New Media Shaping of Perception of Space and Perception of the Body

The Impact of New Media on our Experience of Space and of the Body

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Abstract: The aim of this master thesis is to research human perception of space and of time, as well as of the body, and how digital new media have an influence on it. I believe that digital new media are changing our relational modalities toward space and are altering our sense of time (time as past and present, but also time flow). Among other factors, *presence* and *distance* are at the basis of our time perception, and both are undergoing certain alterations as a consequence of frequent use of digital media. I am particularly interested in how perception of spacetime takes place, and where exactly in the process do new media play a role. By breaking down the different layers of human perception and analyzing them, the work of Brian Massumi offers a very useful starting point for my research. Moreover, to understand how digital media can alter our perception, it is necessary to see technology and the biological human body as one larger network of interrelationships and collaborations. The acknowledgment of unity between biological and nonbiological bodies and the human mind is essential for the understanding of media signals as an "extended proprioceptive experience," and not only an exteroceptive addition to our senses. Since space is not constituted only by exteroceptive stimuli, what we hear, smell or see is just one fragment of our overall perception of space, and as I argue in my thesis it is not even the predominant one. Movement, as I will demonstrate, has become the new mean of exploration and the new subject of study both in philosophy and in the field of media.

In my thesis I also advocate for a larger view of affective and social interactions, which should not be limited to human-to-human and human-to-computer relations. If we apply Bruno Latour's Actor Network Theories to human-machine and human-technology-organisms systems, a number of problematic consideration fall into place by acknowledging that objects and organisms too have agency. The narrow relation that comes to exist between humans and technology cannot be seen as strictly dialogical, but instead as largely networked, where more agents play a role. This principle, if applied in practice, would have great consequences for the field of interface design, and would generate a shift from an interface-centred design to a more multifaceted study of reciprocal interrelations between all agents. In accordance with this reflection, I will

argue that the *Internet of things* is an attainable path for the exploration of yet unknown languages and relational environments. Nevertheless, I will conclude that better ways of exploring these realms focus on qualitative research instead of quantitative mapping, and offer more opportunities for a phenomenological study of the environment. This conclusion comes from the study of the sound based research by Jolande Harris in the field of sonic perception. Besides Harris, the works of Aram Bartholl and Eelco Wagenaar will be examined, to research how artists reflect on and react to the emerging fields of perceptive research as a consequence of the increasing use of digital media and their social effects.

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Introduction

"Perhaps we already are (cyborgs). For we shall be cyborgs not in the merely superficial sense of combining flesh and wires but in the more profound sense of being human-technology symbionts: thinking and reasoning systems whose minds and selves are spread across biological brain and nonbiological circuitry." (Clark 2003: 1)

I am interested in how we human beings perceive the material space that surrounds us and how new digital media alter our experience of space and of the body. Perception of space that is superficially considered as a mainly visual process, has to do with experience, movement, and cross-references between our senses. Therefore, it is not possible to isolate our understanding of spatial perception to a single sense, for example sound or sight. Instead, when analyzing the processes through which humans decode space, researchers should take into account the whole experience of "being" in the space and its complexity, and they should consider the environment as a network of agents, composed by animals and objects, continuously relating to each other. To understand how humans explore space and how we build our interpersonal relationships, it is necessary to recognize the influence that technology[1] exerts on our cognition and affect, through the different sensorial channels that compose our perceptual occurrences, and how new media can so affect our relationship with space and with the body. One of the distinguishing characteristics of the *homo faber*[2] is its use of technology and its will and ability to develop machines that fulfill a function within human activities[3]. What is often underestimated is the power that these machines exert on human cognitive and pre-cognitive processes, imposing their presence as an extension of our biological brain, and the tight intertwinement between their transformations and the evolution of our mind.

These considerations can be applied to a variety of technological implementations, from ancient times to today's latest technique. The human capacity to cooperate with machines of varying complexity that are located outside our biological system does not rely on

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[1] While one could argue that this occurs only in some countries or social context, I am not specifically referring to digital technology or electronics, but to technology in general, that includes all man-made objects that fulfill a function within a social group.

[2] A concept developed in philosophy to describe humans as controlling their environment through tools.

[3] Nevertheless technological development varies among different areas, in relation to economical and socio-political factors.

physical connections between our brain and external circuits, as the cyborg ideal elaborated in the late '90s would portray, but rather on the power of embodiment, virtual immersion (Clark 2003) and affective *experience* (Massumi 2002). The activity of writing, for example, is extremely low tech but at the same time has a very strong cognitive impact, and can reach high levels of engagement in the person who carries out the action[4]. Although this sort of examples can be quite helpful to better understand how we relate to functional objects, from pen and paper to complex machines, in my thesis I will focus more specifically on the influence of digital technology and connectivity on our present experience of space and of others. Virtualization of our daily tasks, as well as of our communication processes, social activity, production, economics and media consumption probably have more impact on our temporal and spatial awareness and sensorial processes than we realize. Not only may our frequent use of new media technology abstract us from our material spacetime conditions and constraint our experience of reality, but also the further integration of new media technology in public and private living spaces might alter our perception of these spaces and of others who are present or absent in the same space. As a matter of fact, this synthesis between physical spaces and new media technology could somehow change our understanding of *presence* and consequently of absence, as well as of location, *distance* (Virilio 1994 & Munster 2006) and of objects' and spaces' functions. Moreover, new media can change our perception of the body and self-image by offering new modalities of "conversation" between space and the body.

In my thesis, I will explore the implications of new media for our experience of space, for our perception of the body in space, and for our consequent perception of the self and the other. Affect and exploration of space are ongoing processes that constantly unfold through our action and presence in space (Massumi 2002), where new media play an increasingly prominent role and interfere with our relation to other objects and persons and our use of objects and spaces. My thesis will consist of two parts: the first part is a theoretical investigation of the idea of space, or better, *spacetime*, virtual space,

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[4] This example is made also by Andy Clark in his book *Natural-born cyborgs: minds, technologies, and the future of human intelligence.*

perception and affect. After briefly defining the perspective on space I have chosen for this research, I will build on Massumi's analysis of *experience* (Massumi 2002) and perception as a process where the body's movement is the pivot, in which Deleuze's postmodern metaphysics has been assimilated, in particular, the concept of virtual and its relation to actual reality and his theorization of *difference* and *identity* (2002: 33). I will first analyze in more depth the relation that the body builds with the surroundings and with objects of use. I will then focus on the dialogical bond that comes to exist between our mind and body and digital media, and how this bond constantly evolves, generating new understandings of distance, location, presence and absence, space and of the body itself. To do so, I will integrate in my analysis Munster's observations on kinaestetic experience generated by virtual reality and digital media (2006) and Clark's reflections on the narrow entanglement between human brains and machines and how their development is reciprocally influenced (2003).

In the second part of my thesis, I will examine a selection of case studies applying the theoretical findings from the first analysis to works of art that reflect on space, objects and the body in relation to each other, where new media technology has been employed in a critical manner and makes the viewer aware of the unfolding relation between the self and space that surrounds it. This second part of my thesis will be divided in three subchapters: the first part will focus on artworks that stimulate vision in the first place. The second part will concentrate on a selection of works that involve use of sound in relation to space and time, and stimulate hearing above other senses. Finally, the last selection of case studies will examine proprioceptive experiences.

With my thesis I aim to investigate how space recognition and *presence* in space change in relation to technology, in particular when the space is altered by the use of new media integrated in architecture or art "outside the white cube." I will attempt to produce a critical constructive analysis on how artists address the possibility of body-space interaction, in order to question our perception and to highlight the yet unexplored possibilities but also incongruence and dangers that are presented by new media technology and their integration in our daily lives and communication processes.

Objects and bodies in space

I will start this chapter by addressing the concept of space. The term space can refer to an extremely broad range of meanings and various contexts. My intention here is not to formulate a perfect definition of space, but to narrow down the characterization of the term *space*, by isolating a specific context and addressing only the aspects that are relevant to my research. To do so, I will start from the general definitions of space that can be found in a dictionary, and address the qualities of space that are interesting with respect to the topic of my thesis. Secondly, I will elaborate on Massumi's theorization of space and body perception, based on a detailed analysis of the working of the human perceptive apparatus. I will then draw a parallel between this analysis and Munster's observations on time and space perception through digital media.

Narrowing down the definition of *space*

The Encyclopedia Britannica defines space as "the boundless, three-dimensional extent in which objects and events occur and have relative position and direction."[5] . This definition, although quite general, is clearly borrowed from physics. However, physicists currently prefer the term "spacetime," which refers to a mathematical model that combines in one continuum the time-dimension with the three space-dimensions used to observe the universe in the mainstream model[6]. In addition to physicists, sociologists and researchers that approach space from the humanities consider it strictly related with time. In his book *The Production of Space* Henri Lefèbvre effectively expresses this sentiment:

> "Space considered in isolation is an empty abstraction; likewise energy and time."
> (Lefebvre 2009: 12)

The somewhat artificial separation between space and time dimensions, that has been introduced to facilitate the study of both, is an abstraction that is an obstacle to a better understanding of the nature of space and time. For instance, time appears to slow down in

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[5] http://www.britannica.com/EBchecked/topic/557313/space (11-08-2010)

[6] Space in physics has been considered separated from time for a long time, while some cultures, like for example the Incas, considered time and space as one entity already.

different spatial conditions. As our perception of time is strictly intertwined with space, we cannot see time but only what happens over time (Kubler 1962: 68).

The inverse is also true: our perception of space happens over time, both short-term through our *movement* in space (and the emergence of *change* from *permanence*) and long-term in the form of *experience*. Earlier this year I, together with my fellow student Sarah Moore, experimented with these perceptive interrelations by producing situations of spatial and operational alienation through constricting ourselves to these situations and by combining them with intrusive use of new media and online participation[7]. Although our personal experience alone cannot be considered as scientific evidence, we witnessed a distortion of our perception of time and reality as a result. For us, this indicates a strict relation between space and time perception.

Space in social studies: mapping human flows
Although the overall definition of the term *space* is borrowed from physics, Lefèbvre criticizes models of spacetime that originate in theoretical physics. Of course his critic refers to social studies of space. I will consider space from a slightly different perspective than that of Lefèbvre, since I am more interested in the study of affect and perceptive experience of space rather than in his theorization of the socio-economic production of space. Nevertheless, Lefèbvre outlines the points of interest for a research on space from the humanities. His main reasons for refusing definitions of space that develop from theoretical physics seems to be the tendency present in physics to unify and reduce, instead of showing the complexity of reality. Applying a model of space that is borrowed from physics to his study of social space would also require the logic of material flows to be employed to outline human actions and interactions. Lefèbvre denies the acceptance of an isomorphism between human and material flows, and therefore is very careful when it comes to interdisciplinary models that refer to space. In this respect, he names Fred Hoyle's theory of energy as a positive model of theoretical physics that is able to approach space in a way that is more useful for social science. According to Hoyle's model, energy flows in every direction, and the existence of a center or a unique

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[7] See http://www.cubinator.nl

source is denied. Hoyle's model of space resembles a rizomatic distribution of equally relevant nodes, through which energy flows from and to any direction. Lefèbvre appreciates that it denies an idea of space originated in the explosion of a center of energy (2009:13).

Virtual space and cyberspace

As much as I need to clarify the use of the term *space* in my thesis in order to avoid confusion, it is also useful to define the term *virtual*, for it has different meanings depending on the context of its use. In addition, the two are often used together, and might refer to very diverse objects of study. It might seem contradictory to speak about virtuality and virtual space in order to better understand research on perception of space, since perception is a bodily experience of material objects and implies a strong physical dimension. However, as I will demonstrate further on, perception unfolds and originates in virtuality.

One of the greatest problems in analyzing space is the difficulty of segregating virtual and actual space. The first reason for this is the acknowledgment that we can never know space as it is, but only as we perceive it. The second reason is that the logical and formal abstractions of space are basically mental, as well as its representation based on sensorial inputs. Even if sensorial perception is physical, it is synthesized and completed by our thought and can be considered a product of our experience rather than something that exists by itself. Many perceptive sensations and a great amount of knowledge that we accumulate through experience in space also remain virtual, and are concretized only occasionally in actions or considerations limited in time, for example in an *event*.

Within media studies, the term *virtual* is generally used to refer to two particular ideas. These are (1) a reproduction of real space (or fantastic space) within a digital environment, as in Second Life or games, but also to (2) an abstract space that exists in our mind, that is deliberately defined as space and consists of virtual thinking processes taking place in a realm that is difficult to materialize or describe objectively, and can be more or less conscious. *Virtual space* also has some associations with the idea of

telepresence[8]. In *telepresence*, we are present with our mind in a virtual "somewhere else" that is not a concrete physical space. In other words, virtual space can be a portion of reality that is not yet materialized, and therefore cannot be entirely perceived.

