INTERCONNECTIVITY AND RELATIONAL EMBODIMENT IN ART AND DESIGN

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In this paper I will argue that, within the scenario of the ever more pervasive use of computers, the aesthetics of user experience and the relational paradigm experimented within interactive arts enable new categories of human-computer interaction to be imagined and investigated and fresh and creative new approaches to design to come up. A non-substantial development of human-computer interaction gives to the design of interactive systems the scope, depth and complexity demanded by a society that will become more and more involved with information technology and network connections.

Envisioning interconnectivity

In a world of inhabitable and wearable computing, made of wireless connections, smart and transparent interfaces and molecular technologies, interconnectivity[76] will bring us towards a reality composed of multiple and connected space/time, materials and entities. Whereas other technologies will change our body (our genetic, physical and perceptual being), the technology of interconnectivity will change the way in which we experience a new 'natural' environment, the human social world, and the self. Interconnectivity, modifying our relational mode of being, will change the way in which we enactively produce our world and our consciousness.

This paragraph addresses interconnectivity in the light of the scenarios for networked applications enabled by pervasive computing, "environments created when computing power and networked connectivity are embedded in virtually every device humans use"[77]. According to David Messerschmitt[78], networked computing can be summarized in the following three trends:

- mobility (computing anywhere)
- ubiquity (computing everywhere)
- embedding (computing within)

This means that networked computing is becoming more and more pervasive; "unobtrusively sprinkled throughout the physical environment"[79] and increasingly available when and where needed. It means that most everyday products and materials (from appliances to fabrics), and most everyday environments (from home to urban areas) will have computing, network connections and artificial intelligence or artificial life forms within.

Sharp Electronics Corp. has recently announced a convection microwave oven that downloads recipes and automatically sets the time, adjusts the power, and cooks the food. In turn, General Electric has announced a net-connected refrigerator with bar-code based food tracking and reordering capability. As John Thackara ironically says: "Ubiquitous computing spreads intelligence and connectivity to more or less everything. [...] You name it, and someone, sooner or later, will put a chip in it."[80]

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[76] Interconnectivity comes from "interactivity" plus "connectivity". By this word, I mean both the ability to interact with machines, humans, or other thanks to the mediation of networked computers, and the dimension of a continuum of connections and potential interactions.
[77] Agoston, Ueda and Nishimura, 2000, p. 1.
[78] Messerschmitt, 1999.
[79] Ibidem, p. 8.
[80] Thackara, 2000, p. 3.

But pervasive computing is not just about smart appliances and devices. One of the fastest growing industrial sectors in telecommunications is, for example, medical telematics. As John Thackara notes, "pervasive means everywhere, and that includes also our bodies"[81], so much that "the space where 'human' ends, and machine [or software] begins, is becoming blurred."[82]

According to market predictions, between 2005 and 2010 companies will be technically able to make amazing things. But the question is: how will our lives change?

The integration of physical and networked electronic spaces will generate hybrid realities, which will become our habitat. In view of recent developments in scientific and technological research, we may foresee that all areas of our lives will be networked and blurred by pervasive computing: the physical, the biological, the human and the artificial. Reality will be composed of multiple and connected space/time, materials and entities that will engender a more 'populated' social world, while the self and the consciousness will emerge from new and more complex relationships and negotiations.

According to the enactive approach of recent cognitive science[83], we produce our world and our consciousness through our experience, more precisely through our relational embodiment in the environment in which we live. Evan Thompson argues:

[T]he mind does not internally represent an independent external world, but rather it enacts a meaningful world through embodied action. To say that cognition is embodied means that it depends upon the perceptual and motor capacities of our bodies, and is intertwined with the environment.[84]

This means that individual human consciousness is "a relational mode of being of the whole person embedded in the natural environment and the human social world"[85].
If we scientifically state that cognition is an embodied action that has no ultimate foundation or ground beyond its physical, biological and cultural history of relational embodiment, and that consciousness is therefore inherently intersubjective, then we must recognize that pervasive computing is not merely a technological innovation. The impact of the changes produced in our lives by a widespread and finely grained interconnectivity must be responsibly taken into account.

