

# Embodied Communication in the Distributed Network

Jillian Hamilton

Creative Industries Faculty, Queensland University of Technology, Kelvin Grove,  
Queensland, Australia  
jg.hamilton@qut.edu.au

**Abstract.** Through the adaptation of new technologies, the creative industries are proposing new forms of interaction for the distributed network. This paper considers the new media artwork *Intimate Transactions* as an example of a creative, experimental approach to interaction and network technology. It discusses this artwork's design of physical interaction, which includes whole-body interaction with a hands-free input device; the incorporation of choreographed interaction with its screen characters; the production of generative, multi-sensory feedback around a dramaturgical model; and the use of haptic devices to relay bodily movement across the network. It explains how this physical interaction produces a sense of flow that perceptually suspends awareness of the work's actual site in favour of a shared virtual space. It then considers how this shared space becomes activated by multi-sensory feedback, including the physical sensation of touch. It concludes that these innovative approaches to physical interaction help to establish the potential for embodied communication and co-presence within networked space.

**Keywords:** Interaction Design, New Media Art, flow, telepresence, embodied interaction, network communication, co-presence.

## 1 Introduction

As the processes and roles of interaction design have begun to settle into conventional forms that are transferred between technologies, the arts have started to present challenges to our expectations of what is possible. As Jason Potts and others in the field of complexity theory and evolutionary economics have argued, the creative industries are involved in the process of experimentation, both through the *origination* of ideas and the *adaptation* of new ideas and technologies.[1] Introducing ways of thinking that are situated outside of the computer science and Human Computer Interaction (HCI) models that we are familiar with, artists are adapting input devices and screen interfaces to produce innovations in the field of interaction design. For example, in a recent essay on her contribution to the collaborative new media artwork, *Intimate Transactions*,<sup>1</sup> dancer and choreographer Lisa O'Neill wrote,

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<sup>1</sup> *Intimate Transactions* has been installed at The Block at the Creative Industries Precinct, QUT, Brisbane; the Australian Centre for the Moving Image, Melbourne; Ars Electronica Festival, Linz, Austria; Artspace, Sydney; the Institute of Contemporary Art, London; and Bios, Athens. The project was sponsored by the Australasian CRC for Interaction Design (ACID), the Creative Industries Research and Applications Centre (CIRAC), QUT, Arts Queensland and the Australia Council. See [www.intimatetransactions.com](http://www.intimatetransactions.com)

*[Suzuki Theatre's] understanding of the movement of the body through space influenced the design and structure of the main interaction device, the 'Bodyshelf'. This L shaped shelf, which is the height of a human body, was designed on a slant so that weight is taken off the feet and redistributed across the entire body ... [It] requires the participant to roll and press their back into it to activate the interaction. This helps to focus their attention on their middle body, and removes the usual inclination to control with the hands. The footpad of the Bodyshelf also drives the navigation. It was designed to be moveable so that the participant has to continually re-adjust and transfer their body weight ... as these movements become more intuitive, the participant is rewarded with the feeling that the body is in total play, moving in concert with the surrounding sounds and visual landscape.[2]*

It is perhaps not surprising that a dancer would question the confinement of our physical interaction with computer input devices to gestures of the wrists, hands and mouse, and would instead argue that the whole body should be brought into play. For the field of interaction design, it is a more unexpected move. And, for the user, this approach has created a new experience of the relationship between the body, the input device and the screen interface.