The association of the two meanings, which are on one hand the digital recreated cyberspace and on the other hand the more philosophical conceptualization of virtual space[9], might lead to a misinterpretation of cyberspace and its effects. The first connotation refers to a representation, a simulation of space, and its digitality by no means produces de-actualization as a result[10]. In Massumi's words:

> "Equating the digital with the virtual confuses the really apparitional with the artificial. It reduces it to a simulation" (Massumi 2002: 137)

As stated by Massumi (2002) and Žižek (2009), saturated digital interactive space that reduces all perception of space to audiovisual experience dictates the path that we will follow and does not leave as much space to fill with our imagination as "non-digital" reality does. In other words, digital space externalizes and actualizes a wide range of possibilities, but never exhausts the potentiality of the virtual. In this respect, Lévy helps clarify the definition of *virtual space*:

> "In scholastic philosophy the virtual is that which has potential rather than actual existence. The virtual tends towards actualization, without undergoing any form of effective or formal concretization." (Lévy 1998: 23)

Therefore cyberspace, which is erroneously associated with "virtual," is an expression of different actualities, instead of a virtualization of reality, since it is a formal concretization of realities. As the inverse process of actualization, virtualization starts with the "processing" of words (Massumi 2002: 138) or other materialities such as space

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[8] Although this concept is somewhat related to virtual presence through media.

[9] This can be found in the study of French philosophers Gilles Deleuze and Pierre Levy.

[10] Actualization is seen in philosophy as the opposite of virtualization.

through sensation, where objects and signs become "figures of speech and thoughts." Virtuality exists, even if not in concrete form, at a deeper level of reality, but it can never be perceived except through its actualizations or effects[11]. Nevertheless it is this unperceivable element that can never be grasped in his entirety, and that makes the experience of reality so rich:

> "[...] What brings about the "loss of reality" in cyberspace is not its emptiness (the fact that it is lacking with respect to the fullness of the real presence) but, on the contrary, its very excessive fullness (the potential abolition of the dimension of symbolic virtuality)." (Žižek 2009: 155)

Here Žižek summarizes well his statement on cyberspace in relation to virtuality, actuality and freedom. According to Žižek, the limits of the actual are freer than the manifestation of infinite possibilities in cyberspace, since the actual admits the existence of virtuality. Furthermore, according to Žižek, the attempt to externalize in cyberspace all unrealized possibilities of reality is a symptom of fear of the limits imposed by reality itself. During my case studies of artworks, I will elaborate on the relation between cyberspace and virtuality, in relation to the renegotiation of space-body relations[12].

Actor-network theory of social space

By analyzing space, intended here to mean our living environment, we should never forget that human perception and reason is but one facet of reality, especially when our study begins with literary description of these spaces as Lefèbvre suggests. It is possible to argue that what the individual perceives is what is relevant to him, but taking this assumption into account as if it were reality has its risks. First of all, perception is not the same for every species[13], and second, even among humans there are relevant differences.

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[11] In a recent blogpost, published during the seminar Scopic Regimes, I mentioned more examples to argue this approach to virtuality in relation to digital technology: http://scopicregimesvirtuality.wordpress.com/2010/03/03/digital-media-and-the-renegotiation-of-space-and-time/

[12] I will do so through an analysis of Bartholl's piece *Sandbox Berlin* (ch. 4: case studies).

[13] I will expand on this point in the section dedicated to the case studies, through the sound-based research by Yolande Harris.

Physical characteristics as well as cultural and technological conditions have great influence on our perception. Other actors that are active in one's "perceptive" network play an utterly important role. In studying space, human beings should therefore not put themselves in the center of the system. Rather they should consider themselves as parts of a bigger networked environment, where every actor influences all the other elements[14]. Living organisms and objects alike have properties that act upon other actors[15]. In addition, material and semiotic networks do not exist as separated realms, but instead act upon each other. This idea is central to Bruno Latour's actor-network theory (ANT). In *Reassembling the Social: an Introduction to Actor-network-theory*, Latour explains what meaning of *social* is enforced within ANT studies. Latour clarifies how ANT is relevant to contemporary social studies and to my research on perception of space and of the body:

> "For ANT, as we now understand, the definition of the term (social) is different: it doesn't designate a domain of reality or some particular item, but rather is the name of a movement, a displacement, a transformation, a translation, an enrollment. It is an association between entities which are in no way recognizable as being social in the ordinary manner, except during the brief moment when they are reshuffled together." (Latour 2007: 64)

Lefèbvre's analysis on the definition of space, and so his approach to the study of social space as well bears resemblances to ANT. In particular, Lefèbvre's notion of different levels of space (the *physical*, the *mental* and the *social*) indicates his desire to produce an analysis of space that overcomes the separation between semiotics and material.

> " The fields we are concerned with are, first, the *physical* – nature, the Cosmos; secondly, the *mental*, including logical and formal abstractions; and thirdly, the *social*. In other words, we are concerned with logico-epistemological space, the space of social practices, the space occupied by sensory phenomena, including

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[14] This theme is being explored by Harris as well. See ch. 4; *Sound*.

[15] For instance, the *Object Research Lab* experiments with objects' properties: http://objectresearchlab.wordpress.com/

products of the imagination such as projects and projections, symbols and utopia."
(Lefèbvre 2009: 11-12)

Lefèbvre also explicitly argues that the separation of these different domains that together produce space is corrupting the study of space as such[16] and enlarging the fracture that already exists between the theory of space and its social reality. Lefèbvre suggests that the city, as a social space, should be taken as the starting point to research real space and he refuses all philosophical models as a point of departure, in particular mathematical models such as the Cartesian one that reduce space to one homogeneous property. Lefèbvre's perspective implies that cities and social space are the only real and relevant space to research. This implies that space created by humans is somehow more valuable than space as it exists before or beyond humans. Conversely, his ideas could also be seen as an acknowledgement of the complexity of a reality that can never be grasped by our perception and logic. According to Lefèbvre, space that has not been planned or rendered functional by social behavior still becomes a product of society. For example, we can think of all territories that have not been "chosen" to be part of our architectures, but also of the separation between city and countryside, where space that is left without a function becomes a byproduct of society. Even if we focus only on urban environments, it is worthwhile to take into consideration what Saskia Sassen calls the *non-places*[17]. These places are "left-overs" between architectures, spaces that have no function, corners between buildings, squares, and under bridges. These considerations of urban space and architecture also function as a trigger for reflection about the relation between space and technology, for what is shaped by humans (also cities and other spaces) is technology, and technology respectively shapes space, which in the end plays a role in the formation of human perception. Space that appears natural today is therefore always produced by humans because the use of space, its separations and its delimitations are results of socio-economic processes.

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[16] For him, real space is social space.

[17] http://www.skor.nl/artefact-2829-en.html (6-8-2010)

Lefèbvre analyzes space on three different levels: *spatial pratice*, *representation of space* (signs and code, language) and *representational space* (complex symbolism, art). He seems to ascribe more relevance to the first, which is the consideration of space in accordance with its functions and the skills and knowledge that we have to bring into play in order to act in it. However, space possesses other proprieties that act on our perception, like form, color, texture, dimension, distances, sounds, temperature, time and so on, that are not related to their functions or to our skills to use them. In most cases we identify a space with activities and functions that are commonly associated with it, for example, food preparation with the kitchen. We do not need to establish this connection every single time because it has been stored in our experience of living space. Together with its functions the kitchen also contains social, political and economical references, which shape and are shaped by the social use that we in the Western world make of the kitchen, and its value as a good of consumption. Our kitchen has other qualities too that are not connected to its function per se and are not considered of sufficient value in Lefèbvre's analysis. These qualities, such as colors, smell, its position in our house, the sounds that we can hear from a specific location, its time, and its aesthetics, are not entirely a priori but are partly shaped by other agents in the network and their relations. Even though we generally do not observe these qualities on a conscious level[18], they certainly influence our experience of that specific space and all spaces that somehow relate to it. Lefèbvre discards this kind of analysis as formal instead of dialectical. But formal characteristics of space shape and are shaped by our perception and ideas of space itself, in a dialog between our senses and signals from the environment. Therefore these qualities should constitute a significant part of the study of space. Architect and artist Gordon Matta-Clark questioned our perception of strongly *skilled* spaces such as "the house," by deconstructing their function. Reactions to his work *Splitting: Four Corners, 322 Humphrey Street, Englewood, New Jersey* (1974) reveal the strong relation that exists between the kinesthetic experience of space at the level of perception and the ideas and concepts related to it at the level of practice.

> "The insides were like a chasm opening up the earth at your feet. Realizing that a house is home, shelter, safety – knowing what a house is – is one thing. Being in

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[18] Except for the first times that we enter a new space.

that house made you feel like you were entering another state. Schizophrenia, the earth's fragility, and full of wonder." Susan Rothenberg (Stiles & Selz 1996: 558)

"After it had been cut, I felt nervous being in the house. I thought it would collapse at any minute. I really didn't enjoy being in it, though I loved the way it looked from the outside, and I liked standing back and looking at it." Horace Solomon[19]

The body and the senses: the perception of space

While an utter and precise definition of such wide terms as *space* or *spacetime* can by no means be formulated here, I aim to deepen the reflection on our modalities of perception in space, and how they can be altered by the technology of digital media. Rather than Lefèbvre, who focuses his research on social space and the political and economical implication of its production, Massumi is more interested in our perception of space over time, and in the way we experience real space, as well as in the relations between *virtual space* and its multiple actualizations that result in perceived space. Massumi does not state that empirical experience alone can provide knowledge about how things are. Instead, he investigates how each person, immersed in his virtuality, produces an experience of reality, one actualization out of the infinite possibilities that reality offers, and how this experience becomes that individual's reality. Furthermore, Massumi distinguishes empirical investigation from *sensation*. He is thus not so much concerned with the scientific empirical investigation of reality, but rather with *sensation* that is "matter in analog mode" (2002: 135). While sensation allows us to approach the possible and the potential, we can never grasp the virtual in the same way. The virtual remains unperceived; the actual on the contrary, is what we can see. As Massumi states, vision is always the production of our affect:

"Paradoxically, it is only the unperceived that can in any sense be argued to be given. What is actually seen is productively added to it: *overseen*." (Massumi 2002: 155)

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[19] http://www.mattaclarking.co.uk/ (13-08-2010)

Massumi deconstructs the experience of space through human cross-referencing senses, movement in space and experience over time.

Cross-referencing exteroceptive, proprioceptive and interoceptive senses and the role of experience

> "Every attentive activity occurs in a synesthetic field of sensation that implicates all the sense modalities in incipient perception, and is itself implicated in self-referential action." (Massumi 2002: 140)

Massumi illustrates how three different layered levels of sensorial perception act in our body to produce our experience of reality. He calls these three levels the exteroceptive senses, proprioception and interoception. Exteroceptive senses are vision, hearing, touch, taste and smell; proprioception, observes Massumi, "translates the exertion and ease of the body's encounters with objects into a muscular memory of relationality" (2002: 59), while interoception, also called visceral perception "immediately registers excitations gathered by the five exteroceptive senses even before they are fully processed by the brain." (60). These three different layers also correspond to three different sorts of subject-object relations. While exteroceptive senses relate to objects and space in a more unidirectional way, proprioception represents for Massumi the spatiality of the "body without an image" (2002: 57) and interoception its temporality. While movement has to be interrupted in order to be captured by the eye, and so it becomes image, proprioceptive sensitivity comes to exist through movement and is therefore nearer to the virtual space that exists between the actual past and the actual future, where the body "becomes." This is called by Massumi an *event*, and is characterized by pure relationality and is full of potential and transformative energy. Viscerality, that is interoceptive, relates more to time than to space since it is the perception of *suspense* that breaks the process of action-reaction during which the input from our senses is elaborated by our brain and becomes spatially identified.

Massumi identifies experience as an important constituent of our perceptive apparatus in different ways. Our vision and our perception of space rely on past experience of the same signals. Experience is a indispensable ingredient of perception, for "there is no "raw" perception. All perception is rehearsed."(Massumi 2002: 66). We tend to think that intensity of perception, or the degree of its effects are inversely proportional to its grounding in our experience. Massumi states the exact contrary: the more intense is our perceptive experience, the more it refers to our past, because it educes different layers or facets of related experiences. These layers do not become concretized until an event recalls them.

