A Space Between

At Together Elsewhere I asked the audience to join me in the following exercise:

I would like you to join me in thinking about the spaces between us. When we are seated together in a room, bathed in light, we can see a particular relationship among us. The configuration of chairs, pockets of empty seats. In this room, I can see those of you close to me and make out the details of your clothing. I can see others, who I perceive to be further away because they are fragmented and obscured by those in between. The light that bounces about this space, tirelessly traveling in straight lines, makes it possible for me to approximate such distances. I exploit clues, like my perception of scale, saturation of color, relative speed of movement. These clues combined with the horizon line implied by the meeting of walls and floor help me to understand where you are in relation to me, in relation to my eyes. These clues suggest a space between.

But in this room we are not just bathed in light. The space between us is also filled with a network. This network is invisible; unlike light it travels in all directions. This network is air. Just for a moment, listen to yourself...
breathe. Before you leave this room, the air that just left my lungs will travel through each of yours. Carbon dioxide liberated by the movement of your bodies and expelled by your lungs will enter me. Oxygen that you do not use will fuel me to give this talk. Through our breath we are connected in this space at the level of blood. Through our collective breath we become one.

For some, this realization is uncomfortable, disquieting. As a New Media artist, I feel this realization is vital.

The works and ideas I discuss in this paper are works that strive to understand the spaces between us in terms aligned more with the image of a collective breath than with images made possible by light. They are works that strive to understand space from the perspective of embodiment and agency. Like the air in the room described above, they are works created collaboratively through the efforts of many. In this regard they are works I have initiated and shared in but do not own.

**Historical Context**

Artists have been long interested in the ways that telecommunications technologies can integrate with and reshape traditional creative practices. Through their work artists have sought to understand the experiential nature and creative potential of the spaces that emerge within telematic systems.

The earliest of these works were characterized by explorations into spaces defined and informed by the remote simultaneous image. These works created a kind of telescopic view of the far made possible by the emerging technologies of satellite image transfer and teleconferencing. Prescient among these was Vera Frankel’s *String Games: Improvisations for Inter-City Video* (1974). The piece drew its title and interactive structure from the two-person children’s game *Cats Cradle*. The work was staged in the Bell Canada Teleconferencing labs that connected Toronto and Montreal. Performers engaged in a series of real-time video-mediated improvisations that played of the duality of the string game and the paired nature of the conferencing lab. Similar in structure, but

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conceptually distinct is the communication sculpture *Hole in Space* (1980). In this work Kit Galloway and Sherrie Rabinowitz created a visual and aural intersection of people walking past the Lincoln Center for the Performing Arts in New York City and “The Broadway” department store at the open air Shopping Center in Century City (LA). The public became performer in this work as the distant image served to connect people on the street and, on its second night, long-separated family and friends.

Following these early satellite driven works, but before the ubiquity of the Internet, a number of artists began exploring the potentials of telerobotic pieces support by telephone connections. Eduardo Kac created several works that relied on telephone-connected spaces including his collaborative work with Ed Bennett, *The Ornitorrincro Project* (1989-1996). In this work, users had the opportunity to visually explore a remote space through the camera “eye” of a small telephone keypad–controlled robot. Video images from the perspective of the robot were returned in near real-time to the person at the telephone control. Like *String Games* and *Hole in Space*, these works relied on the transmission of remote images and the construction of a visual field for users to understand the ways that telecommunications technologies were bridging geography.

Distinct from these works, and in some ways most influential to the events that this paper describes, was *Telephonic Arm Wrestling* (1986) by Canadian artists Norm White and Doug Back. As the Web was still a “dream for poor little artists,” this work created a connection across space via telephone line and like other works relied on a point-to-point linear communication structure. Significantly, the artists abandoned the screen for this work and in so doing created an experience that, long before others, imagined a kind of telepresence that was not optical, but active.

*Telephonic Arm Wrestling* connected people through their energy, not their image. The idea “was to allow contestants in two different cities to arm-wrestle, using motorized force-transmitting systems interconnected by a telephone data link” and “you could almost feel the pulse of the other person … it was uncannily human-like – the sensation of sinews and muscle – not at all like feeling a machine.” The two identical force-sensing mechanical

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arms, constructed of scrap parts and custom electronics, were successfully exhibited through a telephone link-up between the Canadian Cultural Centre, Paris, and the Artculture Resource Centre, Toronto (Canada) and again later between Toronto and University of Salerno (Italy).  

