles and their behavior through their relationship with light. Quantum theory [12] asserts that all entities, although apparently continuous, are really made of particles. Reality is a noncontinuous heterogeneous woven fabric, but with such a fine texture that it suggests continuity to our perception. Reality depends on the interactions among its elements to maintain its unity—to exist. The idea of an interface traverses this discontinuous continuum of reality, since its presence is fundamental as an element of dynamic liaison: granting the existence, multiplicity and mutability of the fabric of reality.

Foucault [13] proposes another vision of space, stating that our experience of the world is network-like: The experiential relationship of space-time is one of connection and weaving. The position of experience in space and its distribution in time do not obey conventional geography or the successive linearity of history. Events are represented by neighborhood and connection more than by position or date. Adjacency becomes the basic condition for a relational occurrence mediated by an *inter*face: "*Inter-* encompasses relations that may occur between, among, or amid elements insofar as they are given as bounded within the space of their relating, or of the events insofar as they are bounded in time" [14].

Interface and Time: Speed, Iteration, Harmonization

Speed is a relational concept, since it considers the distance (space) covered in time by a mass. Paul Virilio studies speed through telepresence and uses light exposure as an alternative measure of time [15]. Time becomes chronoscopic instead of chronologic. Like objects in a photograph, an event in time may be underexposed, exposed or overexposed [16]. The time of the interface is also one of exposure: A thing or event only exists for the other system if "exposed" in the interface. If the thing or event is underexposed, the other system cannot acknowledge it; if, on the contrary, it is overexposed, then it loses its novelty and interest (it is saturated).

Another aspect to consider is the iterative nature of interface time. According to Pierre Robert [17], the interface is built around two rhetorical axes: The first is developed at the moment of its conceptualization; the other unfolds through interaction. The interface is reconceived by each action, in an iterative process, not in a cyclic one.

Finally, the time of the interface depends on rhythmic harmonization, which is related to cybernetics [18] through feedback. The entities that interact might operate in different time units or in different rhythms; it is the role of the interface to make them compatible.

Fig. 1. Char Davies, *Osmose*, immersive virtual environment, 1995. Immersant wearing a stereoscopic head-mounted display and breathing/balance interface vest during a live performance of *Osmose*. (© Char Davies. Photo: Jacques Dufreine.)

Interface and Matter: Transmission, Plasticity

The interface has a matter whose presence depends on action: It becomes *in interaction*: it is formed while transmitting. It becomes "visible" when transmission occurs; its matter is concretized at each moment of interaction. Therefore, interface matter is dynamic, both in composition and in shape, making it comparable to plastic material [19]:

- Malleable: The interface receives its form from the gap between entities; it is molded dynamically by them and molds them in turn [20].

- Superficial/coating [21]: The interface sticks to entities, covering them, laminating them, sometimes becoming indistinguishable from them. This coating makes it possible for entities to see each other, albeit through a mediating layer.

- Artificial [22]: There is always something artificial about the interface: precisely that which is natural to the other entity.

- Synthetic [23]: The interface synthesizes something new every time it promotes the encounter between two entities: the Hegelian attribute of plasticity.

Composite materials [24] are made from two or more constituent materials that, when combined, produce a

material with characteristics different from the individual components. The interface is made of different original materials combined, not fused, into a heterogeneous complex. This heterogeneity does not compromise its unity; on the contrary, heterogeneity is the very foundation of the interface [25].

Simultaneous creation [26] occurs in composite plastics because they gain form and define their composition at the same moment—in action—just like the interface.

Char Davies's *Osmose* (Color Plate C, Fig. 1) exemplifies what is meant by the plasticity of the interface [27].

HOW DOES THE INTERFACE RELATE TO OTHER ENTITIES?

In this section, I analyze the relational mode of the interface with its bounding entities. We leave the abstract sphere and address the instance of the human-computer interface and how it relates to its bounding entities: humans and computers.

I focus particularly on how humans perceive the interface, asking two questions: (1) How does human perception relate to the passage between actual and virtual? (2) How does human perception affect the meaning of transparency in contemporary digital culture? Both these questions are analyzed in the light of aesthetic computing—"the application of art practice and theory to computing" [28], while implications for interface design are noted.

