Telemediated Art: The Utah experience with the ADaPT (Association for Dance and Performance Telematics) Collaboration

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Abstract

Great opportunities exist for the use of emerging network technologies to develop “Telemediated Art”, which we define as art created and/or performed using modern networking techniques involving artists at different geographic locations. This paper presents different views on this emerging activity. The views and experiences described here are those from the Utah and Ohio participants in the ADaPT collaboration and they represent the viewpoints of artists, technical engineers and administrators of technology.

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Introduction

Great opportunities exist for the use of emerging network technologies to develop “Telemediated Art”, which we define as art created and/or performed using modern networking techniques and involving artists at different geographic locations. Several projects have demonstrated that this is a real possibility: (http://apps.internet2.edu/demos99/oct.htm, http://www.okgigapop.net/FineArts/). More recently a dance application (http://www.digitalworlds.ufl.edu/sc2001/default.asp, http://apps.internet2.edu/html/arts.html) was awarded the most creative use of network bandwidth at SC2001 (http://www.sc2001.org/), the premier conference in high end computing and networking.

Successful projects in this area of research require three fundamental components:
   i)  Artistic excellence and desire to explore this new artistic medium.
   ii) Technical expertise in high end computing and networking.
   iii) Project management expertise to coordinate the diverse participants and guarantee proper execution of the projects.

In this paper we analyze how the University of Utah has developed these three fundamental components to support our participation in the ADaPT (Association for Dance and Performance Telematics) collaboration.

Background and Environmental Considerations

Art Technology focus in the College of Fine Arts

Digital technology has revolutionized the arts in many ways and at a pace never before seen in history. Entire art forms have been transformed and new art forms are appearing at a dizzying rate. No longer a peripheral endeavor, computer technology has become central to much of what we do in the College of Fine Arts. And while traditional art forms and disciplines will not be replaced nor diminished, emerging digital forms offer new possibilities for the development of curriculum and artistic expression in institutions of higher education.

The world wide web has significantly broadened accessibility to the arts for students and art enthusiasts of all ages around the world. With the advent of Internet2 (www.ucaid.edu), and the availability of full motion video with sound across distance, artists are becoming increasingly fascinated by the possibilities of creating with new aesthetic forms and modes of expression. The College of Fine Arts is committed to continuing and perhaps pioneering the use of telemediated space as a creative, interactive tool, and has committed substantial resources in support of this activity.

The ADaPT collaboration

The objectives of ADaPT are to develop a virtual venue for telematic collaborative inquiry for the purpose of developing new models of practice and training techniques for the creation of networked dance and performance. To this end ADaPT attempts to develop a shared mediated space for investigating performance and creative collaboration through a distributed environment across time zones. It is also important for the collaboration to situate its research within a larger cultural and political context that
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acknowledges how mediated performances both frame and are framed by issues such identity, privilege, and access.

Since March of 2001 members of ADaPT have been meeting monthly on-line to experiment with a variety of methods and processes for distance collaboration. What has emerged from these experiences is a fuller understanding of the nature of telematic space. While it is possible to create on-line events in which dance/performance, music and other elements contribute to the presentation of a live event in a single location, our research has led us also to the creation of telepresent events that exist only on the Internet. In addition to our monthly online videoconferences, the group also maintains a discussion and planning mail list. The discourse on telematics that has emerged can be visited on our websites. (http://isa.hc.asu.edu/adapt [http://www.dance.ohio-state.edu/workshops/ips3.html [http://www.dance.ohio.state.edu/workshops/ipstheory.html]).

Internet2 initiative at Utah

The Center for High Performance Computing has the responsibility to support and develop Internet2 type of projects at the University of Utah. While more traditional engineering and scientific applications are a natural fit to advanced network technologies the fit is less clear for fine arts applications. As part of this mission CHPC has dedicated resources to enhance and facilitate the participation of Utah in the ADaPT collaboration. Technology administrators should realize that full support from faculty and administrators is necessary to foster these activities, which require significant commitment from all the participants. For instance, CHPC has dedicated a significant portion of a senior media specialist to the project; the media specialist has also access to network engineers to support network resources. Our experience shows that it is unrealistic to expect any significant progress in this area without assembling a cohesive team of artists, technical engineers and administrators of technology.

Telemediated art requires unique facilities that are not usually available in University settings. It is common to find either “electronic conference facilities” for teleconferencing activities, and traditional performance studios. Telemediated art requires a hybrid that, in general it is not available. The lack of adequate facilities was apparent from the outset of our project. After several trials in existing facilities it was decided that to make significant progress in the project, it was necessary to develop a unique facility dedicated to telemediated art. The College of Fine Arts has allocated a space of approximately 3,000 sqr. feet for these activities. The space has been furnished with a direct connection to the University network backbone to mitigate possible adverse side effects from advanced network uses on the remaining users in the College. The space also has been furnished with traditional performing equipment such as theatrical lighting, sound, marley floor, drapes, scrims for projections, etc.