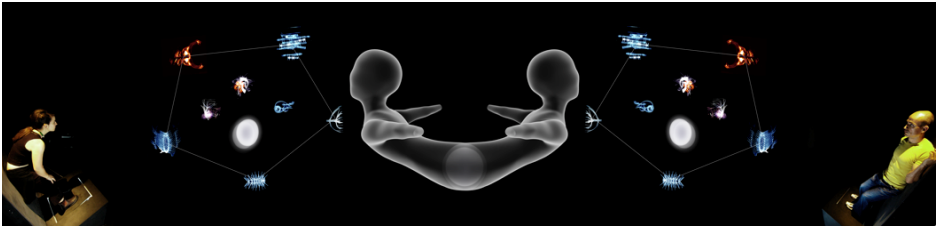
As *Intimate Transactions* evolved into a dual site installation linked by the distributed network, O'Neill's whole-body approach to interaction has produced an additional effect, which has implications for the broader field of network communication. In the networked version of this artwork, the Bodyshelf<sup>2</sup> has come to provide a dual function. At one level, users lean and roll on to it to drive their navigation of an avatar through a virtual environment and to interact with the creatures that inhabit it. In turn, the generative images, colour bursts, and soundscapes that are triggered as feedback are complemented by textured vibrations, which ripple through a haptic pendant on the participant's chest as well as through the Bodyshelf onto their backs. In this way, the Bodyshelf facilitates both interaction with, and feedback from, the screen-world. At a second level, the Bodyshelf facilitates interaction between users located at separate sites. As they both collect assets from the creatures, the vitality of their shared environment gradually slows down and they must co-operate to restore its integrity. They must conjoin their avatars and work in unison to return assets to the creatures. Again this interaction relies upon movements on the Bodyshelf, which navigate the conjoined avatars. And again, the Bodyshelf provides a conduit for feedback. When their avatars are interlocked, the users can feel each other's push and pull through the Bodyshelf. As their motion is relayed back and forth, they become part of a remote, embodied collaboration. Their communication relies as much on touch as vision and sound.

In this paper I discuss *Intimate Transactions*, an interactive new media artwork by the interdisciplinary research team, the Transmute Collective,<sup>3</sup> as an example of a

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<sup>2</sup> The Bodyshelf was designed by artist Zeljko Markov.

<sup>3</sup> The Transmute Collective includes artistic director, Keith Armstrong; choreographer, Lisa O'Neill; and sound designer, Guy Webster. On this project they collaborated with artist Zeljko Markov (design of the Bodyshelf), programmers Marcos Cáceres and Cameron Owen (System Design), artists Benedict Foley and Stuart Lawson (character animation) and spatial architects Pia Ednie-Brown and Inger Mewburn (haptic feedback devices).



**Fig. 1.** Composite image of *Intimate Transactions* showing users at two sites, with conjoined avatars in a shared screen-world. Photo credit: Erica Fish. Artwork: Benedict Foley and Stuart Lawson.

creative, experimental approach to interaction and network technology. I describe its innovative approaches to physical interaction, which include whole-body interaction with a hands-free input device; the incorporation of choreographed interaction with the work's screen characters; the production of generative, multi-sensory feedback around a dramaturgical model; and the use of haptic feedback devices to relay bodily motion through the network. Drawing on the work of social, spatial and HCI theorists, I explain how this physical approach to interaction design takes this artwork beyond harnessing fast-speed data transfer to perceptually diminish the distance between co-located users. I argue that it helps to cause perceptions of the work's actual site (the space of the gallery) to be suspended and increases the sense of presence in a shared virtual space. I then establish that this shared space becomes activated through multi-sensory feedback, including the physical sensation of touch, to produce a form of embodied communication. Through this discussion, I argue that physical interaction, and the transfer of sensory feedback across the network, produces a form of telepresence that can be described as embodied co-presence.

## 2 Embodied Immersion

In a study on user experience of *Intimate Transactions*, HCI researchers Jamie Madden and Stephen Viller noted that users reported a high level of engagement in the work's virtual world, which produced an altered perception of the flow of time.[3] To understand this phenomenon, it is important to understand the approach that has been taken to the design of this artwork. *Intimate Transactions* is unusual as an artwork because it is temporal and processual in nature. Unlike a typical (static and material) art object, it relies upon the user's physical participation to bring it into being, and their ongoing interaction to maintain its presence in the world. This ongoing generation of the work contributes to the transformation of perceptions of time and the space of the gallery, but it is the work's interaction design that largely produces that transformation. The movements that are required to activate the motion sensors embedded in the surfaces of the Bodyshelf shift the user from a relatively passive role to a physically engrossing, whole-body interaction with the work's input device, and with its internal world.

Through reference to the work of several social and spatial theorists, as well as writings on aspects of HCI, I will establish why the space, time and other occupants

of the gallery appear to fall away during interaction with this artwork, in favour of the user's relationship with the work's internal (virtual) environment and a distant, unknown collaborator within it. I will argue that embodied immersion is produced by this interactive artwork in three, inter-related ways: the absorption of the input device into the user's body image, the integration of the screen interface into the user's extended body boundaries, and the activation of surrounding space through multisensory and haptic feedback.