The rapid proliferation of the Web through the 1990s opened a vast array of new communication possibilities and new models for communication. The Web’s structure and reliance on asynchronous communication achieved through an information storage and retrieval model creates a distinct kind of telepresence. Ken Goldberg and Joseph Santarromana produced the influential installation *TeleGarden* that elegantly made use of these asynchronous properties. “The *TeleGarden* is an art installation that allows Web users to view and interact with a remote garden filled with living plants. Members can plant, water, and monitor the progress of seedlings via the tender movements of an industrial robot arm.”9 This piece employed the Internet as a kind of distributed eye (and hand) allowing remote users from around the globe to tend a central garden housed at the *Ars Electronica* museum in Austria. Initiated in 1995, the piece was retired in 2004.

**Inter-connecting Days**

Since the spring of 2005, I have coordinated five telepresent events that have partnered in various combinations New Media students from Ryerson University, Integrated Media students from OCAD, graduate students from SUNY Buffalo and InterAccess Electronic Media Arts Centre in Toronto. These events have been produced in association with undergraduate and graduate classes in physical computing, networked objects and/or telepresence at each of these universities. Each event has involved 25 to 60 emerging and established artists/students situated in physically disparate locations presenting unique networked interfaces and experiences. In this regard, these are collaborative works that I initiated and developed but do not own.

I was most interested in working in active social spaces that were informed by White and Back’s strategy of embodied participation and agency, rather than creating continuations of the progression from telescopic to distributed eye. The organizing principles of these events were informed by the many sources and pre-Web art works outlined above and, for clarity, may be succinctly re-articulated with the words of Eduardo Kac, who claims that in the context

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of high-speed data networks, “the shortest distance between two points is real time.” In other words, two remote spaces can be made to feel experientially like one if they are connected with real-time communication networks.

Our telepresent events have been conceived as creative response and experiential investigations into the consequence of mapping communications systems over physical space. By developing projects that distribute, merge and entwine, in real time, participant energy throughout and across the networked system we seek to understand the relative roles of embodiment, interface design and network structure on the experience of space and each other. As such we have encouraged the production of experiences that are driven by active audience participation. We have in this context found that the majority of our most successful interfaces link multiple physical systems rather than provide opportunities to remotely control media playback systems.

There are three fundamental but distinct transformations that user interfaces have to address in embodied telepresent works. The first is movement of the participant’s body into virtual space – this is really a form of energy transformation that captures participant energy and moves it into the network. The second transformation is the distribution of this energy across the system. Finally, the original user energy is re-embodied and given form or agency in the receiving interface. Combined, these transformations in, across and out of the system create the telepresent experience. In this context the most challenging experiences employ interfaces that are animated only when a user’s energy brings them to life.

To achieve these conceptual goals our events purposefully operate at the level of electronic circuits and the Internet, rather than at the level of the desktop applications and World Wide Web. A typical node in these events consists of do-it-yourself (DIY) electronic interfaces connected to an Internet backbone. We employ a broad range of production strategies merging and overlapping interface design, physical computing and networking layers to create an overall experience. We have used Arduino, basic stamps and pic microcontrollers and have connected to the Web with old-fashioned cables, WiFi, serial-to-TCP/IP links, xBee radios and Bluetooth devices. Our Web and network communication is usually handled with PHP, MAX/MSP or Processing and JAVA.

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At the end of our first event it was clear that communication networks could reconfigure space, but it was also clear that space does not simply collapse. Telepresent audiences in our systems are not in a single tele-unified space but rather paradoxically are in simultaneous yet distinct hybrid realities of one and many spaces. Perhaps more important, the various events have revealed that tele-present experiences depend critically on the kinds of network relationships that are constructed to support them. While a full understanding of how network structure affects experience is only emerging,\textsuperscript{12} the network topologies of our events have significantly shaped the extent to which a space collapsed by real-time communication systems is perceivable and identifiable as one. Several of our interconnecting events, each with its own distinct network topology, are informative in this regard.

\textit{Power and Perspective} was mounted in the spring of 2005. Students from Ryerson University created works that were physically located in the Image Arts building at Ryerson and a few kilometers away at InterAccess Electronic Arts Centre (then located at 401 Richmond St., Toronto). The two physical spaces were innervated with multiple data streams between locations (nodes). Experiences within nodes were also \textit{intra}-related, richly sharing user energy. It was fascinating to watch, at each location, the audience flow in synchrony with the distant movements of other groups, not just in response to local events.

