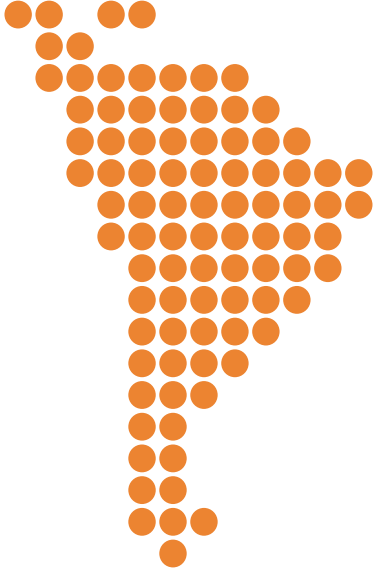

DANCE AND DIGITAL MEDIA PERFORMANCE WITH TELEPRESENCE AND TELEMATIC METHODS

Lisa Naugle
lnaugle@uci.edu

John Crawford
john.crawford@uci.edu

Abstract

In this paper we discuss a series of dance and media performance works spanning almost 20 years through which we have explored concepts of telepresence and telematic art. We trace the origins of these terms: telematic referring to collaborative, multi-site art projects utilizing computer and telecommunications technologies; and telepresence referring to the feeling of being physically present within the distributed computer-mediated environment. Our projects use the Active Space networked media system, a collection of media objects for creating interactive performance environments based on motion tracking technology. Cameras capture the movement of the performer, the system processes the moving image through feedback loops and related methods, and projections merge video layers between multiple sites. The nine works described here include an early project integrating

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dance, music and drama over dial-up computer links; several dance/media projects using the high-performance research computer networks of the Internet2 consortium; and a new multi-year program of research into innovative forms of distance collaboration combining dance with advanced digital media technologies. Telepresence in the performing arts is simultaneously situated and defined within multiple realms, physical, digital, and phenomenological. Our work endeavors to make connections between these realms, and among the participants, using progressive composing techniques that integrate synchronous and asynchronous learning experiences with a focus on improvisation.

Keywords

Dance, Digital media, Performance, Telepresence, Telematic

Introduction

Building on the work of the pioneering artists and scientists who developed early concepts of telepresence and telematic art, we have used such methods since 1996 in the creation of a series of dance and media works that engage performers in the concept of progressive composing. Working with a variety of pre-professional and professional performers, including dancers, musicians, composers, media artists, we integrate synchronous and asynchronous learning experiences with a focus on improvisation as an enduring approach to art-making. Progressive composing recognizes and responds to diverse research interests and goals that participants bring to all phases of development, rehearsal and performance.

In this paper we briefly discuss the origins of contemporary approaches to the use of telepresence and telematics methods in art making, then provide an overview of several dance and digital media performances we have created, and finally discuss the *Virtual Venues* concept, a new research project working with distance collaboration and real-time interactivity.

For almost fifty years, adventurous artists have adopted telecommunications technology as a platform for creative projects. Early examples include the interactive video "happenings" organized by Alan Kaprow and associates in 1969, works by Claes Oldenburg, Robert Smithson and others in the 1969 *Art by Telephone* exhibition, and the 1970 online hypertext exhibit created by Ted Nelson and Ned Woodman.

In 1977, Kit Galloway and Sherrie Rabinowitz staged *Satellite Arts Project: A Space With No Geographical Boundaries* which demonstrated "that several performing artists, all of whom would be separated by oceans and geography, could appear and perform together in the same live image" featuring the Mobilus Dance Troupe in "an interactive dance concert amongst geographically disparate performers, two in Maryland and two in California (http://www.ecafe.com/getty/SA). On video monitors at these locations was a composite image of the four dancers, who coordinated

their movements, mindful of the latency, or time-delay, with those of their remote partners projected on the screen" (Shanken, 2003: 60).