Cross-referencing exteroceptive senses

To illustrate the functioning of our perceptive system, Massumi uses a number of examples of experiments that had been conducted in the past to research how our exteroceptive senses work together to constitute our perception of space and of our body. Though these experiments have been carried out for different purposes, for including attempts to prove the existence of telepathy[20], they provide valuable material for the analysis of our physical perception of form and space. The Gestalt effect referred to the form-forming capability of our senses, specifically with respect to the visual recognition of figures and whole forms instead of just a collection of simple lines and curves. According to the results of these experiments, every sense functioned poorly when isolated from input from other sensory channels. For example, the isolation of vision under specific circumstances could lead to hallucinations, with participants in the experiment unable to describe the color, shape, and dimensionality of the images they saw. They also experienced trouble maintaining body balance after the experiment. Therefore, the researchers concluded that the form-creating capability of our brain theorized in Gestalt psychology relies on the cross-referencing activities of our senses and our proprioception[21].

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[20] See Ganzfeld experiments.

[21] Another example named by Massumi is the one of a pilot having trouble orienting after having his seat anesthetized. In this case the lack of muscular orientation in space influenced the ability of the pilot to orient in space, even with full visual (and exteroceptive) sensitivity.

The cognition of reality through change and movement

Perception of space has a narrow connection with self-image and body awareness. This becomes clearer in Massumi's analysis of the different layers that do not only include our exteroceptive senses, but also muscular and visceral bodily sensitiveness. It is through movement and variation in movement that the body reaches the understanding of what is inside and outside, what is a unit and what is not. The reason for that as argued by Massumi is the ontological pre-existence of *movement* and *change* to fixity and *permanence*. In fact, perception of permanence and fixity is the result of a very low change rate in movement. Change rate in movement is the discriminating variable that allows us to distinguish permanence from movement. Although everything is in constant motion, "permanence" presents a very low change rate and therefore movement in it is almost unperceived.

> "The way we orient is more like a tropism (tendency plus habit) than a cognition (visual form plus configuration)." (Massumi 2002: 180)

This sentence encloses the essence of Massumi's analysis of perception. To Massumi, proprioceptive perception, although less recognized on a self-conscious level than exteroceptive sensorial signals, plays an incredibly important role in our activity of measuring and decoding space. Over time, proprioceptive exploration of space builds up our experience, even when, and probably because, it does not become a piece of information that has been explicitly elaborated by our brain and logically allocated in space. Proprioception and interoception produce our in- and outside, our habits and our tendencies in space. Rhythms of movement in space registered on a proprioceptive level seem to constitute more effective references for our brain than visual orientation.

The sensory fold: philosophy of perception and the media

> "What we feel as our ordinary everyday embodiment is only one actualization of intersecting sensory and proprioceptive virtuality, concretized over a period of time into habits and recognizable rhythms" (Munster 2006: 115)

In this statement Anna Munster explains how immersive virtual environments can challenge our body and space awareness by altering the "recognizable rhythms" that we learn over time. In her book *Materializing New Media: Embodiment in Information Aesthetics* (2006) Munster explores the complex relations that exist between actuality and virtuality, and how actual experience emerges from the ungraspable virtual, through movement and perception. She refers to Leibniz's mathematics and to his baroque idea of a vibrating world that is partially captured by human perception. Leibniz's idea of vibrating continuous change, and his conjunction of "marginal perceptions" with "moments of illumination and clarity" constitutes a break with the strict Cartesian distinction, within affect, between confused sensations and clarity of reasons (Munster 2006: 42). Despite his use of a different terminology, Leibniz already saw the distinction between virtual and actual, by stating that the "material soul," or our perception is able to qualitatively discern one particular aural experience from the variety of "infinite variation" (2006: 42) that exists. His understanding of human perception of space closely resembles Massumi's study of perceptive layers, culminating in the *event*. Munster takes Leibniz as a starting point for her introduction of the concept of *fold,* writing that:

> "The baroque universe of Leibnizian perception is one of vibrating events and murmurs impacting upon one another, one in which distinction occurs as a result of bodies contracting particular and clear perceptions into their local spheres." (Munster 2006: 42)

The *fold* described by Munster constitutes the interaction between the separated though intertwined levels or moments of perception and sensation. For Leibniz, these two separated moments are not a unit, but take place in a continuum and do not differ in value since they depend on each other. This point is essential to Munster's analysis of perception. She evokes Massumi's topology in the metaphor of the fold to explain how our experience of reality emerges from the virtual. Here Massumi in turn clearly refers to Deleuze's metaphysics, which describe the virtual as an *internal difference* opposed to difference inferred from formal categories (Deleuze 2003: 32), which reveals itself

through *actual experience* in a constant process of folding and unfolding. *Being* in Deleuze is described as a process, where differentiation is the essential experience. No unified being can be revealed through experience, but experience itself is *monistic*.

> "It is not a question of this or that place on earth, or of a given moment in history, still less of this or that category of thought. It is a question of a model that is perpetually in construction or collapsing, and of a process that is perpetually prolonging itself, breaking off and starting up again."(Deleuze & Guattari 1987: 20)

The ontological shift from sign to topology

To understand movement in space, to grasp change and transformation and to *see* one's body in space has been a theoretical and artistic endeavor for a long time. Massumi explains it with the impossibility of capturing his own movement with the eyes without stopping it and so making it turn into an image. Munster abstracts the idea of movement by describing it as a *fold,* something that brings two entities together and separates them at the same time. But what is it that we seek to capture? From Leibniz to Munster, through postwar French philosophy, the study of photographic images and the architectural shift in the 70's and 80's, we became more interested in movement and potential transformation instead of fixed images. Munster also identifies this tendency both in architecture and philosophy (Munster 2006: 53). However, it does not concern buildings and moving images only, it also reflects on human perception of the body. Our identity and our self-image is increasingly defined by changes and in-folding experience, instead of by permanent attributes and fixed images. While Munster refers in her book to Leibniz's theory of perception, outlining the path that philosophers have taken towards the understanding of space and human perception, we observe that media of representation like photography and video have facilitated the study of our body through the investigation of movement in space[22]. By looking at himself in a videotaped *event*

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[22] This interests also Paul Virilio (1994).

actor Ronald Reagan, for the first time, does not recognize himself in the scene he is acting[23].

This tendency, whose starting point Munster identifies in the break between classic and baroque for what concerns philosophy, took over in the media in the 19th century[24], when Eadweard Muybridge realized a several number of photographic plates as part of a study on animal locomotion, during which he analyzed the movement of (also human) animals (see fig.1).
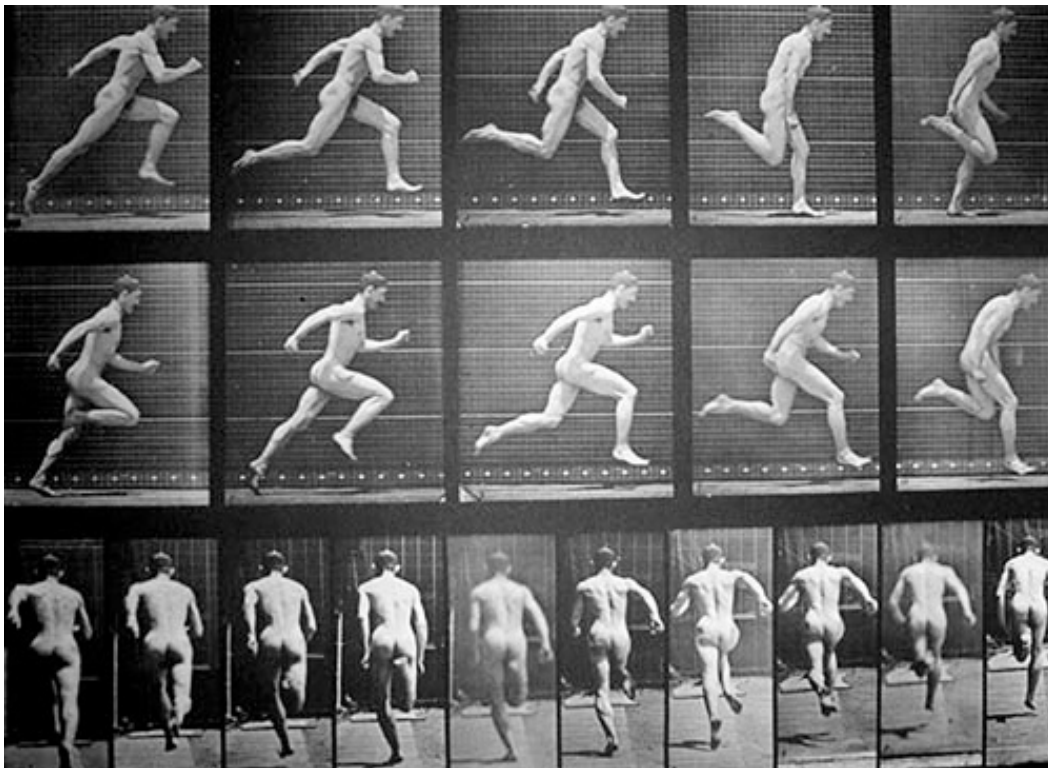
Fig. 1, Man running by Eadweard Muybridge (1880)

Muybridge is considered the pioneer of motion pictures, but what his work represents is more than a mere technological step forward from fixed image to film. He was the first photographer able to capture bright images of a moving animal, which show in sequence

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[23] Brian Massumi explain this example in detail and uses it to illustrate his theorization on the perceptive *experience* (2002: ch. 2).
[24] Other attempts to create a moving image such as the invention of the magic lantern were more related to magic illusion and the supernatural, and less to a study of movement and of the body.

changes in position over a very short period of time. From that moment, it was possible to observe human body from a different perspective. Muybridge was able to depict the body performing one single action, simultaneously photographed from different perspectives. A very fast movement could be deconstructed by analyzing the frame of each instant. This new fashion of representing and so looking at the body and movement probably played a significant role in the successive evolution of media of entertainment and communication, but also in other domains like urban architecture, technological experimentation, science and philosophy. In this respect, it is helpful to repeat that Munster and Massumi observe today a shift in our focus from "position" or "sign" to "topology"[25]. A greater contemplation of evolution instead of the static image also manifests in digital media and in the way we deal with information. Information in new media is no longer classified according to fixed ontologies. Instead it is distributed and networked, changeable and constantly rearranging itself according to its use. We often confer more value on the novelty of information and its ephemeral relevance, than on reliability and preservation. This system relies on user-generated data such as tag clouds and data mining, and bases its information retrieval on *folksonomies* (Flew 2008: 19). We lose interest in signs and we move our attention to their topology (Massumi 1998). This new behavior towards information is at the same time a consequence and the generator of a concept of truth that is predicted on change and interactions between actors within a network. Within social studies, this idea is confirmed by Latour's ANT.

Actual, virtual, and the infra-empirical space
The tendencies that I described in this chapter are interrelated and can be interpreted as a step forward toward the investigation of reality, a "next move" in exploring the reality of things, rather than just another way of organizing information. Trying to grasp movement and the changing nature of things is not solely a rejection of the modern ideals of knowledge and progress. This new way of interpreting reality offers a possibility to acknowledge that the virtual is part of the real, and can never be fully understood or perceived. A result of this ontological view is not only the denial of absolute knowledge, but the acceptance of a reality that is more complex and manifold than we can ever

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[25] The term *topology* is used here to indicate the continuous deformations of objects.

comprehend. As a matter of fact, the opposites *virtuality* and *actuality* refer to the multifold complexity of reality that we can never perceive at once, and the singular concrete experience that we are able to encounter and conceive. As mentioned above, what we see is an addition to reality (Massumi 2002:155). This would mean that what we perceive as real is a product of the encounter between the flow of sensation and our body moving and acting in it. Vision, he argues, gives back more than what is actually given in the first place and at the same time excludes all other possibilities by producing one single actual experience of reality. So, the *real* in its totality is somehow impossible to grasp. I argue that what we see, hear, or taste might be considered as a *hyperreality*, because it is never only what is, rather what we think it is, and therefore it varies from context to context, from time to time and from person to person. Consequently, if we relate Massumi's idea of *overseen* to the concept of *hyperreality* as theorized by Baudrillard, we could see the latter is the result of the propagation of these multiple *overseen* actualities, dressed up as real objective representation of what *is*. Although Massumi and Baudrillard's two studies arise from two distinct areas of inquiry and belong to two different levels of interpretation, they become related to each other through the role of new media in our perception of reality. Baudrillard's *hyperreality* is based on how our consciousness can be shaped or at least influenced by different media. Massumi offers a useful model to identify where exactly in the process new media act on our perception, where it is not only a bodily experience but also a cultural one.