## 2.1 Absorbing the Input Device into the User's Body Image

The first aspect of embodied immersion occurs through the absorption of the input device, the Bodyshef, into the user's 'body image'. Through reference to psychoanalyst Paul Schilder's work on 'body image', the writing of social theorist Elizabeth Grosz helps to explain this effect.[4] Grosz argues that, perceptually, the boundaries of our body image are not fixed but fluid and 'osmotic'. Objects, implements or instruments – from a scalpel or pen to a jet aircraft – become absorbed into our body image when we use them as a tool or medium of expression. During the period of their use, the implements we use become intimate, vital extensions of our body image. When we use a mouse or a joystick as a tool for interaction, this effect no doubt occurs. Much like a pen or a scalpel, we move them as if they are an extension of our hand and arm. We relay our intentions through them, becoming less aware of their physicality than our effect through and beyond them.

The process of absorbing a mouse or joystick is localised and limited to the hand or arm that uses it however. Explaining the process of absorbing tools into our body image in its most complex form, Grosz refers to the example of a vehicle. Describing the process of maneuvering a car, she writes, "Chasing another car or trying to fit into a small parking spot, are all experienced in the body image of the driver".[4] When driving, we experience the vehicle as an extension of our physical self because we must continually anticipate and incorporate the effects of our physical motion upon the vehicle in its entirety. As we determine its motion and direction through our body movements, we must continually take the girth of the vehicle into account to avoid a collision. We must perceptually project our body boundaries outwards, and absorb the vehicle's physical proportions into them, to be able to do so. Interaction through the Bodyshef as an input device works in a similar way.

Like a car, the Bodyshef encompasses the entire body. And, like a car, it requires movements that simultaneously involve both core and peripheral zones of the body to affect navigation. Together, these factors contribute to the device becoming absorbed into the body image in its entirety. And, while the Bodyshef does not actually move as a car does, the enveloping screen-world and evolving surround-sound produce the sensation of such motion. The effect of whole-body movement upon navigational motion through this space means that the user perceptually takes the vehicle – the Bodyshef – with them.

The process of incorporating material objects into our body image is not immediate or seamless. As Grosz suggests,

*Part of the difficulty of learning how to use [implements and instruments] is not simply the technical problem of how they are used but also the libidinal problem of how they become part of the body image, a body shell for the subject.[4]*

This is certainly the case with a car, as anyone who has learnt to drive can attest. It also helps to explain often-reported experiences of interacting with the Bodyshelf. One of the findings of Madden and Viller was that at first it requires self-conscious, intellectual grappling with multiple bodily movements and their various effects in the screen-space but, at some point during the twenty-minute experience of *Intimate Transactions*, a transition tends to occur as the body eases into the pace and rhythm of the onscreen avatar.[3] When it does, the Bodyshelf that sits behind the user has become absorbed into their body image. It becomes part of the expression of the body in action and, as O'Neill suggests above, the user is "rewarded with the feeling that the body is in total play, moving in concert with the surrounding sounds and visual landscape".[2]

## 2.2 Bridging the Space between the Body and the Screen

Besides incorporating the Bodyshelf that sits behind them into their body image, the user also projects forward, to incorporate the field of the screen. A pioneer of interactive cinema, Toni Dove, has pointed out that interacting with a responsive screen interface is significantly different to observing a screened film.[5] The audience of a movie may empathise with a character, and may even 'enter' the screen-space in terms of visual perception (because, as Laura Mulvey points out, film-making conventions tend to assume the spectator's point of view[6]), however the viewer remains physically passive. Therefore, the inactive and disassociated body remains behind. By contrast, the body assumes an active role in relation to a screen avatar. As a user exerts their agency, and the avatar immediately responds to their body's actions, an integrated relationship is produced in which the viewer comes to feel connected with, or 'stuck to', the character. Dove suggests that this 'tug' of the avatar leads to a partial transference of the self into the screen-space. She argues that, "[the subject becomes] simultaneously aware of their presence 'in' their body and 'in' the screen". She concludes that, to overcome this split in location, the subject perceptually traverses the intermediate space, causing it to become 'activated' or 'charged'.

Dove's argument is made in relation to common computer-screen interfaces and mouse-to-screen interaction with an avatar that moves laterally across the screen-space. In comparison, the potential for bridging the space between the body and the screen is maximised in *Intimate Transactions* in two ways. Firstly, because its highly rendered avatars and characters move both laterally and into a third dimension, slipping through a layered series of deeper inner worlds, a spatial depth is produced which 'pulls' the user beyond the surface of the projection screen into a fathomless anterior space. This causes the physical properties of the screen, and the sense of a two-dimensional surface, to perceptually recede. Increasing the 'tug' of the character in this way heightens the sense of 'presence' in the screen-world. In turn, this serves to intensify the perceptual traversal of the intermediate space between the user and the screen.