The \textit{Art of Tom Foolery} (April 1, 2006) event involved multiple pieces that emphasized inter-connections between physical sites but not local connections among the works. The simultaneous and parallel works in this event were each structured as a kind of tele-mirror of the remote node with their own distinct network stream supporting the experience. Each of these works did create the internal impression of contiguous telepresent space. However, the lack of explicit node-level intra-connections prevented the previous global experience of being in a single tele-collapsed space at the scale of the site.

While acknowledging that a sense of deep wonder is established when physical locations are separated by the breadth of the globe, we sought to examine the playfulness that can emerge when spaces are separated by scales closer to those traversed by the body. As such the next events \textit{Sources and Sinks} (2007) and \textit{Imperial Measures} (2008) attempted interconnections that employed three physical nodes. These events were conceived to purposefully subvert the point-to-point structure that dominates models of communication

and intended to explicitly create a web topographically as well as topologically. We presented these interconnected experiences at Ryerson, OCAD and InterAccess. With these events we had hoped to strongly encourage audience flow from site to site, not just achieve space-collapsing connectivity across sites. Again, the works revealed that carefully conceived systems could collapse space. However, the ambitious idea of creating a flow of people across physical space as well as through telepresent space revealed the limits of audience participation. Systems that seek to explore topographic connectivity must be spatially scaled very carefully. Physically distanced locations that are too far apart can become too taxing.

These experiences are dramatically contrasted by the outcomes of Cross-border Disputes, also held in the spring of 2006. This event was a simultaneous show of works by makers at Ryerson and Buffalo (NY). A variety of factors including security concerns led us to link the spaces with temporally asynchronous file transfer protocol (FTP) methods rather than real-time streams. Asynchronous connections are behaviorally similar to the experience of downloading a Web page (interfaces for the show remained DIY and were for the most part screenless). Information must be requested and delivered rather than allowed to flow between sites. Characteristic of these kinds of connections is a time lag between the occurrence of a local user-event and the remote inter-nodal experience of such events. This lack of immediate, real-time connection left the two physical sites dislocated and while both groups of artists hosted great local successes the communication bridges between them did little to transform space.

Unframing Telepresence

It is clear to me that network structure is strongly influencing our ability to construct telepresent works. But it is also becoming clear that real-time communication on its own is not on its own sufficient to create a rich experience. Real time is necessary to collapse space, but user feedback makes that collapse meaningful. In our systems where local feedback is richly woven into a local site the fact of connection becomes more knowable. When feedback fails, the sites are experienced as dislocated. When the system provides feedback channels that users can manipulate the space comes to be understood more intuitively and spaces collapse palpably.

I believe that much of the richness in our events is a reflection of new potentials made possible with Internet-driven communication networks. With Internet-based systems, multiple layers of experiential feedback can be woven into physical sites. With as little as $20 in parts and an IP address anyone can connect to anywhere on the Net and have at hand the elements of an
embodied telepresent experience. In this new communications context we can produce works that address questions of remote agency in ways never before imagined. It is now conceivable to plan and produce multichannel as well as multiuser, fully networked (by that I mean organizationally, spatially, temporally and socially) experiences that I constantly reconfigure our sense of space and time. This ability represents a radical shift from how previous telematic works were structured.

I have also come to realize that the spatial qualities that do exist in telepresent works are not optical; they are relational. To attempt to understand them as spaces only from a perspectival sense is to misunderstand their true character. I am coming to understand the distance between us in these works as a social distance and that such distances can be mediated through the structuring of relationships. This represents an important shift in thinking because it allows me to re-approach the question of telepresence not from the perspective of what can I see, but rather from within a notion of what can we share.

Based on these experiences, my understanding of telepresence has shifted tremendously. We expand the original statement by Kac and observe that space can be not only collapsed with real-time communication but also pushed apart by mediating the temporal relationships of a system. It can be made to expand and contract, as if breathing, by modulating data rates on the fly. Further, the configuration of the network, socially and technically, can dramatically influence how space is experienced as reconfigured. The hybridization of distant topographies and the bringing together of distant audiences is greatly controllable through network topologies. These too can be altered dynamically such that none of these relationships need be stable through time. We no longer need to be together or apart, but at least theoretically, can be at every distance in between.