What is the relevance of these observations to our perception of space and to our relation to the body today? In my opinion, in our predominantly visual culture it is necessary to reflect on the sensorial interconnections demonstrated by Gestalt psychology and exhumed by Massumi. This field of thought draws our attention to the entire body as a perceptive entity, instead of focusing only on visuality. This concerns the realm of the media, but also architecture, art and other cultural domains.

Massumi brings us a step beyond Gestalt psychology by highlighting the role of proprioception and interoception, and so offering a different interpretation of perception as distributed over interacting layers rather than centrally synthesized by the brain.

Moreover, with his reflection on human perception Massumi addresses the subject-object relation between spacetime and the body, and adds new depth to the discourse on virtual vs. actual reality. Experiments realized in the context of the Gestalt psychology have shown that even when we seem to rely on one of our senses alone, or on one of the layers that constitute our perceptive experience, for example vision or sound, the rest of our body is also actively shaping our perception of what we see, and is building up experience and storing information that will eventually be used again in other situations that relate to the current sensory episode. Massumi uses these somewhat outdated observations to reflect on how actual experience emerges from the virtual. Proprioception and interoception affect our actual experience of reality in addition to the complex relations that take place between exteroceptive states. So, movement becomes an essential element of our perception, because through movement actuality emerges. Moreover, the role of memory and experience define the intensity of perception, for the *event* is enriched the more it is stratified. In the quote below, the interplay between body and spacetime is described as a powerful accumulation of the virtual. Here the *fold* described by Munster appears in its greater complexity, produced among others by the back and forward oscillation between actual experience and suspension of spacetime, a gap that Massumi also calls the *infra-empirical space*.

> "The body without an image is an accumulation of relative perspectives and the passages between them, an additive space of utter receptivity retaining and combining past movements, in intensity, extracted from their actual terms. […] In its spatial aspect, the body without an image is the involution of subject-object relations into the body of the observer and of that body into itself." (Massumi 2002: 57)

Different perspectives of the body, both as subject and object[26] and what exists in between, accumulate over each other. Still, they remain separated. This accumulative experience creates a new spacetime, where the body is neither subject nor object, because

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[26] It is almost impossible to avoid the parallel with Muybridge's multiple simultaneous perspective of the human body that becomes explicit here. Massumi's *body without an image* could be seen as an evolution of a research domain that has been initiated more than a century ago.

all the distinct moments of actuality relate to each other instead of relating to the actual reality that produced them. The process of transformation in the body without an image *becomes* in a spatiality that is only its own; Massumi calls it also *incorporeal interval of change*, the *event* (2002: 57).

New media technology today constitutes a significant portion of our experience of the world and of the activities that our body performs on a regular basis. Therefore, new media interfere in the dialogical relation that we constantly maintain and adjust with the sensorial flow produced by the environment and with ourselves, through our senses, our proprioception and our visceral experience. New media have evidently changed our behavior in physical space, while technology has always played an important role in our cognitive process[27] (Heim 1993). Technology can be seen as an extension of our body, mostly functioning as a supporting agent during the completion of a given task[28]. For instance, technology has shortened distances while we travel or communicate; it has filled our homes with material goods and lightened the load of daily tasks. In order to integrate technology in our lives we have adjusted our bodies, adapted and refined our skills and learned to cooperate with machines. In the technological landscape, new digital media are mostly considered to be two-dimensional, concentrated on the auditory and visual channels. However, their presence in space and their influence on our body cannot be excluded from the user experience. Proprioceptive sensations of the body lying or sitting, hands typing or scrolling, temperature, amount of movement, smell and taste and their lack thereof, even visceral reaction to remediated signals become part of the experience and affect our performance even if we are not fully aware of it. Some of the basic relations between the senses, as described by Massumi (2002) and by Gestalt psychology before him, might be weakened or altered by the digital re-mediation of reality that we experience today, thus upsetting our functioning in space. But more importantly, what role do the media play in the process of unfolding actualities? What is their place in the *infra-empirical space*? Do the media make this process more or less

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[27] I am not stating that technology shapes society more than society shapes technology. Since it is clear that technology is produced by humans, with this affirmation I want to draw my attention to the less evident inverse process. Technology too has a part in shaping human behavior and cognition.

[28] Although it has been often considered as opposed to human nature (Heim 1993: 60-61).

evident? Do they constitute an obstacle or accelerator of this process? And how does this affect our experience of space and time, and our self-image?

Mind outside the skull: sensation through digital media

In the second chapter I have argued how human perception of space is mainly based on movement in space through our proprioception, interoception and cross-referential exteroceptive senses, founding my argument on Massumi's analysis of perception and on Munster's observations on topological cognitive processes embodied in the image of the *fold*. In this chapter, I will reflect on these elements in relation to new media, and I will research how new media interfere with our perception of space and time, and the perception of the self. To do so, I will start by explaining the term *hauntology* and three different interpretations of it by three different theorists, starting with its inventor, Jaques Derrida. I will then introduce Clark's theorization of the *native cyborg.* In order to apply this idea in practice I will illustrate a number of spacetime perceptive alterations that are generated by frequent use of new media. To conclude this chapter on the intertwinement between humans and technology, in particular digital media, I will draw a parallel between ANT and the *Internet of things,* a future scenario that would connect everyday objects in a network of radio signals and digital information-sharing.

Different interpretations of the term *hauntology*: social and affective media presence
Hauntology is a neologism coined by Jaques Derrida in 1993 as a politico-philosophical concept (Derrida 1994). *Hauntology* is a combination of the words "haunting" and "ontology." It refers to ghosts in that they represent a particular state of presence in non-existence. According to Derrida, the ghost haunting the present is first of all cultural, impossible to define or to escape, and only possible to approach through indirect references. He created another neologism to describe this occurrence: *differánce* (Derrida 1978). *Differánce* is a word that means "to defer" and "to differ." It is an apt description of *hauntology*: something that exists but does not exist, that cannot be grasped but can only be referred to through cultural signs.

The similarities between Derrida's *hauntology* and Massumi's definition of the virtual cannot be disregarded. Massumi also speaks of virtuality as something that can never be captured; it can only exist between one image and the next one in a movement that cannot be perceived, other than through a sign referring to it, or in the form of an effect that can be felt. The main difference between the two theories is, in my opinion, their background

and their area of study. Derrida is concerned with socio-cultural structures and how these can determine the future and be influenced by the past. Massumi instead dedicates his research to the study of space, architecture and the media, first on a pre-cognitive level before than social. Still, the two philosophers seem to have a common ground. In particular they acknowledge a complexity that can never be fully captured: the origin of effects that we experience as reality, which are actual experiences for Massumi and structures for Derrida.

Hauntology and telepresence: new media and experience of spacetime
Tom Boellstorff uses the term *hauntology* in his analysis of digitally recreated environments such as Second Life, where he conducts ethnographic research on online social networks (2008). In his book, Boellstorff brings the behavioral and software-related practices that he observes to a higher level by subjecting them to a deeper theoretical analysis through the conceptualization of *telepresence* and *hauntology*. In this case though, the term "presence" partly loses its original connotation, and is applied to the idea of *telepresence*, defining the possibility and actual occurrence of a "switch of reality." What Boellstroff describes as *hauntology* is the degree of presence in one or another reality, in this case either the "real world" or the digital realm. He observes that we always choose to "be" in one or another reality, not only when it comes to the choice between cyberspace and "real space," but also because every moment we could be present or absent with our mind in the same place or situation in which we are physically immersed. In Boelstroff's understanding of the term, "haunting" refers to the invisible presence of our consciousness in our body, or in another body when we decide to occupy it. In other words, it not only refers to the real versus cyberspace debate, but to a variety of ontological modalities that we experience. This was not the original definition of the term, as Derrida explicitly excluded the idea of presence from its meaning:

> "To haunt does not mean to be present, and it is necessary to introduce haunting into the very construction of a concept. Of every concept, beginning with the concepts of being and time. That is what we would be calling here a hauntology.

Ontology opposes it only in a movement of exorcism. Ontology is a conjuration."
(Derrida 1994: 161)

Derrida's connotation goes deeper than the haunting of bodies and spaces by the human mind. It is reality in its complexity and elusiveness, which is virtual reality as we know it. Therefore he does not speak about presence, but about being, because reality is not present, it just *is*. Nevertheless, the relevance of Boellstorff's connotation of the term, which relates to presence, cannot be underestimated. Boellstorff re-interprets *hauntology* from a different perspective, starting from the study of communities and personal engagement of the participants of cyber communities, in particular Second Life. By using this specific term, Boellstorff distances himself from body/ mind dualism and aims to offer a more complex and subtle description of *presence*.

When we connect *telepresence* with Massumi's unfolding of the actual through movement and proprioceptive experience, we can reflect on whether it is necessary to be "present" with our mind to fully experience space through the body, and to what extent mental presence would change the intensity of the experience. Probably, the human body would "record" the experience in space through our exteroceptive senses and proprioception, with no need for full presence of mind. Otherwise experiencing space the way we normally do would require full consciousness of every performed action in every situation. But a lower degree of engagement in the action might certainly affect the intensity and the quality of the experience of space.

In this respect, especially in accordance with Boellstorff's analysis of cyberspace, we could reflect on the role that the media play for our capacity and opportunity to fully experience space. Our exploration of reality becomes progressively mediated, abstracted from physical space, confined to few actual locations and simultaneously multiplied in new experiences to which we gain virtual access. This results in a "colonization" of our time by activities whose relevance and value are debatable (Virilio 1997), such as surfing the web, jumping from one website to another, or from one chat window to another. Since time and space perception are intimately related to each other (Kubler 1962;

Massumi 2002; Munster 2006; Virilio 1994), our new uses of time and its relation to the space that we occupy shapes a new concept of the world based on the disappearance of distances and the absence of a "journey" despite the increasing importance that we accord to the destination (Virilio 1994).

> "Lastly, *paradoxical logic* emerges when the real-time image dominates the thing represented, real time subsequently prevailing over real space, virtuality dominating actuality and turning the very concept of reality on its head. Whence the crisis in traditional forms of public representation (graphics, photography, cinema..) to the great advantage of presentation, of a *paradoxical presence,* the long-stance telepresence of the object or being which provides their very existence, here and now." (Virilio 1994: 63-64)

Telepresence through new media might be seen as an instance of the disjointedness of the mind from the body. We constantly struggle to build new spacetime relations[29] in order to establish a junction between what our body is feeling through proprioception and what we are experiencing on a interoceptive and exteroceptive level and on the level of communication. A simple instance of it is the experience of walking on the street while listening to a non-diegetic sound such as music or while engaging in a conversation in chat session or on a smartphone. Annet Dekker (2009) observed that the use of mobile devices facilitates isolation in a private space, which is at the same time immersed in public space.

> "Advanced mobile phones with integrated MP3 players allow people to move through cities with headphones on, thereby distancing themselves from what is going on around them. […] (With the arrival of modern mobile communication devices) while being in contact with distant others, people are distancing themselves from the people around them. These long-distances conversations that are made with portable phones reinforce the privatization of public space." (Dekker, in *Urban Screens Reader*: 225)

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[29] This assumption is also based on the case study called *The walking piece*, by Jolande Harris.

She presents a short analysis on how new portable media from the walkman to the smartphone renegotiate the burdens between private and public space. Despite the social relevance of this observation, there is still a missing layer that is more interesting with respect to affect and space perception mediated or interfered by new media, one must acknowledge the effect of mixed signals from the medium in use and from the environment around us, and how they merge together to unfold in an actual experience. Further on, assuming that every lived actuality becomes part of our *experience*, and so defines our perception of spacetime, I will explore how a distorted, non-diegetic experience of the environment influences our future experience of space, time and the body.

Haunted media and the flow of consciousness
Jeffrey Sconce's re-use of the term *hauntology* focuses on the role of media and their existence through history, and on how their presence shapes and is shaped by our culture, introducing yet another facet of the term. In Sconce's analysis on the electronic presence of media in society through history, it is in particular "media metaphysics" that interest him. In Sconce's view, media presence through history is a social construct that constantly evolves. At the same time, the almost religious value that society attributes to the media and the different metaphors that have been used to speak about media, cause us to adjust our perception and understanding of the world according to the electronic media that are so prominently present in our lives. Sconce describes in his book *Haunted Media: Electronic Presence from Telegraphy to Television* the sentient qualities that have been associated with television and later the computer, and how these qualities of liveliness, intimacy and presence might result from the continuous *flux* of moving images, sound and information that comes out of these media.