Are the principles of human-computer interaction adopted by the designers and activity modellers of high-tech companies scientifically and historically appropriate to the new trends?

According to Andrew Feenberg, the way in which nowadays technology acquires meaning and significance is due to the interconnections between different technologies in a network that imposes a specific way of life. He calls the work of making these connections "system-congruent design":

The intricately interlocking network or system of technologies appears value-free but in fact inducts us into a normative framework as we adapt to it in our daily activities. The unending chains of dependencies arising out of everything we use, [...] our way of life, our very gestures are programmed by our artefacts with a rigidity that has no precedent. [86]

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[81] Thackara, 2000, pp. 4.
[82] Thackara, 2000, pp. 5.
[83] See Varela, Thompson, and Rosch, 1991 for the original presentation of the theory.
[84] Thompson, 1999, p. 2.
[85] Ibidem.
[86] Feenberg, 1995, p. 228.

It is expected that pervasive computing is going to reinforce and empower old and new interconnections within the network created by "system-congruent design"[87]. In turn, it is likely that "system-congruent design" peculiar to pervasive computing is to model our experience[88] with powerful tools. Looking to the future, reasonable questions arise: to what extent will we have control over the horizons of our daily life? Will we be able to play creatively with the alternative and unknown worlds and ways of being that technology seems to offer to us? If we will, what new ethics will belong with a creativity extended to such a degree?

There is no doubt that we are developing transformational technologies and that pervasive computing and networked-based applications will be a form of social engineering and cultural experimentation. Facing this scenario, the challenge is to define a way of life, not to obtain more goods as in the prevailing socio-economic model[89].

INTERCONNECTIVITY IN ART AND THE AESTHETICS OF USER EXPERIENCE

The aesthetics emerging within interactive arts interestingly outline a design of the 'user experience' that seems to answer some of the concerns expressed in the previous paragraph, particularly those connected to the issues of relational embodiment and intersubjectivity. By enabling new categories of human-computer interaction to be imagined and investigated, the aesthetics of user experience developed within interactive arts come up with fresh and creative new approaches to design, which diverge from the mainstream development of pervasive computing.

In his forthcoming book "The Language of New Media", Lev Manovich argues:

Many new media artworks have what can be called 'an informational dimension', the condition which they share with all new media objects. Their experience includes retrieving, looking at and thinking about quantified data. [...] At the same time, new media artworks have more traditional "experiential" or aesthetic dimensions, which justifies their status as art rather than as information design. These dimensions include a particular configuration of space, time, and surface articulated in the work; a particular sequence of user's activities over time to interact with the work; a particular formal, material and phenomenological user experience.[90]

The analysis of Manovich well examines the aesthetics of user experience elaborated by new media artworks in general. To consider the kind of experience that takes place in art within the dimension of interconnectivity allows me to make a step forward in my argumentation.

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[87] The tendency to cross-industry partnerships between appliance manufacturers and technology companies or the setting up of large groups of producers to develop and establish new standards are clear indications of this phenomenon.

[88] Coherently with the trends of technological development in networked computing, 'experience modelling' or 'experience design' seems to be a major preoccupation of the new economy. Within the field of e-commerce applications, experience design is conceived as the way business will create products and services, "paying careful attention to an individual's entire experience, not simply to his or her expressed needs" (Rick Robinson, Chief Experience Officer, Sapient).

[89] Andrew Feenberg (ibid.) points out the relevance of this goal within the context of a discussion about the definition of new politics of technology. But in the present paper I argue that we miss out a step, if first we do not re-examine the categories of human-computer interaction which current design methodologies are founded on.

[90] Manovich, forthcoming. Excerpt from a preview published on RHIZOME_RAW, 29th January 2000.

Moving from the assumption that every single interactive artwork can be led back to different types of interactivity[91] and different qualities of interaction[92], we may maintain that the 'conditions' designed for the interaction process are evidence of a creative strategy from which the artwork's aesthetics of user experience originates and develops and consequently experimental categories of human-computer interaction as well.