In *Cybernetics to Telematics: The Art, Pedagogy, and Theory of Roy Ascott*, Edward Shanken claims that the first work of art to use computer conferencing was *Sat-Tel-Comp Collaboratory*, a 1978 project produced by the artist Bill Bartlett in the Open Space Collaboratory series. "The emphasis of Collaboratory was on production, collaboration and idea exchange. It acted as a catalyst that linked technology, art and community. The installation and related events were a laboratory for the experimental arts and the use of the computer, telephone, communication satellites and video" (Shanken, 2003: 61). (See, also: http://www.openspace.ca/node/1397).

Roy Ascott's "Is There Love in the Telematic Embrace" traced the origin of the term "telematics" to a 1978 French government report where the term *télématique* referred to the convergence of computers and telecommunications. In this seminal essay, Ascott presents his vision of telematics as a medium for the creation of collaborated, distributed art:

> Telematic culture means, in short, that we do not think, see, or feel in isolation. Creativity is shared, authorship is distributed, but not in a way that denies the individual her authenticity or power of self-creation, as rather crude models of collectivity might have done in the past. On the contrary, telematic culture amplifies the individual's capacity for creative thought and action, for more vivid and intense experience, for more informed perception, by enabling her to participate in the production of global vision through networked interaction with other minds, other sensibilities, other sensing and thinking systems across the planet—thought circulating in the medium of data through a multiplicity of different cultural, geographical, social, and personal layers. Networking supports endless redescription and recontextualization, such that no language or visual code is final and no reality is ultimate. (Ascott, 1990: 243).

Shanken points out that Ascott conceives art as a "map of actual and potential relationships" in contrast to "the idea of art as a window on the world." He sees telematic displays as "screens of operation" rather than just representation, where the "telematic screen gives the individual mind and spirit worldwide access to other minds and spirits," enabling expanded "cognitive, affective, and spiritual behavior" (Ascott, 1990: 243).

In 1980, the computer scientist Marvin Minsky proposed the term "telepresence" to describe robotic systems that give a human operator the feeling of being physically present in a different place (Minsky, 1980). Subsequent work by the cognitive psychologist John V. Draper and others describes telepresence as "a mental state in which a user feels physically present within the computer-mediated environment" and "the projection of human consciousness into a computer-mediated environment" (Draper, 1998).

Active Space

Our dance and media projects make extensive use of Active Space, (http://as.embodied.net), a networked media system designed to facilitate the use of telepresence and telematics methods in experimental performance. The system simplifies the process of creating interactive performance environments through a collection of custom real-time media objects developed by intermedia artist and software designer Crawford in association with choreographer Naugle, with contributions from other collaborating artists.

Implemented using a mix of custom-built software, commercially-available products and open-source media programming tools, the Active Space media objects include systems for multi-channel live video and audio processing, generative animation, musical composition, mediabase storage/retrieval and high bandwidth networking. Associated motion tracking objects perform real-time sensing and analysis of location, speed, duration and various other characteristics of movement. The results of this analysis can be used to generate video and audio in response to movement.

Motion tracking involves real-time sensing and analysis of location, speed, duration and various other characteristics of movement. Motion capture is the technique of sampling movement in 3D space and creating graphical representations derived from the resulting numeric data. Typical applications of motion capture tend to produce realistic animations, but the aesthetic focus of our work goes beyond realism to explore notions of non-linear association, embodiment and reflexivity. The interplay between improvisational and compositional elements is of particular interest.

Active Space has been developed to make effective use of high-performance research computer networks such as those provided by the Internet2 consortium (http://www.internet2.edu). The Internet2 network, which began operation in 1999, linking about 30 US universities with 2.5 Gbit/s bandwidth,[1] now connects over 500 member institutions worldwide at 100 Gbit/s.

Performances using the Active Space system situate human interactions in relation to cameras that capture the movement of the performers. The system responds in layered feedback loops that re-situate the participants in other locations and enables real-time with collaborators from hundreds of miles away through video projections that merge video layers between multiple sites. The media system itself becomes a message, or series of messages, an embodied sequence of codes, exchanged among performers and between performers and viewers/audience.