Sconce observes how the image of a *flow* has been used to (1) describe human thinking processes and affect, (2) represent electricity, also called "current" and (3) define information that is distributed through the media. The affinities between these three

elements, also produced by socially generated images of them, is one of the most influential elements at the origins of media metaphysics, according to Sconce:

> " In the more fantastic discourses of presence[30], these varieties of flow frequently appear as interrelated and interdependent, casting the media and the audience as an interwoven and at times undifferentiated complex of electricity, consciousness and textual data." (Sconce, 2000: 8)

Sconce is clearly very critical of the imagery that has emerged around electronic media, and sees it as a result of a deliberate cultural representation of human perception, electricity and information. I think instead that what Sconce observes is just one of the aspects of the ontological shift that I have described in the second chapter of my thesis. The "creation" of the image of the flow has not been deliberately introduced out of the blue: the philosophic shift and technological advances in photography and moving images cannot be radically taken apart. In the same way that information can no longer be classified in strict Aristotelian compartments, where every bit of knowledge belongs to one class and not to all other classes, ontologies have become more fluid. The different phases of human thinking processes are understood to emerge from a flow of *differentiation* (Derrida 1978) instead of being seen as isolated and identifiable progressive steps.

Sconce's interpretation of *hauntology* refers to "haunted media," because of the liveliness and sentience that we attribute to media, but also to "haunting media," because their presence "haunts" our culture and our knowledge. Like Derrida's original connotation of the term, as something that exists in our culture and shapes our thought, Sconce's reinterpretation of it describes something that is never concrete except in its effects and can only be referred to.

Thinking across biological brain and circuitry

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[30] I cannot avoid the immediate association with the natural network that connected all creatures in the movie *Avatar* (2009).

Andy Clark offers an interesting perspective on the relation between humans and technology by reflecting on how affect does not only rely on the human body, but on a larger network of interrelationships between the human body and technological tools. Instead of providing a new model of analysis, Clark's books offer a different perspective on the subject[31]. In this chapter I will address first Clark's argument of the *native cyborg*. I will then elaborate on this idea by bringing it together with Paul Virilo's and Anna Munster's observations on perception of distances through media and Roy Ascott's ideas of the "mind at large" in relation to new media technology. To conclude I will discuss perception of time through media with a personal reflection inspired by Kubler's theorization of the shaping of time and history.

Native cyborgs

Clark dedicated two books to the scientific demonstration of the simple fact that humans are *native cyborgs*. In his view, it has been a mistake to identify the human mind as existing only inside the body, because humans are by nature "fortresses built to be breached" (2003: 5). This characteristic distinguishes humans from other species, and elevates them to a higher level of abstraction of thought. According to Clark, since the invention of language humans have gradually learned to outsource certain tasks to nonbiological sources and to build collaborative networks with the tools that they invent. The human mind then, in Clark's view, becomes one with the technological network that humans create: "the mind is just less and less in the head" (Clark 2001: 4). Even though the human brain appears to be slightly more complex than other animal species' neural apparatus, according to Clark it is not a higher complexity in the brain that distinguishes humans. Rather, it is their capacity and tendency to work within extreme complex networked systems, wherein our neuronal plasticity plays a significant role.

Although Clark is a cognitive scientist and a philosopher, his social and media-related analysis is less subtle than the neuroscientific one. The main point of interest in his research is the human mind's plasticity, flexibility and openness, and humans' tendency

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[31] That spacetime perception cannot be considered abstracted from the technological context is already very clear, because technology interferes in many of our activities, communication processes and perceptive signals.

to work together with nonbiological tools within a highly complex network. Whether our mind becomes integrated in larger systems of interconnectivity with machines, or these machines evolve into outsourced unwired organs of the human body (Clark 2008: 10), a natural consequence of Clark's observation would be a decrease in reliance on biological rhythms and a proportionally increasing dependency on the requirements dictated by the tools that we use. As technology constantly develops and assumes a larger range of activities and skills previously performed inside the brain, humans need to focus their energy on other activities that are necessary to complete the machines' work. One simple example of this is the amazing improvements in the size and power of digital storage, with all the consequences that this development produces for our mental archiving and memory skills. Electricity, as well, altered our day/night schedule to such an extent that our circadian rhythms are no longer based on biology, but rather on socio-economically established production time. If we reflect on the day/night and work/ leisure dichotomies, we can observe how these rhythms are changing with the spread of the Internet and the rise of the 24/7 economy.

Clark's model of human-machine interaction, if it is applied in practice, has other consequences. It certainly challenges the currently prevailing model of interaction and interface, and questions the definition and value of interaction in the context of interface design. Clark's view on the relationships between the human mind and technology dispenses with a system of binary oppositions with the user on one side and the machine on the other. Instead, both humans and machines should be seen as agents in a larger networked context. Therefore, models of human-machine interaction based on inputs and outputs should make space for more complex portraits of these relations, of all factors of influence within them and of a consideration of humans, other species, and machines within the same network, where no center can be located.

Digital media and the perception of distances
According to Paul Virilio, new media have played a significant role in altering our perception of proximity, and so also the value that we assign to physical proximity and, on the other hand "digital proximity." In the digital realm, he observes, proximity is

defined by the time rather than by geographic distances, because the electronic image is replacing the actual in our perception (Virilio 1994: 63). Therefore, he argues, architecture is no longer architecture of space, rather it is an architecture of time. Our social networks no longer rely on the people who live in the neighborhood, or the ones that we have the chance to physically meet at work, at school, and in other areas of the community. Instead we build social networks online, connecting with people from different countries, cultures, and environments; unknown people, or old contacts that we would otherwise have never kept. The purchases we decide to make are no longer defined by the nearness and comfort of a physical shop, but instead by the seller's ability to infiltrate our time by offering fast delivery services, easy payment options, and so on.

Anna Munster also includes a reflection on time and proximity in her analysis of new media aesthetics. In a digital environment that is increasingly defining our social activities, our consumer behavior, our cultural development, and our mixture of work and free time, *lag* and *speed* are the new parameters for distances and proximity. In every context of our media use, for entertainment or for other purposes, we strive for speed, for real-time response to our action, and the immediate availability of the service or product that we seek. This tendency is demonstrated in the expansion of bandwidth and outsourced business tasks that aim to reduce the lag in response for internal and customers, such as when customer support farmed out to countries in a different time zone or employees work from home with more flexible times. We might ask ourselves what this search for speed means for our perception of time, but also of space and proximity. The craving for speed is connected to an extreme attempt to be present in the reality of communication that we experience online. This digital presence can isolate us from the space and time coordinates of reality and draw us into a vortex of feedbacks, responses, networks and inputs that makes us forget our "real time" and "real space," our neighbors, colleagues, and living environment. Of course, if our mind extends to the digital media we use as if they where *mindware upgrades*, the creation of *telepresence* is an inevitable consequence. We do not feel detached from real spacetime, because we are not a body using nonbiological tools. Instead, we feel extended, because we are a mind spread over a biological and a nonbiological body, both networked with other bodies that

are part of the same ecosystem. Roy Ascott connects this idea to Antonio Rosmini's concept of *fundamental feeling* (FF) (Rosmini, 1844: 10), which is permanent perception of unlimited space and produces the *idea of being*, and he attributes the expansion of the limits of the biological body to *noetic space* (Ascott 2000: 147), which is the space of ideas, consciousness and meditation.

> "The subjective FF contains a feeling of space which is in itself not shaped nor limited by the body surfaces, until the limits of the felt body are defined by touch sensations of its surface. [...] Movement into spaces outside the body then generates a subjective sense of time." (Ascott, 2000: 147)

Machines generate logical systems that are absorbed by our affective system on all three levels of the exteroceptive, proprioceptive and interoceptive, and become part of our experience. What we need to realize is that this is a foundation of spacetime perception, working as a reference for all new incoming signals in the future. Without expressing any moral judgment, and without stating that the machine is taking over, it would be of great value to distinguish the human body from the machine in all fields of study including cognitive and social science, and to understand how digital media change our perception by becoming part of our "system." Clark observes how "person" and "mind" are open-ended concepts, and how important it is for us to establish it on a moral and philosophical level and overcome the limits of the "skin-bag" (Clark 2003: 33) when looking at humans. One could argue that Clark's view assumes a separation of body and mind that has been already debunked. Clark's model instead should be interpreted as a more contemporary view on the body and mind. Clark does not see the mind as something apart from the body, but he thinks that the human body is expandable because of its neuronal plasticity. So mind and body as one are capable of integrating other entities into their activities. To conclude, I want to add that there are strong similarities between what Clark calls *mind* and what Steuer defines as *telepresence.*

Digital media and the perception of time

When we primarily act through digital media, the time needed to contact someone or visit a place defines our distance from it. Munster and Virilio observe that *speed* is the new means by which we identify distances in the online world. We experience closeness when response from the machine or another person is rapid. Consequently, lag in response creates an effect of remoteness. In the light of Virilio's reflection on time and Munster's description of the utopian invention of a global time that visibly clashes with the geopolitical limitations of access to new media, we immediately realize the practical influence of technology on time. If we would observe three different geographic areas with three different degrees of technological advancement, we would also notice three different ways of understanding time. In a highly technologically and socio-economically diverse planet with a digital and technological divide, truly global time cannot exist. We should also become critical of the desire for real time interaction as society and as users of digital media. Although it seems natural to us, we might want to ask ourselves to what extent the pursuit of speed in new media is a consequence of our distorted perception of time and presence, constructed by the media we use to communicate and work. *Telepresence*, very much relying on speed for its effectiveness, constitutes a key experience within our use of digital media.

In the globalized 24/7 economy, strongly supported and enforced by digital media, we are also prompted to believe that everyone and everything is always awake and active. Our interaction with a computational device partly erases human constraints, such as our biological rhythms, and our physical distances, at least in our imaginations. This strongly affects our perception of time and routines and creates a break between biological rhythms and operational ones. To bridge this break, our biological body tends to adapt to the machine[32]. This particular consequence of the existence of a globalized Internet time is reflected not only in a universal and commercialized "Internet clock"[33], but also in our

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[32] Of course we should never forget that the machine was designed for the biological body in the first place. I am not stating that the machine has the power to change humanity, I am just trying to highlight that step of evolution that is often forgotten, which is the influence that man-made technology has on the body and on human cognition.

[33] http://en.wikipedia.org/wiki/Swatch_Internet_Time (13-08-2010)

everyday experience of time. Wendy Chun (2006) delineates the effect of the Internet on the concept of time and location in everyday practices, stating:

> "Fiber-optic networks also work the divide between physical and virtual locations. They physically span the globe, buried within oceans or spanning office buildings' ceilings, while at the same time carrying the light necessary for these other spaces. Unlike "information," fiber optics emphasize the physical necessity of location and the explosion of virtual locations"(Chun 2006: 26)

Chun describes the other side of what Clark calls the *natural cyborg.* She highlights the geopolitical and economical factors that influence technological political choices. Clark analyses how the human body adapts to different perceptive signals to orient in time through the use of certain technologies, without requiring the human brain to be wired to a computer. Chun looks at how the physical characteristics of the matter that is used to sustain new media technology influence new media politics and new media geography "behind, and beyond the screen" (Chun 2006: 27).

One element of influence on our perception of time resides in the way that historians traditionally reconstruct past events from signals such as objects and documents. Through these signals we are able to reconstruct past events, which are never experienced in person but always mediated. Nowadays, we are used to the constant mediation of contemporary events. With increasing frequency we participate and experience the world through media such as television and the Internet. While feeling closer to events and more in control of our experience, in reality we lose contact with the occurrence itself in its physical spacetime even as we grow accustomed to remediation[34]. This element of remediation might be considered a permanent transformation of real events into *signals*, resulting in an accelerated process of time reconstruction and the simultaneous abolition of past, or at least a blurring of the line between past and present.

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[34] I can relate this to my personal experience. More and more often I decide to stay at home and watch online podcasts of events that I could have attended in person. Les Levine produced the work *Systems burn-off* (1969) to address this topic, in particular in relation to art events being more and more experienced as information about art, instead of art itself.