With respect to the dimension of interconnectivity and the types and qualities of interaction that can be adopted in an online interactive artwork, a first and elementary distinction can be made between an interactivity of selection and an interactivity of content.

When the outcome of the interaction of the user is a new web page, an image, a sound or any other class of retrieved information, he or she makes a selection and realizes something that is predetermined and therefore possible[93]. This condition is independent from the range of the selection allowed to the user, that can be a site or in principle the whole Net. But if the user is in the condition to create content, his or her experience is not confined to the choice of an option; of a possible path. The outcome of his or her interaction is not simply the web pages or multimedia files selected and served through the client-server system. In the case of an interactivity of content the user experience, though still depending on the system and interface of the artwork, is undoubtedly much more creative and unpredictable than the experience generated through an interactivity of selection. It is an experience much more 'poietic'[94], rather than aesthetic. Moreover, the more 'subjects'[95] are involved and intertwined in the process of interaction and creation, the more complex the system becomes, and the interface acts and enacts meaningful worlds as agent of virtualization and actualisation, moving us into the heart of creation or into the indeterminate event of being as creation.

Within this strand of development in interactive arts some artists are developing strategies of user experience inspired by ideas of relational embodiment and intersubjectivity. The indeterminacy of the event of creation is moved into the exploration of 'inter-being'. Such 'inter-being' is experienced through networked processes that allow people to grasp the available intersubjectivity and the relations that come about within a place - at the same time physically distributed and interactively connected - where subject and object are relationally embodied into the system. The ways in which subject and object are relationally embodied into the system and put into the condition to interact are different. Creative processes can arise from interpersonal relationships, group relationships, collective mechanisms or any other pattern of relations[96]. Intersubjectivity can be extended to comprehend different realms and different levels of relation[97].

The principles developed by these artists let a relational paradigm in human-computer interaction emerge; one that seems to match the trends illustrated in the previous paragraph and welcome the epistemological shift in our approach to the world claimed by enactive cognitive science. This relational paradigm challenges not only aesthetics and epistemology, but it consequently challenges, pointing out some lines of direction, the

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[91] Cf. Vittadini, 1993. According to Vittadini, we can distinguish two basic types of interactivity: interactivity of selection and interactivity of content. These types of interactivity are explained and developed in the following lines.

[92] The quality of interaction is linked to the extent and the depth of the interaction process.

[93] In this paragraph I mean the difference between possible/real and virtual/actual according to the meaning gave by Gilles Deleuze in *Difference and Repetition* and by Pierre Lévy in *Becoming Virtual*.

[94] 'Poietic' derives from the ancient greek verb 'ποιεω', that means 'to create, to generate'.

[95] From human beings to non-human beings (animals and plants), artificial beings, machines and codes. Here 'subject' is not meant as a pre-established and fixed entity.

[96] For a detailed review of the relational strategies of some online artistic projects: cf. Giaccardi, 1999.

[97] Human-to-human, interspecies, human-to-artificial, artificial-to-artificial and so on.

foundations and the established categories of the discipline of human-computer interaction.

But how can we develop, in the field of human-computer interaction, the paradox of the non-substantial foundation that a relational paradigm seems to insinuate? How can we give this development the scope, depth and complexity suitable to a society that will become more and more pervaded by computing and network connections?

WORKING HYPOTHESIS FOR A NON-SUBSTANTIAL DEVELOPMENT OF HUMAN-COMPUTER INTERACTION AND DESIGN

The reason why I am interested in the philosophy of Nishida Kitarō[98] is the extent to which he thematized the issue of embodiment and the relation of intersubjectivity in the final years of his philosophical career.

Of course the philosophy of Nishida Kitarō is very complex, and I will address just some of his core logics. I apologize in advance if, in this paper, I will refer to these logics without going into the complexity and the historicity of the thought of Nishida Kitarō. Nevertheless, let me draw up a set of working hypotheses, in order to frame the development of pervasive computing and the reassessment of human-computer interaction in the light of the nishidian 'interconnectivity':

I hold that the self is consciously active when it is interactive [...] Self and other, subject and object, are constituted in the individual acts of existential consciousness. These acts are self-originating and yet co-originating, too, as forms of dynamic, reciprocal expression[99].