Articulating the Intelligible with the Sensible While Actualizing the Virtual

Human-computer interfaces corroborate two observations made by Paul Fishwick in justifying a move toward aesthetic computing:

> (1) aesthetics in computing are broader than the purely cognitive dimension; and (2) the art-science confluence embedded within the discipline of interaction design is broader than the primary "desktop" interface [29].

1. To understand the interface itself, we need to use hybrid reasoning. In the case of human-computer interfaces, that reasoning must be simultaneously mathematical and sensible, for those are the modes of "perceiving" on both ends. Alain Renaud considers this to be the central operation of the interface: a process of intellectualizing the sensible and embodying the intelligent by actualizing the virtual [30]. Human-computer interfaces congregate cognitive and material aesthetics by articulating the intelligible with the sensible and actualizing the virtual all in the same movement. In human-computer interfaces, the cognitive dimension is no longer pure at the interface layer: Cognitive behavior is simultaneously sensible and intellectual, for such is the translation and transmission (the operation) the interface guarantees. This coordination is also present in the actual/virtual translation if we consider the quantum physics principle that there are no measurable continuities in physics. There is no abrupt passage

between actual and virtual—there is no moment or point of discontinuity in the interface where magic happens and the analogic (continuous) becomes digital (discontinuous). Both realities are discontinuous but at different levels. Aesthetics in computing are hybrid (material/virtual and cognitive/sensible) at the interface layer.

2. The art-science confluence and the diverse ways in which that confluence is revealed on human-computer interfaces can serve as models for other dimensions of interaction design, proving that that confluence is broadly embedded in the discipline of interaction design. Moreover, since Foucault, network vocabulary has defined experience. A relational mode of experience pervades our digital culture. This mode is important in terms of user experience and consequently in terms of the possibilities for experience design. Again, interface concept and design can be the model to replicate when considering experience design.

Transappearance through Biodigital Rhythmic Harmonization

The chronoscopic measure of time reinforces the idea of interface as a receptacle of objects, not only in space (as in Plato's formulation) but also in time. Interface is the space-time structure that supports Virilio's real-time perspective [31]. In terms of human-computer interfaces, this means it is the role of the interface to control exposure, becoming a window in time—a special window, since its matter is plastic. The plasticity of the interface, combined with the fact that the interface gains matter intermittently through transmission, guarantees its transapparent mode of existing (transparent and opaque, commutatively).

Interfaces are transparent because there is a need to see through them, and they are apparent because there is a need to operate them and identify with them (as mirror). If well realized, both these characteristics are experienced simultaneously. Being transapparent is being beyond apparent—being apparent yet traversable, like Alice's mirror. That is how transparency is experienced in digital culture: seeing through and being visible in apparent simultaneity. Rhythm becomes fundamental to achieving transappearance. In human-computer interfaces the rhythmic harmonization is biodigital [32].

Transappearance proves that time and matter are key to developing a well-balanced interface space in terms of transparency/opacity in perfect commuting rhythm. There should be equal efforts made to conceive spatially compelling interfaces and to control the exposure time of an interface's elements. Interaction design addresses the temporal aspect of digital artifacts [33]; pliability is an aesthetic quality in the use of these artifacts. The interface has the quality of pliability through its plasticity. The matter of the interface is the operational means for conceiving an effective spatial-temporal interface.

CONCLUSIONS AND FUTURE WORK

An ontological approach to the interface implies defining what an interface is and how it exists. The interface's inscription in space-time-matter provides this definition: The interface is a complex; it is an intricate fabric of qualities and processes that enables the interaction between two or more systems. The interface exists in the discontinuities of reality. Its space is one of passage, its time is one of exposure and its matter is dynamically heterogeneous, in both shape and composition.

Another ontological aspect to consider is how the interface relates to other entities. The operations performed on the interface and how interaction occurs through it evince another element fundamental to understanding the interface: mediation. The interface is a mediation complex dynamically and iteratively constituting itself both as a plastic window and as a traversable mirror.

To complete this ontological work, our next steps will be (1) to study other relational aspects of the interface, approaching key concepts of digital culture such as subjectivity, image and art, and (2) to create a classification system for interfaces—a taxonomy, preferably—that will distinguish intrinsic from contextual characteristics of the interface.

## References and Notes

1 In the online supplemental file, I analyze this definition and the characteristics of the interface through an example.