"Time, like mind, is not knowable as such. We know time only indirectly by what happens in it: by observing change and permanence; by marking the succession of events among stable settings; and by noting the contrast of varying rates of change." (Kubler 1962: 11)

Here Kubler makes an observation about another level of time perception, which is our ability to identify breaks in the progression of time. In this respect, Kubler's observations are similar to Massumi's reflection on the ontological pre-existence of movement and change to fixity and permanence. Kubler distinguishes two conditions that together shape our perception of time. The first one is repetition of ritual actions, which defines the normal course of events and is therefore adequate to expose the slight change rate in the permanence of objects. The second element is invention. When invention occurs, the ritual is clearly broken and change, rather then defining the rhythm of progressing time, produces a disjunction between past and present.

"Every society binds and shelters the individual within an invisible many-layered structure of routine. […] Another less dense shell of routine binds him […] as a participant of the life of a family. Each (of these families) successively more open layer of routine further shelters the individual from disruptive originality." (Kubler, 1962: 69)

This observation triggers our reflection on the different layers regulating the daily activities of a regular new media user, the degree of repetition and change rate that we can observe during these activities, and the amount of freedom that the user really has to vary creatively in significant ways. I want to argue that digital media multiply our shelters and subsequently decrease our chances to invent, create or deviate. These shelters are no longer direct derivatives of our physically proximate environment, such as the living and working environment and family bonds. Instead, they expand much further than we can handle, including people we occasionally meet, people we would like to meet, and people we know we will never meet. Although these relationships exist only in cyberspace or through other media such as the telephone, they shape our routine and so

they influence our entire interrelational sphere. Moreover, interacting with friends, family and others is being increasingly bounded by standardized modalities through the interface design of the services that we use, for example, the way we can use the "like" button to express appreciation on Facebook. This is compounded by the fact that different social networks are starting to look like one another, in particular Facebook. Modalities that we learn online for hours a day every day easily become incorporated into our behavior and contaminate our off-line actions. Rather than expanding potentials, this state decreases opportunities for invention that combined with the perpetual remediation of current events, powerfully reconfigure our perception of time and of history.

Potentialization of networked environments: the Internet of things
Previously I have discussed Latour's ANT through its application to social studies as well as to the concept of *natural cyborgs.*   There is a clear association between ANT and the *Internet of things* (Van Kranenburg 2008: 36). The *Internet of things*, when fully realized, would connect all existing objects to a digital network through radio frequency identification (RFID) technology. All objects would be traceable and the "user" would be in control of what he has, what he uses, and what he loses, minute by minute. However, this potential lifestyle improvement would by no means be the only consequence of such a change in our relation to objects and their agency and vice versa. An immense amount of information would become available concerning our use of all kinds of objects, and how certain products are related to each other in ways that is currently unknown. I wonder whether progress in tracking interactivities between objects, humans and other organisms, would instigate the potentialization of reality.

> "Digital processing as such doesn't possibilize let alone virtualize. The digital is already exhaustively possibilistic. It can, it turns out, potentialize, but only indirectly, through the experiential relays the reception of its outcomes sets in motion." (Massumi 2002: 141)

In a social environment where all living organisms and objects are interconnected and interdependent, and their mutual relations are better analyzed and taken into account by

different disciplines, can we imagine that a digital "shadow" attributed to each of the nodes of this complex and multilayered network might potentialize our reality by adding experiential relays to objects and so multiplying the outcomes of these relays in yet uncoded potentialities. ANT suggests that objects have agency, but with the implementation of the *Internet of things* we would have access to a parallel shadow map of all known objects and organisms, where we could create charts and models to describe the flow, material and animal, of all mapped entities and their interactions. Certainly, this is not a virtualization in itself, because it clearly is a simplification of what happens between the mapped entities. In other words, in the light of Massumi's observation reported above we could ask ourselves to what extent the *Internet of things* would generate outcomes that would become the seeds of new experiential relays, and therefore create potential that is not yet contained in the digital code itself. Would the *Internet of things* then bring about a virtualization of our environment, or would it on the contrary code every known possibility and become yet another artificial simulation of reality?

The answer to this question depends to a large extent on how the technology would be implemented and then used. Certainly, such a development would generate gigantic amounts of knowledge about our environment, and about object agency, as well as layers of language that are still unknown and unperceivable. Consequently, it might also expand our knowledge of human perception and affect and so also expand our consciousness of the environment and the different varieties of perception that can be found in humans and non-humans inhabitants. Some of the case studies that I describe below partly respond to this compulsion with instruments that are analog rather than digital[35]. In Massumi's logic, the process in its openness and incomprehensibility is always analog, and can never be fully contained or translated in digital code. This becomes immediately clear when we think about the manifestation of the *Internet of things* in practice. In any case, it raises the question of what actually constitutes an object. Clothing, furniture, food, and so on are all easily identifiable objects, but they are also products. What are a wave, a drop, a breeze, and a sunray? It becomes significantly more difficult to map these "objects" and their topologies, their effects on other objects, on the environment and on human perception.

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[35] According to Massumi, nothing is more analog than sound (Massumi 2002: ch. 5)

Case studies – New Media Art

An important part of my research addresses the artists' response to the ontological shift described in the second chapter, reflected in philosophy as well as in the media, and how contemporary artists relate to technology, new media and affect. In my view, to effectively address these topics does not necessarily require the use of new media. The artists whose works I have chosen to discuss as case studies have not been selected because they employ new media in their artworks, but rather for their ability to address new media and affect through whatever medium they employ. Sometimes, this happens just by doubling and splitting our perception of the surroundings, by drawing our attention to the different layers of perception that interact within the human body, or by reproducing cybermodalities and situations into real life. All case studies have been selected for their ability to critically question perception of space and of the body. I decided to select three case studies in total, each referring to a different sensorial channel: the first case predominantly addresses vision, the second case addresses sound, and the third case focuses primarily on proprioceptive experience instead of exteroceptive sensorial channels.

Vision

The Sound of Shadow, concept by Teresa van Twuijver
Inverted Shadow by Eelco Wagenaar
See also attachment 1: Interview with Eelco Wagenaar

The Sound of Shadow[36] is an exhibition held in Amsterdam (Westergasfabriek) in May 2010. The exhibition is also part of a larger research project. The exhibition's concept is by Teresa van Twuijver, Eelco Wagenaar and the design of the exhibition's space is by Sara Palomeque. *The Sound of Shadow* consists of a collection of video projections and installations by various artists[37] and graduating students from the Gerrit Rietveld

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[36] Concept, composition 'Symikonie', organisation: Teresa van Twuijver; curating: Teresa van Twuijver, Eelco Wagenaar; production: PJ Bruyniks; exhibition design: Sara Palomeque; exhibition installation: Daphne Koopman, Eelco Wagenaar.

[37] Anne-Marie van Meel, Britt Kootstra, Daniëlle Davidson,Daphne Koopman, Leonie Oortgijsen, Dirk Moons, Eelco Wagenaar, Esther Verhamme, Lucia Kooiman, Luciano Pinna, Paul Roncken, PJ Bruyniks, Robbert Weide, Sara Palomeque, Teresa van Twuijver, Marijn Korff de Gidts, Tzvetana Tchakarova, Wim Jongedijk, The Genetic Choir led by Thomas Johannsen, Teresa van Twuijver.

Academy. The design of the space aims to reflect on the relation between sound and moving image, and it does so by using image instead of sound to compose a "visual symphony"[38]. The structure of the exhibition is essential to the goal of the works, for it combines different screens that together compose a symphony. The installation is time based and follows the rhythm of a symphony by reproducing different videos at different speeds and by varying their respective positions on the screens. The installation fills the entire space and the viewer can either look at the *symikony* from the outside or walk through the screens to gain different perspectives and discover disparate associations between the images that are projected.
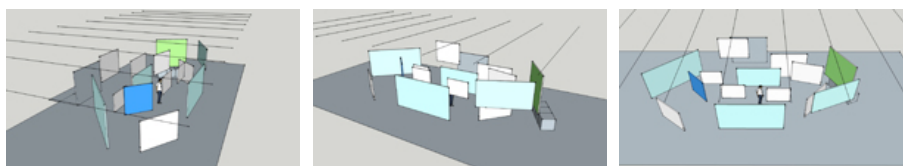

Fig. 3, The Sound of Shadow exhibition design, concept: Teresa van Twuijver, Eelco Wagenaar. Design: Sara Palomeque

In the same space as the *symikony*, the visitors encounter Wagenaar's installation *Inverted Shadow*. *Inverted Shadow* is an installation where images of objects and persons that are in front of an invisible camera are projected as white shadows on a dark screen. The screen and the projection are much larger than the size of a body and are placed at the exit to the exhibit. When the visitors leave the space, they cannot avoid looking at the projection because they have to walk around it to reach the exit door. In front of the screen, which consists of a large sheet, sits a small paper cactus that shows what the installation does. Otherwise it would be less clear for the passerby to see that the shadow that is being projected on the screen belongs to them, especially because of the irregular lag in the rendering of the image. In this sense, the work reminds the *Multiple shadow house* installations (2009)[39] by Olafur Eliasson, or *0,16* (2009)[40] by Aram Bartholl.

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[38] http://www.soundofshadow.com/about.html (02-06-2010)
[39] http://dailyserving.com/2010/02/olafur-eliasson-multiple-shadow-house/ (13-08-2010)
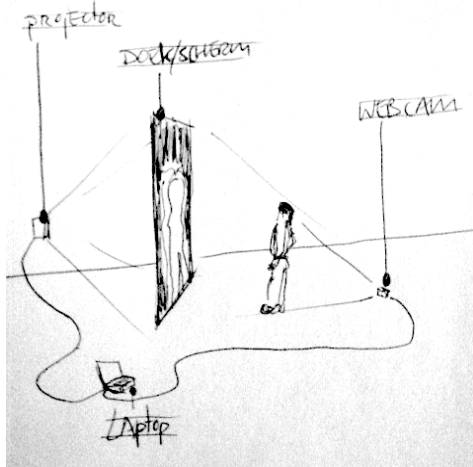[40] http://datenform.de/016.html (13-08-2010)

Fig.4, Sketch of the functioning of Inverted Shadow by Eelco Wagenaar

In my opinion, *Inverted Shadow* is the only work of the exhibition that directly engages with the body of the viewers, for it forces the audience to look at it by virtue of its location. As a matter of fact, the installation enlarges and exaggerates the size of the viewer's body, and at the same time hides and minimizes through a lag in the projection speed, and by rendering an image with low resolution. The body on the screen is a slow white shadow, with no colors and no details, and no real time response to the viewer's movement. This combination of exaggerated size and impoverished image invites the viewer to display extreme gestures of awareness, while he is looking for himself and his shadow on the bigger screen.

In this installation there is only visual feedback, a choice that is in line with the research topic of this project. While the *symikony* wants to produce sound without using sound, experimenting with moving images and perceptive interrelations between visual and hearing signals, Wagenaar's work seems to reflect on space "outside the screen" that consists of real space where we act and see our bodies and those of other individuals. If the *symikony* addresses the artists, makers and audiences of audio-visual products, *Inverted Shadows* seems to approach a larger group[41] for it encourages a critical reflection on self-perception and perception of movement and space. The work does not engage just with media production, but with the human body and its behavior in space.

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[41] The context in which the installation is presented, that is the one of the art exhibition, is still very limiting.

Movement is clearly essential for Wagenaar's installation to work. The viewer discovers his reflected image by moving in the space in front of the sheet and by establishing a relation with his body and between his body and its inverted shadow on the projection. It is by moving and observing the response of the projected image that the viewer identifies himself in the space and detects the presence of other people. The objects and bodies that are present in the space suddenly become necessary for the viewer to orient himself, and therefore assume an outsized importance. This is probably the reason why this piece engages much more with the viewer's body than the *symikony* does. In the *symikony* we observe moving images interacting with each other, creating a rhythmic sequence of video projections. The *symikony* also relates to our body in various ways. It certainly relates to the darkened space of the gallery by illuminating it, by filling it with almost architectural structure of the hanging screens, by opening paths in space through which the viewers can walk. Nevertheless, *Inverted Shadow* reflects on our moving bodies in space, instead of on mediated images of other bodies. The experience then becomes more real because it is an extension of the viewer's direct experience of space, like an external eye that we can appropriate to observe our body. The image is not a realistic representation of the surroundings, like the kind that we are used to see in other contexts such as televisions, movies, and video chats, but it is rather an abstraction of moving objects in space. Just because we are accustomed to a full-color, real-time image of ourselves, such saturated imagery does not make us more aware of our movement, instead only abstracting it out of reality. On the contrary, the *Inverted Shadow* works like a medical screen or heat map of our movements. It gives back a study of our movement, and by doing so makes us acutely aware of its existence.