*Intimate Transactions* further increases the sense of integration with the screen character through the type of body movements that it requires for interaction. These movements were choreographed by O'Neill in line with the Suzuki Actor Training Method.[2] They revolve through the centre of the body, pivoting around a central hinge: what she describes as the body's 'energy centre'. The kernel of these gestures has been transposed into the characteristics of the onscreen avatar, which moves through the same central axis. The movements of the user are thereby simultaneously located both within their own body and within the body of their screen character/avatar. They are mirrored not only in the direction of action, but through the very qualities of movement. This shared gestural expression serves to enrich the connection with the screen character which, in turn, increases the potential for immersion in the activity and presence in the screen-space. This also optimises the potential for a perceptual traversal of the intermediate space.

### 2.3 Immersion through Multi-sensory Feedback

The activation of the space surrounding the user is completed by the multi-sensory feedback that is produced in response to interactions with the screen-world inhabitants of *Intimate Transactions*. In line with her background in performance, O'Neill took a dramaturgical approach to defining their characters.[2] Each creature has been inscribed with a unique personality, causing them to react in highly individuated ways. Some move gently away from movements towards them, others emit screeching, violent vibrations and swirling floods of colour. An interdisciplinary team of graphic artists, animators, sound artists and haptic spatial architects designed this multi-sensory feedback. Regardless of the diversity of this collaboration, the feedback is always combined in concert because it was developed around a dramaturgical model. It is unified by a personality profile, which dictates each creature's style of response. Contingent upon the avatar's relative distance from each of the creatures, a unique combination of changes to the onscreen images; the rhythm, tempo and volume of the sound-scape; and the texture of vibrations is perpetually produced. In effect, an integrated, multi-sensory environment is composed, on the fly, by the user's physical gestures.

The approach of integrating multiple forms of sensory media is not uncommon in the art world. The synthesis of music, dance, poetry, visual arts, and performance can be traced back as far as 1849 and Wagner's *Gesamtkunstwerk* or 'Total Artwork', in which opera served as a vehicle for the "fusion of the arts". It is evident in many genres, from Futurist cinema and Bauhaus theatre to contemporary 'happenings', performance and installation art. The purpose of synthesising multi-sensory media is to absorb the audience in the artwork. Wagner described this effect, writing that, "[the public] forgets the confines of the auditorium, and lives and breathes only in the artwork".[7]

Combining sensory media has a similar purpose in multimedia design. As Randall Packer and Ken Jordon point out, multimedia is intended to "appeal to all the senses simultaneously".[8] It absorbs the audience into the work and diminishes the user's attention to their external surroundings. It is now well established within the field of HCI that even low levels of visual or auditory feedback contribute to a user's sense of

‘flow’ – that is immersion in an activity that leads to an altered perception of time and the exclusion of peripheral surroundings and events.[9] If we extend Wagner’s principle, providing multi-sensory feedback serves to increase the potential for flow and immersion in the work to the exclusion of peripheral activity. *Intimate Transactions*, which triggers integrated layers of surround sound, resonant imagery, and vibration, which engulf the user in response to their interactions, maximises this effect.

*Intimate Transactions* therefore provides us with an example of how embodied interaction can increase the potential for immersion in several, inter-related ways. Its input device – the Bodyshef that sits behind the user – becomes an extension of the body in action and is absorbed into the body image of the user. At the same time, the mirroring of the user’s bodily motility and expression in the onscreen avatar establishes a sense of presence in the screen-space, and a bridging of the intermediate space between the action of the body and the action on the screen. Therefore, both posterior and anterior space is traversed, perceptually embraced and absorbed. As the user performs within this suspended space, they are enveloped by multi-sensory feedback, which further contributes to the diminution of peripheral activity and awareness of the physical site. As Kristine Nowak and Frank Biocca point out, producing such a sense of presence (a compelling sense of ‘being there’ in a virtual or technologically mediated environment to the exclusion of physical location) has been recognised as a key performance goal for interactive systems.[10]