Clearly the body as mediated by the Active Space system and related telematics methods is more ephemeral than live performers, an entity that cannot exist without the presence of viewers somewhere else. The body in telepresence exists at a distance, but is validated and made meaningful through interactions with others who are physically out of

reach. In this context, dance may become a model path for thinking, in that dancing and dance-seeing are knowledge of the sensory effects of movement in general.[2]

When technology assists us in bringing forth performances where others can experience and share in a virtual world, the virtual dance becomes as desirable as the real. Real-time representations of dancers bodies and musicians bodies mixing in layers on screen are more than complex imagery in a themed performance; these are agents of change, allowing the viewer to witness a mediated version of the thinking process with others on stage. Having the advantage of being here and there, we contribute to that discourse. (See figure 1)

Cassandra Project (1996)

When the *Cassandra Project* was presented on December 15, 1996 as a work-in-progress performance, the dancers, musicians and technologists located in New York City and Vancouver, Canada could not have known how their work would come to influence subsequent performances, research papers and student thesis projects. Using only a dial up connection each site began by sending images several hours before the concert. Musicians and technical staff in New York were gathered in a studio at NYU and a Greenwich Village loft across the street from the famed Blue Note Jazz Club, while the Vancouver group, despite treacherous snow conditions, gathered on Burnaby Mountain in a computer lab at Simon Fraser University.

Three sites, simply defined as the dance site (Simon Fraser University), the music site (New York University) and the drama site (Greenwich Village loft) proceeded with the following guidelines, creating material in "stages of interaction." These stages required performers to alternate, one site taking initiative and the other site responding. The duration between the stages overlapped at times and opened up possibilities for improvisation. *Cassandra Project* generated guidelines that became useful for subsequent telepresence projects:

- Each site remains a creative center, specialized in its own form of art.
- All sites will be interactive: each will respond artistically to the other sites.
- Each site starts on its own an individual event:
  - Drama making text available on their Web page and has an actor participate in the multimedia dialog.
  - Dance presenting live movement through a CU-SeeMe window embedded in their Web page.
  - Music sends loops from the performance, digitized and uploaded onto their Web page.

The stages of interaction provided us with a way to anticipate and technical challenges and aesthetic directions and move the work forward.

Figure 1. John Crawford with the Active Space media performance system (2006).

Janus: Ghost Stories (1999: http://embodied.net/project/janus-ghost-stories)

Several years would pass before we had the resources and technical support to produce another telepresence project. *Janus: Ghost Stories* (1999), featured in the IDAT '99 International Dance and Technology conference at Arizona State University, explored the theme of simultaneously looking back (memories) and looking forward (envisioning). Linked by a two-way videoconferencing system, a solo dancer and a media artist were located in Arizona, a musician was in California and audience members were at both locations.

Songs of Sorrow, Songs of Hope (2001: http://embodied.net/project/songs-2001)

Two years later, with colleagues at University of California, Irvine (UCI) and New York University (NYU), we staged *Songs of Sorrow, Songs of Hope*, a telepresence concert connecting theatres in New York and California. Performed live in both locations, dance, music and processed video animation was interwoven between the two sites. This concert was a response to the World Trade Center attacks on September 11, 2001. The Active Space system projected visuals featuring flags of the many countries that lost citizens in the attacks, composited with dance footage, both live and pre-recorded.

Based on our experiences with *Songs of Sorrow, Songs of Hope*, we concluded that Internet2 could indeed be an effective platform to support multi-site live performance. The live video feed from Irvine intermixed wide shots with close-ups using a hand-held camera onstage, and this made an important contribution to the frequency and quality of interactions, as the "camera performer" captured extreme close up movement motifs during the dance. The choreography and decision making process of the camera performer was visible to the audience and performers at the New York site, contributing to the feeling of presence at a distance.

Reverse Patterns (2002: http://embodied.net/project/reverse-patterns)

Cultivating Communities: Dance in the Digital Age was a 2002 telepresence performance event connecting ten sites nation-wide (http://events.internet2.edu/briefings/200301.html). Our contribution, *Reverse Patterns*, an intermedia dance, music and video telepresence performance, was staged simultaneously in Los Angeles and Irvine, California and distributed to the ten sites nationwide via Internet2.