If we relate Wagenaar's work to Massumi's theorization of human perception of space and the body through movement and experience, it is interesting to see how the *Inverted Shadow* installation, despite its prevalent visual qualities, is able to address our proprioceptive level of perception. While we move in space, we observe our "shadow" on the screen responding to our actions. Not only is the image more or less delayed and fairly unpredictable, but the viewer's shadow on the screen does not move as smoothly as

his body would. Visual and proprioceptive inputs do not correspond; specific muscular pressures and efforts correspond to reactions that the body perceives as unusual. The exploration of the viewer's body movement induced by the installation does not correspond with the viewer's proprioceptive experience. Of course, a one-time confrontation with Wagenaar's installation is not enough to alter our long-term perception either of the body or of space. A five minute experiment cannot compete with the accumulation of body-space relations that the viewer has gained during his life. Nevertheless, this short event becomes an experiential layer of our perceptive system and might somehow, some time, be recalled through movement. Furthermore, the delay makes it possible for the viewer to see himself mirrored and in movement, while his image is completely abstracted.

In any case, the installation most importantly makes us aware of the relations between movement and image of the body, in other words, between proprioceptive and exteroceptive signals. It invites us to reflect on how our perception functions and so also on how we perceive space and time as lag and distance. Wagenaar's installation is called *Inverted Shadow,* but clearly refers to filmed and projected images. This webcam "feeling" of the piece and the research context in which the installation has been designed combine to make Wagenaar's work about new media, or media in general. The discourse of perception through movement then immediately becomes a reflection on perception of the mediated image of the body, of space and of others. By abstracting the image, making it at the same time an unrealistic and very analytic rendering of the viewer's body and space, Wagenaar presents a different occasion to look at the self in space.

Sound

Sound based research by Yolande Harris

Yolande Harris[42] is an artist based in Amsterdam, who primarily experiments with sound. All her works share numerous connections as part of a wider research path, so for my case study I will compare three projects realized by Harris: *Sun Run Sun*[43] (2007-2009),

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[42] http://www.yolandeharris.net/

[43] Project blog: http://sunrunsun.nimk.nl

Scorescape[44] (2008-2010) and an untitled work "the walking piece" (Harris 2010) All of these projects are steps the artist makes in her research for orientation techniques based on sound. In other words, Harris is interested in how the body uses sound to understand space, position and movement. The artist is not only focused on exteroceptive audio signals, but on how these signals are integrated within our sensorial apparatus and interpreted or felt, and then translated into knowledge about surrounding space. For Harris, hearing and orientation are not only processes that involve the body and space, for perception and orientation unfold within a network of agents. Inside this network, humans employ a limited range of perceptive tools and are able to gather only some of the signals that are sent.

> "The environment? Humans are part of complex interconnected ecosystems in constant flux. The composer? Organizing sound and making audible the inaudible, can help articulate these relationships through music rather than human language." (Harris 2008)

Harris, through her different sound based pieces, makes us aware of audible environments to which we are not normally attuned.

The walking piece (work in progress)[45]

Harris experimented with this idea for the first time at the Orpheus Institute Gent (Belgium) in January 2010. She took a walk and recorded the sounds produced during her journey.

> "If I play a recording of that same walk back to myself in a quiet space I listen in a different way, without the need to process and interpret sounds immediately for action, motion and understanding of my environment."(Harris 2010)

Stripped of their functionality as navigational tools, the recorded sounds assume completely different meanings[46].

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[44] http://www.scorescapes.net/

[45] Because there is no online documentation of the piece, I contacted her with an email, asking her if she could shortly explain to me the concept and the experiments that she was conducting in relation to the piece.

Harris brought this a step further and tried to reproduce the recordings while taking the same walk one more time. She noticed a disjunction between what she heard and what she saw. The sounds were recognizable, but they did not correspond to visual signals, and probably not to the artist's proprioceptive signal either. Of this experience she says:

> "I may recognize the road, but not see the car that I hear pass by me. I see someone walking towards me, but their footsteps are out of sync with the sound I am hearing." (Harris 2010)

Harris also involved a larger group of participants, and took note of their reactions and their feelings while taking the walk and listening to the sounds she recorded. The reaction to the piece were very different from person to person: "paranoia, feeling of getting in sync, of play, of indifference, of being out of balance, asynchronicity and surprise, of awareness of the environment and our use of senses in its perception."
Also, a number of participants experienced a time-related estrangement. Some had the feeling of being in the past and in the future at the same time, and they felt confused about whether the sound would be from the past and they were walking in the present, or if the sound would be in the present and they were walking in the future. Either way, they felt a "rupture" occur inside them, leading to a different sense of the "now." Participants in the project reported being "aware of two realities," "somewhere different but altogether," and experiencing the feeling that they were "trying to catch up" (Harris 2010).

As the action is taking place while the participants are experiencing a time-related decontextualization, this strangeness is not so much related to perception of unfolding time, nor to the distinction between past and present, but to the perception of presence. The participant's perceptive apparatus receives contradictory signals: through hearing they gather sounds that belong to the space, while through vision they see images that

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[46] I have been experimenting myself with a similar idea with an online sound-based clock: http://martacolpani.com/timetolisten.html

belong to the space as well, but do not correspond temporally to the sounds. The struggle of "catching up," of feeling a "double presence" generates in the audience in a pre-cognitive phase of perception. When they decided to be part of the experience, the participants abandoned the realm of logical cognition by choice. They attempted to "feel" without making sense of the conflicting signals based on the information they received.

Sound did not generally correspond to visual inputs, but also did not match with the participants' movement in space. Interoceptive phenomena are triggered during the experience. As I wrote previously, interoception is the perception of *suspense* and breaks the process of action-reaction during which our input from the senses is elaborated by our brain and spatially identified. No wonder, then, that the participants were left feeling dazed and doubled. Their most visceral layer of perception, the one that makes us gulp when we are surprised or jump when we are startled, was being repeatedly provoked audibly but their visual perception was constantly denying it.

From a theoretical perspective, the relevance of this piece is mainly in perturbing the interaction that takes place between exteroception in sound and vision, proprioception, and interoception in the perception of *suspense* generated by the sounds of absent events. This work makes the participant extremely aware of the functioning of his body when feeling and perceiving reality. The work therefore reflects on human perception, and in this case is strictly focused on the relation between spacetime and the body.

Sun Run Sun

Fig.5, Satellite Sounding at Villa Croce, Genova

Sun Run Sun (2007-2009) is a participative performance by Yolande Harris that explores orientation and navigation through sound. The artist created special devices, called *Satellite Sounders*, which translate GPS data into sonic compositions. Participants in the performance wear these devices, and when they move in space they hear the sound of the data transmitted by the moving satellite. The exploration of space through sound, combined with visual and proprioceptive sensorial layers, is achieved by the artist with the support of an *ad-hoc* technical tool that works as a translator between humans and satellites. Although the link between the participant and the noise produced by the *Satellite Sounders* seems somewhat artificial as we do not normally use the sound of a GPS to navigate, it works as a reflection on humans' reliance on GPS technology to navigate space.

> "What place is there for my sensations, my phenomenology, my conscious and unconscious awareness of space if this knowledge is so efficiently and functionally made redundant by the technologies of satellite navigations?" (Harris 2007)

When we become increasingly dependent on a specific technological tool, some skills that were developed by our body suddenly seem unnecessary. While it is unlikely they will disappear, we may possibly fall of out practice. Among other technologies, GPS navigation tools contribute to the alienation of the human body from its environment. Harris aims to produce "a sense of embodied connectedness to one's environment" (2007) through the use of sound, which is intimate and immersive, familiar for the body as a "natural" tool for orientation in space.

Compared to the "walking piece," which was a study of the body-spacetime relation that occurs through movement in perception, *Sun Run Sun* is rather a study of technology taking the place of our natural perceptive instinct and implicit knowledge passed along for millennia, and an attempt to use just the same technological tool to re-embody in space. Within the complex networks where humans are immersed, Harris focuses here on

the role of technology and reflects on the influence that a specific tool can have on humans. We might ask how *experience* in a Massumian sense will change our perception over time, when perception is constantly mediated and sometimes made superfluous by technology. To partially answer this question, we could observe how technology introduced centuries ago has influenced our skills today. As Clark emphasizes, the evolution of language itself was a technological advance that fundamentally altered our species. Writing has also made our mnemonic abilities partly redundant, a sentiment famously shared by Albert Einstein, who once said: "Never memorize something that you can look up." Every technology that has ever been introduced has also required some adjustment of our body to learn to co-exist and work with the machine; some skills must have been lost and some must have emerged from every change in the technological context. Possibly a more important question would be: what are the consequences of the loss of certain skills? In the specific case that interests Harris in relation with her work *Sun Run Sun*, what would be the consequence of a loss of "touch" between body and environment?

Scorescape

Fig. 6, Sound and video installation, field recordings of a tropical storm create a room full of rain. Atlantic Center for the Arts, Florida. June 2009

In her current in-progress project *Scorescape*, Harris brings the reflection on the relation between humans and their environment a step forward, by including a larger system of interactions between other species that the human species is not aware of:

> "Once we start to understand how little we are able to hear in the overall sound spectrum, we can't help but shift away from an attitude that we're the central creatures on earth. And then we can learn from the immense and complex sound interactions and behaviors that make up these interlocking ecologies of which we are only a part"(Harris 2010).

One of the aims of the artist is to challenge anthropocentric models of perception and social behavior. Therefore she constantly tries with her work to reveal different sonic environments that are either inaudible or at least unknown for most humans. Clearly, the ideas and beliefs underlying her artistic work are very close to, if not overlapping, agent network theories that state that biological and nonbiological entities have agency and constantly interact with each other on many levels. Peculiar to Harris' sound based research is her interest in sound as a language that while unknown and perhaps beyond the range of human hearing, nevertheless rich and valuable. During her project *Scorescape,* Harris explores sounds produced by underwater organisms, water drafts, tropical storms and sounds used in psychotherapy to create mixed compositions with all the different sources. Her tracks create a multilayered sonic environment where small bits of familiar audio signals occasionally emerge from a mysterious mix of cryptic sonic languages. Her interest in sound as language triggers Harris to experiment with image-sound-image translation, so her work is not only sonic but also visual.

Proprioception

Sandbox Berlin by Aram Bartholl

Sandbox Berlin is a project realized by Aram Bartholl in 2007, first as a workshop and then as exhibition. Aram Bartholl is an artist that experiments with situations taken out of their digital context and reproduced in physical space. Almost all of his projects are analog and low tech, but clearly refer to the Internet (a simple examples of which is *0,16*

(2009) a pixel-like surface made of different sorts of paper), or play with the contrast between old and new technology (such as *On* (2009), a candle that works like a lamp). A number of his projects, including *Sandbox Berlin (*2007*)*, are re-enactments in real life of game-like situations or spaces that exist in cyberspace. During these projects, the participants experience with their biological body actions that are normally performed in cyberspace by an avatar. In an interview with Matteo Bittanti on Videoludica.com, Bartholl says:

> "The common denominator of all my works is the idea of importing into the physical, analog world behaviors and principles that belong to the digital, data space. […] I am trying to investigate the many planes of realities we live in. I am trying to find new ways to link together these different realms. For instance, I am transferring elements, behaviors or objects with special properties from the worlds of video games into the "real" world." (Bittanti 2006)

In the particular case of *Sandbox Berlin*, the artist recreates a special area of Second Life (SL) called Sandbox[47], where the inhabitants of SL can freely create new scripts and experiment with software in a protected environment, without risk of damaging the computer. Creating script in Second Life corresponds more or less with building objects, architectures, and such, with the distinction of being free from conventional physics and limitations. Many Second Life inhabitants make use of Sandbox everyday, so the area is constantly filled with undefined forms, objects and artificial landscapes. From what Bartholl writes on his website about this project, it seems to me that he has been attracted by the situation of "formal chaos"[48] and the atmosphere that it creates. Sandbox is like a digital 3D sketchbook for computer programmers and creative inhabitants to try out their fantasies, their ideas and experiment on each other.