### 3 Embodied Co-presence

So far I have considered how embodied interaction can increase immersion and presence in a virtual environment and its internal activities. Now I will consider how it can make a significant contribution to the experience of online communication. *Intimate Transactions* again provides a useful case study because it operates on two levels of interaction – with the inhabitants of the internal world as well as with a user at a distant site. While users tend to begin interacting with this work by following the established conventions of computer games and collecting an array of assets (flora, insects and crustaceans) from the creatures in the world, after a time their attention must turn to collaboration with another user. The work’s system design is built around a metaphor of ecological footprinting and the impact that the degradation of a local environment has on the global environment. This conceptual framework, which was developed by the work’s artistic director Keith Armstrong, means that the gradual depletion of resources in either of the two users’ interconnected virtual worlds affects the vitality of both [11]. The creatures begin to shudder, images dim, sound softens, and movement slows down. This gives rise to the need for the users to establish a co-operative relationship. To restore the viability of their co-dependent environments, they must connect and collaborate. Their avatars locked together, they must work together to return the assets to the creatures in order to reinstate the integrity of their shared world.

### 3.1 Telepresent Insight and Affect

This relationship between the users is mediated through the distributed network. GrangeNet, which transmits data between sites almost 20 000 times faster than a 56k modem,[12] is used to link the museum locations. This fast-speed data transfer enables aspects of telepresence. It means that a user is able to both affect and observe an event's occurrence at a remote site in real time.

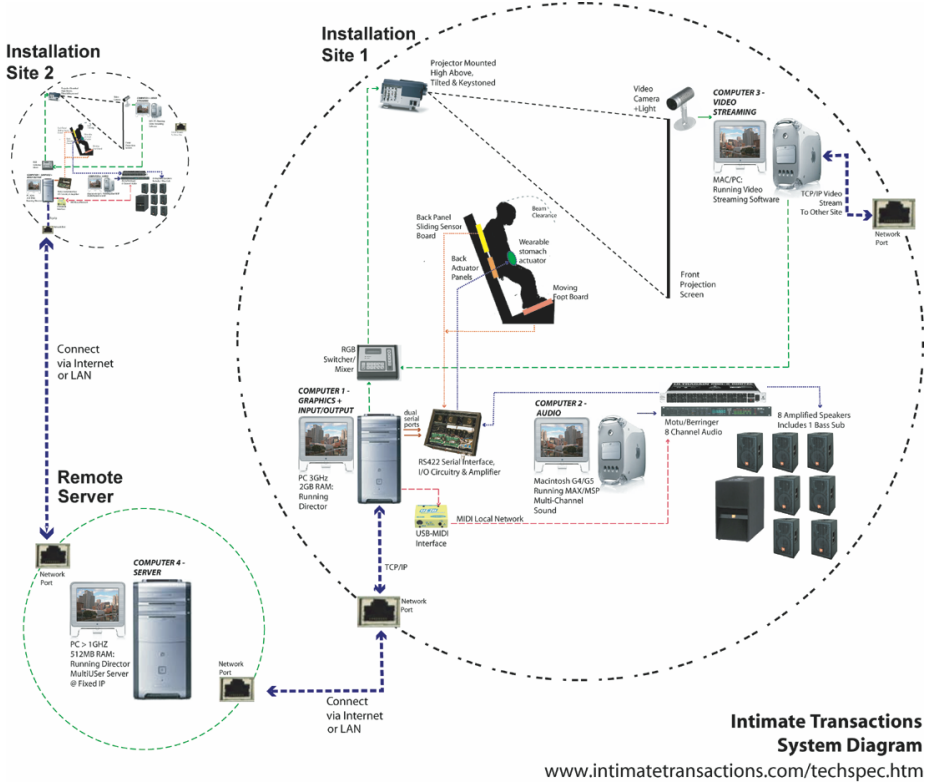


Fig. 2. Intimate Transactions System Diagram. Diagram: Keith Armstrong.

We have become familiar with a number of preliminary forms of telepresent insight and effect that have been delivered by network communication since the end of the twentieth century. For example, we have come to expect news feeds from site after site to bounce off satellites and ricochet through the network to provide us with a kaleidoscopic world-view. And, by entering our pin number at an ATM or ordering a book online, we regularly extend our intentions beyond the screen and through the network to prompt action from databases at distant sites. Such telepresent insight and effect is produced through the perceptual contraction of the space between sites, which is effectively produced through the compression of response time.