Crawford and his Active Space system at the Bing Theatre in Los Angeles generated video imagery in connection to the movements of dancers located at University of California, Irvine. During the

performance, the Active Space motion tracking system continually measured various characteristics of the dancers' movement performed real-time analysis of these measurements to detect "visual timbre" and "motion envelope" information, creating visuals that presented a mediated view of the dancer's performance, continually changing and evolving. The system also displayed video clips from a library of pre-processed dance animations, also in response to the dancers' movement. The dancers (one located at each site) were accompanied by a musician-composer, at the Irvine site who responded to their movement and to the video imagery.

The intention of *Reverse Patterns* in the integration of choreography with digital media was to explore intrinsic aspects of gesture related to building character within the capabilities of the Active Space vocabulary. In particular we looked evocative graphics that gave the perception of expanding the space around the physical body. We were interested in metamorphosis from one form to another and the aesthetic persistence of appearing and disappearing.

Figure 2. Live and virtual dancers in Ootoo (2006).

Entangled Photons (2004: http://embodied.net/project/entangled-photons)

Inspired by the physics concept of quantum entanglement, which Albert Einstein called "spooky action at a distance," *Entangled Photons* was presented by the California Institute for Telecommunications and Information Technology (Calit2), at the University of California, Irvine. *Entangled Photons* linked the Calit2 courtyard on the outdoor, ground floor with the indoor eMedia Studio on the building's second floor. This telepresence intermedia performance, presented simultaneously at two sites, was linked through the Active Space system.

Ootoo (2006: http://embodied.net/project/ootoo)

One of our most ambitious telepresence projects to date, *Ootoo* (pronounced "ooh-too") observed the process of the dreamer and investigated ways in which fragments from a day can get reassembled during sleep, sometimes in strange and unpredictable ways. This performance featured a cast of eighteen student dancers on stage at University of California, Santa Cruz (UCSC), interacting with seven dancers at University of California, Irvine (UCI) using the Active Space system, directed by John Crawford with two choreographers, Ted Warburton (UCSC) and Lisa Naugle (UCI).

Building the idea proposed by Giges and Warburton that telepresence and embodied media in performance gives the audience a new relationship to performer and stage, we add that practical training of contemporary dancers, directors and choreographers must include new approaches to teaching and learning dance technique in relationship with technology (Giges, 2010). The critically thinking dancer is as important as the live media presentation

In the *Ootoo* performance, Naugle directed 8 performers in movement sequences derived from improvisation sessions over a fourweek rehearsal period. Calling the sequences while observing the actions at the distant site, Naugle was responsible for the order and timing of events for the UCI dancers. The aim was to have a cueing system that allowed movement ideas and dramatic themes to unfold for the live audience at the distant site and also for graphic elements to "breathe" with the other performers. We developed a system that allowed time for listening and reading of situations. The fragmented identities of the performers at the UCI site represented the dream state of the performers at the UCSC site, simultaneously abstracted through the Active Space system and magnified by dancers' decisions to locate themselves in close proximity to the video camera.

From a choreographic perspective, one of the more challenging sections of *Ootoo* was the creation of a visual effect consisting of one line of dancers, with performers at both sites joined. In rehearsals we explored where each individual would go in relation to each other to create one

line between the two sites. A sound cue signaled the performers at both site to join and solve the task in real time.

Songs at a Distance (2007: http://embodied.net/project/songs-at-a-distance) and Synchronicities (2008: http://embodied.net/project/synchronicities)

Songs at a Distance and *Synchronicities* were intermedia telepresence concerts with interactive dance, music and video, staged simultaneously at two sites: California and New York in 2007; California and New Jersey in 2008. Live dance, music and processed video animations generated at both locations were interchanged between the two sites over Internet[2]. Student dancers and faculty media artists using the Active Space system at University of California, Irvine tracked the movement of dancers performing structured improvisations. In response, the composition systems produced synthesized video and audio combining live and pre-recorded vocals and visuals to create a mediascape screened simultaneously at both sites and streamed live over the web.