2 In Hookway's terms, this study of the interface follows both the "between faces" and the "faces between" approach. See Branden Hookway, *Interface* (Cambridge, MA: MIT Press, 2014) pp. 9–11.

3 The online supplemental file contains a detailed justification for choosing this framework.

4 Friedrich Kittler, "Towards an Ontology of Media," *Theory, Culture & Society* **26**, Nos. 2–3, 23–31 (2009).

5 The online supplement contains definitions of *interface* from different authors and fields.

6 "Complex" comprises space-time-matter and therefore respects the three types of characteristics of the interface: inherited, emergent and constitutive. The online supplement explains the framework used to study this complex.

7 The online supplement presents these definitions and concepts of space in detail.

8 Plato, *Timaeus* (Project Gutenberg, 2008): www.gutenberg.org /etext/1572 (accessed 27 July 2016).

9 Plato [8] p. 300.

10 André Nusselder, *Interface Fantasy: A Lacanian Cyborg Ontology* (Cambridge, MA: MIT Press, 2009) p. 13.

11 Hookway [2] p. 5. See also Brenda Laurel, *The Art of Human-Computer Interface Design* (Boston: Addison-Wesley, 1990) p. xii, where the example of a doorknob as human/door interface exposes this agency.

12 David Deutsch, *The Fabric of Reality* (London: Penguin, 1998) pp. 35–36.

13 Michel Foucault, "Of Other Spaces: Utopias and Heterotopias," *Architecture, Mouvement, Continuité* **5** (1984) pp. 46–49. Available at: www.foucault.info/doc/documents/heterotopia/foucault-heterotopia-en-html (accessed 27 July 2016).

14 Hookway [2] p. 7.

15 Paul Virilio, *Open Sky* (reprint ed., London: Verso, 2003) p. 3.

16 Virilio [15] pp. 27–28. An object underexposed to light is not captured on film; an object overexposed to light becomes saturated and impossible to read. The OSTF discusses the implications of chronoscopic time.

17 Pierre Robert, "L'interface: Le bien de la communication," in Louise Poissant, ed., *Interfaces et Sensorialité: Esthétique des Arts Mediatiques* (Saint-Foy Québec: Presses de l'Université du Québec, 2003) pp. 115–122, p. 116.

18 Norbert Wiener, *Cybernetics; or, Control and Communication in the Animal and the Machine*, 2nd Ed. (New York: MIT Press, 1961) pp. 35–38.

19 I follow Malabou's multidisciplinary work on the concept of plasticity: Catherine Malabou, ed., *Plasticité* (Paris: Léo Scheer, 2000).

20 Bernadette Bensaude-Vincent, "La plasticité des materiaux nouveaux," in Malabou [19] pp. 170–185, p. 171.

21 Jeffrey L. Meikle, "De l'immatérialité virtuelle: Plastiques et plasticité au XXe siècle," in Malabou [19] pp. 146–169, p. 150.

22 Meikle [21] p. 148.

23 Catherine Malabou, "Le voeu de plasticité," in Malabou [19] pp. 6–25, p. 10.

24 Bensaude-Vincent [20] p. 174.

25 The online supplement contains a discussion on this subject.

26 Bensaude-Vincent [20] p. 173 ("la prise en masse" and "la mise en forme").

27 This artwork's interface is discussed in the online supplement, both in its concept and regarding its plasticity. See Char Davies, *Osmose*: www.immersence.com/osmose (accessed 17 March 2017).

28 Paul Fishwick et al., "Perspectives on Aesthetic Computing," *Leonardo* **38**, No. 2, 133–141 (2005) p. 133. The online supplement details the framework.

29 Fishwick et al. [28] p. 134.

30 The online supplement details the author's idea. Alain Renaud, "L'interface informationnelle ou le sensible au sens de l'intelligible," in Poissant [17] p. 69.