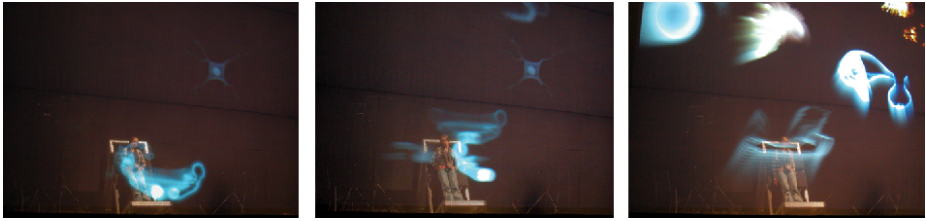


A number of interactive new media artworks harness network technology to experiment with telepresent insight and effect. For example, Jeffrey Shaw's *The Legible City* (1989-90) uses motion-tracking technology to allow visitors to navigate through an external site when pedalling a surrogate bicycle within the gallery. It provides a remote view into another location. Ken Goldberg and Joseph Santarromana's *Telegarden* (1995) uses telerobotics to allow online audiences to control an environment within the gallery. It allows users to affect a distant location. Like these works, *Intimate Transactions* breaches the architectural confines of the gallery and spans geographical distance. However it conjoins two geographically separated gallery sites and combines these aspects of telepresence. As users at each site interact with each other, the distance between sites appears to contract around an interim shared world, which both can see and affect.

According to some theorists, even preliminary forms of telepresence cause us to reconfigure our body image.[5] As we simultaneously act at both the site of our physical presence and the distant site, we reach beyond our corporeal selves, beyond our physical limits, and become co-located. Again, we achieve the sense of being there – 'there' in this context being a distant location rather than an internal screen world. *Intimate Transactions* allows its users to achieve this co-location and sense of being there through presence in a virtual environment that is suspended between geographically separated sites. And, through its embodied interaction, it allows them to experience the sense of being there with someone else.

### 3.2 Embodied Communication

Embodied communication within the shared space of *Intimate Transactions* is produced through two means. The first is inter-identification between avatars. As I have noted in the previous section, avatars provide a visual representation of both users in the *Intimate Transactions* environment and a user's identification with their avatar is increased through its reflection of both the direction and the physical qualities of their motion. It is important to note that the avatar of the second user is similar in form and motility, pivoting through its 'energy centre' to produce familiar expressive qualities. While Madden and Viller suggest that this similarity can potentially lead to difficulties distinguishing between the avatars (they differ only in their visual intensity),[3] it can equally be argued that it serves to produce a secondary identification. Nowak and Biocca suggest that using visual avatars in computer-mediated collaborative environments helps to provide users with a sense of each other's presence.[10] Moreover, they have established that people are more comfortable communicating with those who look like them, and so feel familiar. This suggests that designing similar avatars for both users extends the perceptual 'tug' of a user's own onscreen character to the avatar of the second user. A user's relationship with the other user's avatar is experienced both 'in' the body and 'in' the screen. As one user commented, "Once I saw the other participant, I wanted to dance".[3] This is the experience of co-presence – the sense that a person with whom one is communicating, is in a shared physical space, despite their remote location.[13]



**Fig. 3.** A user on the Bodysshelf engaged in collaboration with another user across the network showing avatar-to-avatar interaction. Photo credit: Peter Cullin

The second form of embodied communication that is produced by *Intimate Transactions* comes about through the relay of haptic feedback between the sites. When their avatars are conjoined, and they work co-operatively to return assets to the creatures, users can feel each other's movements through the Bodysshelf, which presses against their backs. In effect, they can feel the push of resistance or pull of co-operation as they negotiate the direction of the interlocked avatars. This introduction of tactile sensation establishes a physical relationship between the users. It produces an effect that is quite different to that of other telematic art, such as *Telematic Dreaming* by Paul Sermon (1992). In that artwork, two participants lie on beds at separate sites and each sees a high-definition projection of the other beside them. They can react, in real time, to the movements, gestures and voice of this apparition as it is relayed through high-speed video-conferencing between sites. According to some reviewers, *Telematic Dreaming* produces a sensory impression of tactile interplay between participants.[14] But this sensation is achieved synaesthetically. Within *Intimate Transactions*, the collaborator's presence is experienced through a combination of relayed visual representation, surround sound, and physical sensation relayed through the Bodysshelf.