First working hypothesis: identity.
Nishida's logic of contradictory identity can support the development of a relational paradigm in human-computer interaction on a non-substantial foundation. According to Nishida, self and world are mutually revealed and ontologically constituted. The principle this embodiment - bodily and historical - is grounded on is contradictory as it discloses the codetermining identity of subject and object. The embodiment and the creative interaction from which subject and object originate constitute a system of experiential interrelations; a place of dynamic identities and entities where everything is active and interactive and is therefore non-substantial. Each action (or interaction) is poietic creation (or enaction[100]), and as it is a point of co-origination of subject and object it is also a point of co-origination of space and time.

It is a radically transformational and *event-centred approach* that can let the discipline of human-computer interaction switch off from the tendency to approach computer-mediated interpersonal and social interaction through fixed and reductive schemes. Within the framework that the study of human-computer interaction can gain from this approach, we can start thinking of users as more dynamic and transformative planes of interaction and stop thinking of space-time as a matrix of predefined synchronous or asynchronous spaces and times. Having said that, this is not the occasion to explore which new categories of human-computer interaction can be derived from this theoretical framework[101].

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[98] I want to thank Masaru Yoneyama and Matteo Cestari for having introduced me to Nishida's thought when I was graduate student and I was working to my graduation thesis on the creative interaction on the Web.
[99] Nishida, 1987 [1949], p. 49.
[100] To use the terminology of the cognitive science.
[101] See Giaccardi, forthcoming.

Second working hypothesis: place.
Nishida's logic of place is connected to the logic of contradictory identity. According to Nishida, the dynamically tensional structure of the place from which subject and object, self and other, originate is given at three different levels. Typically Nishida begins with the physical world, which is to him the more causal and therefore less dynamic matrix of interacting forces. He builds up from this level to the biological, and finally to the human (historical and existential) worlds. Each of these "worlds" presupposes and exhibits the contradictory identity of objectivity and subjectivity.

This structural matrix is particularly interesting when considered in the light of pervasive computing. Without comparing the characteristics of the nishidian places to the historical reality of high-tech society (is biological time still irreversible, as Nishida states, in high-tech society? Will it still be?), the multidimensional and transformational ontology elaborated by Nishida is extremely interesting. The adoption and development of the Nishida's structural matrix to think of the 'places' of interactivity mediated by pervasive networking can be, in my opinion, very fruitful.

Curiously, Edward Casey concludes his history of the notion of place from the pre-modernity to the contemporary age setting forth that:

[P]lace is not entitative - as a foundation has to be - but eventmental, something in process, something unconfinable to a thing. Or to a simple location. [...] The primacy of place is not that of the place, much less of this place or a place (not even a very special place) - all these locutions imply place-as-simple-presence - but that of being an event capable of implacing things in many complex manners and to many complex effects. [102]

Third working hypothesis: world-poesis.
Nishida's logic of world-poesis subtends the existential nexus between freedom and creativity. If the scheme subject-object is temporary, as Masaru Yoneyama assumes in his paper on Nishida Kitarō and the Western dualisms, all things are not separated, but become free variations[103]; creative moments of lived experience. According to Nishida, creativity is not unidirectionally oriented from the self to the world, but it is horizon of interaction[104].

The challenge for new approaches to computing and design and for new politics of technology, hopefully for new forms of "pervasive" ethics, is given on such a poietic and indeterminate horizon of interaction and creativity.

CONCLUSION

The elaboration of a non-substantial foundation in the field of human-computer interaction, of a design space based on relational and embodied categories of identity and activity, and on a structural matrix of 'places' of interactivity, can give to the design of interconnectivity the scope, depth and complexity demanded by a society that will become more and more pervaded and made composite by computing and network connections.

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[103] Cf. Yoneyama, 1996.
[104] Cf. Cestari, 1996.

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