Bartholl decided to reproduce the same environment in real life. He organized a three-day workshop in Berlin, on a deserted area that was previously part of Berlin Wall. He

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[47] http://en.wikipedia.org/wiki/Sandbox_%28computer_security%29 (13-08-2010)
[48] http://datenform.de/sandboxeng.html (13-08-2010)

provided different kinds of materials and tools, and he invited as many participants as possible to come and freely create. The photographs[49] below show that this abandoned space was undefined and at the same time part of the city. In his *Sandbox Berlin* blog[50], Bartholl published his personal impressions during the workshop. Here is a short example:

> "It's fun to see how objects are moved or manipulated over the night. The yellow cube became a house with a "door" and four "windows" in the first night. I am curious for the result on Sunday."(Bartholl 2007)

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[49] Bartholl also has a Flickr profile, with one photoset dedicated to Sandbox Berlin: http://www.flickr.com/photos/bartholl/sets/72157602346002636/

[50] http://datenform.de/blog/tag/sandbox/

Fig. 7-8, Sandbox Berlin (2007)

From a theoretical perspective, in particular when I relate this case study to my theoretical research, the most interesting facet of the *Sandbox Berlin* project is Bartholl's attempt of creating a strong, concrete link between experiences that we have in cyberspace and the actual living space where our biological body acts. Whether the artist's interest is to create a playful environment, a happening or a moral reflection on Second Life, the most interesting result is the gathering of "real bodies" in an actual abandoned space near Berlin performing creative activities that are completely irrelevant in the context of everyday life. The space of the workshop becomes a pleasant meeting point, a playground for grown-ups, far away from the rules and conventions that govern city life. Participants' bodies become freed but at the same time slightly lost. It is remarkable that this playfulness can derive from the associations that adult Internet users make with Second Life. While Second Life is a community in cyberspace, populated by avatars and used by the participants through a network of technological tools, where *space* and *place* possess connotations that are not transferred back to the actual

environment of the biological body, Bartholl creates a new spatial setting for the body to inhabit the cyberspace mind. This effect is also achieved with the sandbox's objects, which were chosen to appear indeterminate and not suggest a specific social function.

While Harris acknowledges that sound has a different meaning when we listen to it without trying to use it to orient in space, we could ask ourselves to what extent moving our body without being concerned with the performance of everyday activities, in a space that is our city but is not the city we know, and working with *"unskilled"* objects opens up to a new experience of space and of the body. All three layers of perception are cut loose from their routine, their autopilot, and freed to experience a completely new space. Of course, some characteristics of the space are well known, like sounds, smells, colors and forms. What will be new for the participants is the *non-functionality* of the space, an *"unskilled"* space, which builds a new relationship between space, objects, others and the body. One of the most celebrated qualities of cyberspace, and in particular of *Second Life*, is its capability of opening new ranges of potentials, and offering the chance to re-build the *self* through the construction of a cyber-self or avatar. We can re-build in cyberspace a new communication mode between the body, the self and consequently to space and other human individuals. While the failure of cyberspace might reside in both the necessity of using protocols and a screen-based interface, transferring these principles from the digital to the analog realm have potentially powerful consequences. Of course, outside the artistic environment similar experiences are possible in "real life," such as reenactments of personal or historical events or role-playing games. However, all these experiences have as a common denominator a preset of rules, almost a script, which have to be followed. In opposition to this is *Sandbox Berlin,* which places the body in a free, *unskilled* space filled with free, *unskilled* raw materials and encourages exploration that is not bound by an interface.

Works of art combining offline environments and cyberspace settings clearly refer to the body and its movement, even when the reference is only visual and the piece is not interactive. Besides Bartholl, more artists experiment with similar associations. Visual

artist Brody Condon[51] works with live performances but also video and images where cyberspace is merged with actual space and body, with a particular focus on movement, such as his series of *Self-playing Computer Games* (2003). In this series the artist combines the aesthetics of game and cyberspace within the frame, in a literal and metaphorical sense, of a religious painting. However, Bartholl does something more interesting with *Sandbox Berlin*: instead of setting the rules and roles for the participants, he applies the quality of cyber-freedom, which affords the chance to produce meaning starting from matter that has no social function. For this reason, the work brings the participants much nearer to the aesthetic experience of objects, space and body without mediating this experience with rules and assigned functions or meanings, like the work of the *Object Lab* attempts to do. On the other hand, the neutral space and informal matter that participants are invited to freely manipulate is taking different forms over time, and transforms through actions by participants. Bartholl seems to create a small system of objects, humans and natural organisms interacting upon each other and discovering each other's agency mutating over time and modifying the environment. The experience uncovers the social as an "association between entities which are in no way recognizable as being social in the ordinary manner, except during the brief moment when they are reshuffled together" (Latour 2005: 64).

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[51] http://www.tmpspace.com/ (13-08-2010)

Conclusion

With my thesis, my aim was to research how new digital media influence, or could influence, our experience of space and of the body. I have concluded that space cannot be analyzed apart from time, especially from the perspective of affect; time is an indispensable variable to discern permanence and change, inside and outside, and to produce *experience*, which determines the intensity of the perceptive *event*. Because I am very interested in how the human body explores space through the senses, I depended mainly on Massumi's theorization of perception and the three layers of perception that he describes: exteroception, proprioception and interoception. In the light of his theories, other philosophical approaches to the same topic become more understandable and concrete, in particular if one looks at Massumi's perceptive theory in relation to Clark's notion of human-machine interaction. Munster's and Virilio's observations on *distance* that is defined by *speed* and *lag* can be placed within the context of digital media as a consequence of a networked mind that works across biological and non-biological bodies. When we communicate with a remote location through a computer we do not sense this communication as occurring only in our mind; we feel as though we are really there. In this perspective, *telepresence* cannot be seen as a disjointedness of the mind from the body, but rather as a moment of hyper-felt connectedness with our non-biological body, that disappears and becomes one with our biological one. Particularly interesting from the same perspective are Rosmini's original idea of the *fundamental feeling* as the source of consciousness of *being* and its expansion outside the burden of the biological body, rehearsed later by Ascott.

If we relate this observation to the case study of the "walking piece," another question has to be asked. When we communicate through media, signals from the medium and signals from the environment seem to merge without struggle in one experience that becomes easily identifiable. Our body is not constantly asking, "Where am I? Why do I hear sounds that do not correspond with what I see?", while during the "walking piece" participants are "split" between present and future, or between two places where they are present at the same time. When we engage in a mediated long-distance conversation we do not experience the same struggle. Part of it is certainly due to the fact that when we use communication media we agree that we will be talking to someone that we will not

physically meet. Moreover, during a call from a computer we are mostly sitting and we are concentrating on a human-to-human computer-mediated conversation. We also hear sound from the environment that we see around us, but our body can understand that the voice of the other person is non-diegetic. During the "walking piece" participants walking on the street listen to sounds that claim to correspond with their visual and proprioceptive experience. This is what the body struggles to merge: the three layers of perception are stimulated by different sources, which are yet very close to each other.

It is interesting to realize how digital media users constantly merge different sensorial sources from different context to create an original experience. This must happen especially since new mobile media and technology that is embedded in our environment blur the line between physical presence in a space and media engagement. When I state that the human mind is spread among biological and non-biological bodies, I am not implying that the mind is separated from the body, but rather that we should consider both *mind* and *body* open-ended concepts. To consider technology not as an extension of the body, but as a complementary part of the networked body that we use, would enrich our idea of self, mind and body and would offer inspiration for more effective and responsible media design. In this same context, it would be useful to abandon the main anthropocentric model for studying society and affect, and turn our attention to other nodes of the networked environment that we are part of, and that our mind is part of, by exploring multiple layers of perception that do not belong to humans. A larger study of perception would not only enlarge our knowledge of the human body and affect, but it would bring to attention how our behavior and actions affect other agents within the network, and emphasize how we constantly make use of these other agents in ways that we do not always realize.

To conclude my thesis, I would like to refer one more time to the question that I asked at the end of the third chapter, whether the realization of the *Internet of things* would mean a potentialization of our environment or, on the contrary, a mere digital simulation and unavoidable simplification of the agency of objects and organisms. It would be relatively simple to map all factors that we already know in relation to objects by observing how

they change and interact with each other. We would therefore have at our disposal an unimaginable amount of information that might become knowledge about these objects and their behavior. At the same time, I think that there is much that we can discover about our environment in other ways, by trying to explore qualitatively, instead of quantitatively, how objects, living creatures and other phenomenal factors interact with each other and with the human species. In this respect, I see great value in experiments like the ones conducted by Harris that consist of an exploration of perceptive auras that are beyond human ken, and an understanding of different linguistic systems based on different frequencies than the ones used among human civilizations. New media change our perception of space and time, because our flexible neuronal structure permits us to connect with larger systems, to explore layers of our ecosystem and of our perception that would otherwise remain unplumbed. Awareness of this potential is essential since it allows us to capitalize on the power of the human mind to be open and interconnected. I would like to encourage artists and researchers to employ new media technology with these aims in mind.

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Attachment 1: Interview with the artist Eelco Wagenaar (Spring 2010)

At the exhibition The Sound Of Shadow, your piece was the only one that explicitly engaged with the audience's body and displacement in space. How would you relate your piece to the 'symikony' produced by the video installation?

Yesterday I also talked about that, and I might have contributed even more when my Inverted Shadow installation would have been mixed up with the other screens. But in our try out, where a lot of people also interacted with my installation it became a bit 'noisy' to the other screens (which where then just smaller screens, except mine).

How it worked now (and that is what our intention was to put it in this situation), was when at the end a viewer of the composition left he/she would be have a kind of 'aftershock' by being confronted with him-/ herself. So it emphasizes more the contradiction between going around the screens and immerse into the video-projections, and experiencing the physicality of their own body (which is being stretched, because of the oscillating time delay...). So maybe we can say that the inverted shadow installation is a counter piece towards the video installation.

How do you, as an artist, research the relations between sound and visual inputs and their relation to our perception of movement?

What I actually research is, I would say our perception of space; how we relate to space (and to each other). This perception is influenced (or maybe controlled) by sound and visual inputs and also influenced by time (therefore perception is in a way time-based). So I do not specific do research on sound and visual inputs, but I use them as my tools to experiment on the perception of space in relation to our bodies.

An important aspect of your installation Inverted Shadow is, I think, the lag between the movement of the viewer's body and the inverted shadow that appears on the projection. Can you talk about the choice for inserting a lag in the installation and the reason for it? Is delay/ real-time response a topic that you try to research with your work? If so, in what ways?

The lag adds an extra dimension; it puts the 'user' on the wrong leg (well this is a Dutch saying directly translated to English...). The user is looking at himself but it takes some

time to realize (there is some kind of connection to Dan Graham's *'Time Delay Room'*). The time lag is in fact oscillating. So sometimes there is no delay and sometimes there is. This makes the 'shadow' jumpy and also able to catch up with the 'real' time. So it stretches the perception of the relation we have with our body. The white shape on the screen behaves like a shadow (but it is only a simulated shadow!!). We kind of accept it as a shadow, whilst it has a contradicting color and it does not really behave like a shadow (well, like a lazy shadow ;-)). But like you said, it is quite an important aspect in this work. In a previous work, the cube I showed at Rietveld (*Unfold*), I tried to make the delay in the projections as small as possible (only milliseconds, so it was almost like real time). But as I tried to explain in the previous question, I would say perception of space is influenced by time. So by using the delay in this installation, this perception is being manipulated.

So, if I understand well, in Inverted Shadow you mainly played with lag and inverted color to make the viewer aware of his body and his movement in space. The absence of sound also played such an important role?
Hmm, not specific I would say. But I think you can achieve a similar effect with sound or even with a combination of sound and visual. But in the extent of the exhibition (sound of shadow), to add sound sometimes takes away some of the strength of the visuals. So to use all the senses, doesn't always make the experience better.

In my thesis, I want to research the relevance of (new) media for our perception of space and of the body. I am interviewing you because I want to look at contemporary (media) artists and at how they engage with these topics. Do you have an opinion about that? How do you think that your work as an artist can be of value for our awareness of the influence by media and technology on our use of space and of the body? Maybe you can talk more about what this topic means to you, or how are you planning to research it in the future and how this relates to previews research/ works.
Of course do media or new media effect our perception of space and the body (like McLuhan says, the extensions of man). Almost everything around us is mediated.

Sometimes we just don't realize. Now people start to create an awareness of their virtual other, for example the effects of online social networking.

Because of the technology drive, media keeps on changing and developing. It seems there isn't going to be a stop (soon). As an artist I can only try to create awareness about mediation and technology. But for that I also have to accept and embrace technology, because I have to understand what's going on. Of course I don't think technology is a bad thing, the only thing is that it can be used in a bad way.

About my research, I am still defining my research boundaries. But it concerns the relation between artist, public and technology in a (new) media perspective. The technology will continue developing, so to keep in the game, the artist should follow these developments and explore the boundaries of the technology. The public will do the same in their own way. So they form a kind of a triangular relation around what might be context.