This dual form of embodied communication has quite a profound implication. If, as I have argued in the previous section, the user becomes immersed within the work through their simultaneous absorption of the Bodysshelf into their body image and projection into the screen-world, then it follows that their relationship with the other user is experienced within this suspended space. Their touch is experienced within the space of the Bodysshelf, which has been absorbed into the user's body image, and as embodied interaction within the traversed space of the screen-world. That is, an embodied relationship with someone thousands of kilometers away is wrapped, libidinally, into the intensely intimate space of the user's extended body boundaries. This extends the potential of presence within a virtual environment to embodied co-presence within networked space.

#### 4 Reducing the Distance between Us

At its best, art does more than simply adopt new technologies to illustrate contemporary concerns. It is an experimental site of research that approaches technology, materials and concepts laterally to produce innovation. This is the case with the *Intimate Transactions* project. Its design, including a whole of body

interaction with a hands-free input device; the incorporation of choreographed interaction with the screen characters; the production of generative, multi-sensory feedback around a dramaturgical model; and the use of haptic devices to transmit bodily movement across the network, all make significant contributions to the developing field of interaction design. Together, these innovations combine to produce an embodied interaction, which increases the potential for a perceptual compression of distance between co-located users; an immersive participation within an intimate, suspended space of a shared world; and the sensation of embodied co-presence.

This potential carries significant benefits for the field of networked communication. While online representational relationships that are played out vicariously through avatars in games and virtual environments are not new, they are largely based on visual icons, digital dialogue and/or aural communication. Because they are not configured around face-to-face relationships, they lack the cues that are offered by physical proximity. *Intimate Transactions* provides a model through which networked relationships can move beyond autonomous verbal communication into the realm of a shared corporeal – visual, aural and tactile – engagement. That is, it establishes the possibility of an enriched, intimate transaction within networked space.

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## References

1. Potts, J.: Economic Growth and Creative Industries, Lecture 2 New Economics of the Creative Industries (2007)
2. O'Neill, L.: Placing the Participant in the Performing Role. In: Hamilton, J. (ed.) *Intimate Transactions: Art, Exhibition and Interaction within Distributed Network Environments*, Australasian CRC for Interaction Design: Brisbane, pp. 36–43 (2007)
3. Madden, J., Viller, S.: Am I the Lighter One? Awareness in a Dual Site Networked Installation. In: Hamilton, J. (ed.) *Intimate Transactions: Art, Exhibition and Interaction within Distributed Network Environments*, Australasian CRC for Interaction Design: Brisbane, pp. 98–105 (2007)
4. Grosz, E.: *Volatile Bodies; Towards a Corporeal Feminism*. Allen and Unwin, Sydney (1994)
5. Dove, T.: The Space Between: Telepresence, Re-animation and the Re-casting of the Invisible. In: Reiser, M., Zapp, A. (eds.) *New Screen Media: Cinema/Art/Narrative*, British Film Institute, London (2002)
6. Mulvey, L.: Visual Pleasure and Narrative Cinema. In: Bennett, T., et al. (eds.) *Popular Television and Film*, British Film Institute, London (1981)
7. Packer, R., Jordon, K.: Multimedia from Wagner to Virtual Reality (accessed, September 2006), <http://www.artmuseum.net/w2vr/timeline/Wagner.html>

8. Packer, R., Jordon, K.: *Multimedia from Wagner to Virtual Reality*. WW Norton, New York (2001)
9. Pace, S.: A Grounded Theory of the Flow Experiences of Web Users. *International Journal of Human-Computer Studies* 60, 327–363 (2004)
10. Nowak, K.L., Biocca, F.: The Effect of Agency and Anthropomorphism on Users' Sense of Telepresence, Copresence, and Social Presence in Virtual Environments. *Presence* 12(5), 481–494 (2003)
11. Armstrong, K.: Towards a Connective and Ecosophical New Media Art Practice. In: Hamilton, J. (ed.) *Intimate Transactions: Art, Exhibition and Interaction within Distributed Network Environments*, Australasian CRC for Interaction Design: Brisbane, pp. 12–36 (2007)
12. Wickham, G.: (Infrastructure Development Group, AARNet): Email correspondence with the author, 'How fast is GrangeNet?' (9 October 2006 11:51:44 AM)
13. International Society for Presence Research. *The Concept of Presence: Explication Statement* (2000). (Accessed, August 2007), <http://ispr.info>
14. Grau, O.: *Virtual Art: From Illusion to Immersion*. MIT Press, Cambridge Mass (2003)