Telemediated art and in this case, performance telematics, requires extensive digital support in the form of cameras, projectors, workstations and networking. In terms of digital support, there are two areas that need to be discussed, audio/video visual equipment and audio/video processing equipment. In our current setup, see Figure 1, we have access to three Canon, two GL1 and one XL1 digital video cameras. We utilize 4 video/data projectors, three Sony VPX1L-15, and a Sharp Notebook. Additional equipment includes a Panasonic video mixer, a Mackie CFX-12 12x4x1 mixer, two speakers and subwoofer.
Figure 1: Current set up of the Telemediated Art Space in the College of Fine Arts at the University of Utah.

The audio/video processing equipment includes an Apple Mac Dual 800 Mhz G4 workstation, with MacOS X used primarily for video capture and broadcasting. We have used the Sorensen Broadcaster 1.1 and have now begun using Quicktime 6 Broadcaster. In addition we have five dual 1.4 GHz AMD processor Windows 2000 systems for receiving the video streams from the other sites. Four of these systems are connected to the projectors while a fifth is used for text communications.

All the data that is generated or gathered funnels through three network switches and a campus backbone router before being transmitted to the ABILENE network (http://www.ucaid.org/abilene/). The connection to the ABILENE network is currently at a speed of 155 Mb/s; the University of Utah aggregates traffic with other institutions in the Intermountain region through the Intermountain GigaPop operated by UEN (Utah Educational Network, http://www.uen.org/) connecting to the ABILENE backbone at the Denver POP.
Practical Experiences and Aesthetic Considerations

ADaPT sessions

It is difficult to convey the power of a telemediated art session in a paper format (see discussion below), but in this section we attempt to provide some basic information on how these sessions evolve and present some pictorial representations of their results. Note that in the ADaPT language these sessions are commonly referred as “contacts”. In a typical contact, once that connectivity has been established, a pre-selected set of participants send video/audio feeds to the community.

Each member site conducts its research cooperating as a team, which renders each videoconference a collaboration among multiple teams. The studio set up and physical space in each location vary, and the online sessions connect the five sites across three different time zones. Each site adheres to specific hardware and software standards and communication protocols that were chosen, but new conventions and techniques of real-time performance dialogue (including delay and echo functions, mixing and remixing) are beginning to be established. Conventions of the World Wide Web (browsers, windows, URLs, etc) are part of the configuration, while older notions of the book (web pages) and theatrical dialogue (person-to-person communication) are displaced by screen-based image interfaces: telematic dance exists as transmitted images for remote seeing, and thus it resembles online television/cinema. The process of mixing, which is indebted to cinematic/televisional and musical practice and to the new digital sampling, compositing and filtering operations provided by the computer, has supplanted traditional choreographic process in many crucial ways. Online performers primarily compose with selections of video/audio data, camera angles or sensor-controlled interfaces, and of course with software and the operations embedded in it. Thus the notion of "distributed choreography" is at best metaphorical. In the virtual laboratory of interconnected distances, performance process has shifted from physical object (movement, gesture, voice, etc) to electronic signal, which can be constantly modified in real time by passing it through filters and combining it with other data and interfaces. The mobility, energy, and expressive quality of dance as mixed, combinatory video and sound streams need to be understood within the logic of this particular cultural interface: telepresence links us through little QuickTime movie screens on our computers. At the same time, our contemporary kinetoscopes can be enlarged via video projectors, and simulations of a 3-D environment can thus create a virtual stage just as easily as it is done in video-projection environments in a theatre or installation.

We rely on an experiential process of investigation. Given that we are rehearsing the functionality of the technology as well as ideas of content and form, we employ a number of different methodologies, and each session is dealt with in a slightly different manner. For example, we might designate one site as the director with other participating sites responding to instruction. Direction in this context can mean a multiplicity of tasks and sensitivities: from communicating camera moves/framing (i.e., if the director wants to work with scale differentials for example, s/he might instruct the camera operator in one location to zoom in or out at a particular time). Direction can also include very specific instructions for the performers execution of movement qualities, use of props, facings/relationships to the frame, or ways of interacting with other performers from other sites. What has also occurred is that we enter the process with very specific ideas,
and once all the participants are engaged within an environment of image, movement and sound, we enter an improvisation experience that is metaphorically contained, yet fluid enough to maintain a dynamic evolution. In these situations the concept of authorship vanishes and we all become equal participants in a telepresent event.