Virtual Venues (2012-14: http://vv.embodied.net)

Virtual Venues is a multi-year program of research and creative work directed by Crawford, with participation by Naugle and other collaborating artists. The performing arts domain is providing the initial context for research into innovative forms of distance collaboration involving artists, scholars and technology researchers, with results expected to be also applicable to education, health care, entertainment, consumer devices and other areas with potential for commercial research and development.

Participants in the project include UC Irvine faculty and selected students who are currently active or interested in telepresence, telematics and multi-location interaction, working together to develop and present a series of telepresence networked performances linking rehearsal studios, concert halls and theatres at multiple campuses, using advanced digital media technologies not commonly available in such settings.

Beyond simply connecting auditoriums in a videoconference, the Virtual Venues concept is envisioned as a rich telepresence performing arts capability based on advanced digital media technologies, advancing the notion of a shared audio/visual environment with participants at multiple locations, interacting in real time. This research will point the way to new methods for connecting theatres and performance studios with classrooms and public spaces, with the potential to extend such connections to homes, dormitories, hospitals, vehicles and handheld devices using scalable network capabilities. The Virtual Venues concept is envisioned to include state of the art performance and editing studios, control rooms and high performance computing facilities, all deeply connected to create a responsive media environment that is immersive and engaging for performers and audiences alike.

The organizational objectives of the Virtual Venues Project are: (1) to connect faculty and students from multiple campuses using a distributed collaborative model, informed by existing expertise; (2) to research and implement new systems and processes to establish an unprecedented level of inter-campus collaborative activity including but not limited to the performing arts; and (3) to demonstrate and disseminate these capabilities within a wider public context.

Conclusion

When we compare the processes and the products of telepresence performance with other forms of dance or music performance, we are aware of how each genre defines its own telos, techne and excellence. The telepresence performance is simultaneously situated and defined in multiple realms, physical, digital, and phenomenological. Reflecting on our involvement in performances using telepresence and telematics methods beginning in 1996 and continuing today, we see the expansion of research that includes diverse fields and has expanded its ability to join with others at a distance.

Endnotes

1 Gigabits per second, a measurement of data transfer speed.

2 Susanne Traub. *Dancing is thinking – on the relationship between philosophy and dance:* http://www.goethe.de/ges/phi/eth/en8820849.htm

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Biographies

Lisa Naugle, Professor and Chair of the Dance Department at University of California, Irvine earned her M.F.A. from NYU Tisch School of the Arts and Ph.D. in Dance Education from the Department of Music and Performing Arts Professions. Her choreography has been presented in Eastern and Western Europe, Asia, South and North America. She first articulated the concept and method of "distributed choreography" in her 1999 article, "Distributed Choreography: A Video-Conferencing Environment" and is recognized for her solo improvisation performances integrating dance, interactive video and live music. From 2008 to 2012 she was Director of the Improvisation/ Choreography Summer Intensive in Malaga, Spain. In 2009, Lisa founded DTM2 Improvisation Ensemble. In 2010 she was selected by the Alwin Nilolais Foundation and honored at Lincoln Center for continuing the legacy of Alwin Nikolais. Lisa holds a courtesy appointment at NYU. At UC, Irvine she teaches choreography, improvisation and pedagogy.

John Crawford is an intermedia artist, interactive performance director, projection designer and technology developer. Intersecting software with digital media and theatrical performance, he uses computers and video to create painterly animations and motion graphics for dance, theatre and music. His projects explore embodied interaction, combining processed video and digital animation with motion capture, real-time motion tracking, image processing and telepresence. He originated the Active Space concept in 1994 to describe his intermedia performance systems that produce visuals and music in response to movement. His work has appeared across North America and in Asia, Europe and South America, including theatre and dance performances, dance films and telepresence networked performances linking studios, concert halls and theatres in multiple locations. He is Associate Professor of Dance and Media Arts at University of California, Irvine and has been a visiting artist and researcher at numerous universities in the United States, Europe, China and Japan.