31 Virilio [15] pp. 31–33. The online supplement details the author's theory.

32 The online supplement presents examples of this harmonization.

33 Fishwick et al. [28] p. 138.

CRISTINA SÁ *is an assistant professor teaching courses in media art history, aesthetics of interaction and digital culture. She has a strong commitment to interdisciplinary work in fields such as art and technology, influenced by a formative education combining engineering, art and communication.*

COLOR PLATE C: **TOWARD AN ONTOLOGY OF THE INTERFACE:**
IDENTIFYING THE INTERFACE AS A MEDIATION ENTITY
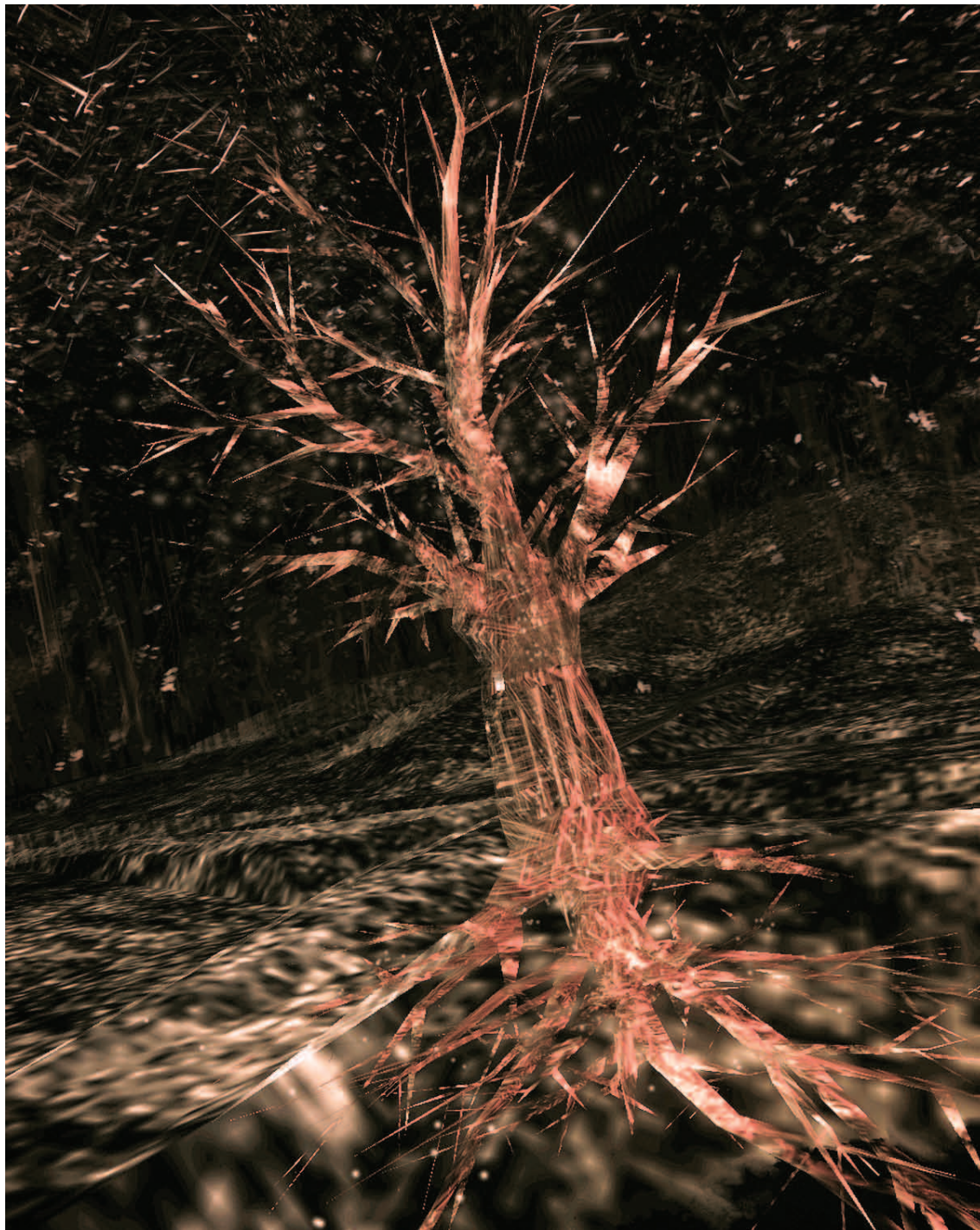
Char Davies, *Osmose*, immersive virtual environment, 1995;
Tree, digital still image captured during a live performance of *Osmose*.
(© Char Davies) (See article in this issue by Cristina Sá.)