**Interactivity**

Within this telematic environment interactivity is at the root of the aesthetic experience, as it is through the myriad varieties of blending and mixing that the potential for meaning emerges. Through the language of movement and gesture, dancers from each site interact with each other in time, while simultaneously responding to/interacting with the space of the frame in which their image is projected. In this way, interactivity can be defined quite literally and traditionally as two or more dancers moving together and responding to each other. While the sense of touch in telepresence is non-corporeal, the dancers make contact through the shape, space and dynamics of human movement. Future plans call for adding motion capture devices to the telepresence environment. Interestingly, when there is a delay created by the network, the "events" of motion are liberated in time from the bodies executing them. This creates the sensation of a double present: the first now as it happens in real time and the second now as it is experienced in relationship with the other gestural artifacts from the other sites. These experiences give the performers and viewers the opportunity to feel time and space in subtly new ways.

In the first Adapt sessions, the various sites contributed visual material that consisted of a variety of rich imagery/activity: tight shots of a violinist playing, hands against a black background slowly tearing white strips of paper, a performer slowly wrapping her head in bandages, etc. Each of these images were continuously mixed together and sent out again, often creating enigmatic and evocative juxtapositions. In this way then, interactivity refers not only to causality, but to the spontaneous interaction of images and sound and their emergent, fluid and relative meanings.

The composed video feed(s) is re-sent to all the participants for comment and discussion. This method of communication and direction is quite inadequate, as giving feedback by inputting text is laborious, time consuming and requires attention, immediately pulling one out of the experience. It is anticipated that voice communication will dramatically improve the process and the immediacy with which suggestions can be made, thereby having an appreciable effect on the artistic outcome. It is important to realize that this media allows for multiple composite images depending upon the different combinations of sites and timing used in the compositions. As mentioned below this diversity of the experience can increase even more if multicast could be used. In the following section there are three visual examples and descriptions of the interactive and compositional processes of three telematic contacts. While these pictorial examples can be informative, they pale when trying to convey the fullness and dimensionality of a time-based art form.
Example One

Image 1.1: A graduate student from the University of Utah moves in front of the video camera while watching her image being projected on a wall (not shown). Image captured at the University of Utah.
Image 1.2: In the foreground, the Utah dancer image is visible on the screen of a laptop and it is also being projected onto a wall. In the background, a University of Wisconsin student is moving with the projected image of the Utah student, while her image is also being shot, mixed and projected onto a wall. Image captured at The University of Wisconsin.
Image 1.3: The camera operator in Madison, University of Wisconsin, is framing only the Wisconsin student hand and the result is a lovely and delicate hand duet that eventually grew to involve arms and heads. The two dancers at Utah and Wisconsin worked within the telematic environment to touch, cradle and merge with each other. Image captured at the University of Wisconsin.
Example Two

**Image 2.1:** In the foreground, a student of Ohio State University is visible on the screen of the laptop while it is also being projected onto a wall (not shown). In the background there are two students from the University of Wisconsin, who are moving with the projected image of the Ohio student, and as in Image 1.3 above, their images are also being shot, mixed and projected onto a wall. Image captured at the University of Wisconsin.
Image 2.2: The mix of the two feeds from Image 2.1 generated a trio. Image captured at the University of Wisconsin.
Image 2.3: Four different feeds viewed simultaneously. From right to left: a student from the University of California, Irvine, a student from Ohio State University and two students from University of Wisconsin. The last feed on the left, is a mixed feed coming in from Arizona State University with the students from Wisconsin with delayed images of themselves, creating a quartet. Image captured at the University of Utah.
Example Three

Image 3.1: Utilizing a video mixer, an image of a student of the University of Utah is inserted into an image of a student from the University of Wisconsin. The mixer has generated a filter on the image of the Wisconsin student, rendering it colorized and in its negative. The box at the upper right corner, which contains the image of the Utah student is able to be moved within the larger frame and while doing so, reveals and conceals different parts of the student’s body. With both dancers moving, the entire image is one of color and motion. Image captured at the University of Wisconsin.
Image 3.2: Utilizing the same effects used in 3.1, the inserted screen is split between the Utah student and a student from Ohio State University increasing the sense of motion and interactivity even more. Image captured at the University of Wisconsin.
Image 3.3: Repeating the same ideas from images 3.1 and 3.2, the three dancers have been directed to relate to each other both in terms of movement and in terms of the space in which their projections are seen, resulting in an improvisation of simultaneous and multiple architectures. Image captured at the University of Wisconsin.
Image 3.4: The dancer from OSU watches and interacts with the projected image of another dancer from Utah. This process is projected onto another screen. All of these layers are recorded by video creating a complex space of illusion, perspective and interactivity. Image captured at Ohio State University.
Remaining Issues and Future work

Limitations of current technologies and plans to upgrade

For over a year now we have been experimenting with the Sorenson Broadcaster 1.1 for Mac OS. Although it has been sufficient to get the project started, we have found several issues that force us to find a more consistent and higher quality video broadcasting package. Each site’s outgoing video stream is reflected from a QuickTime server at Arizona State University. This server generates only unicast streams, not allowing us to take advantage of multicast streams. Our goal this year is to test Apple’s QuickTime 6 Broadcaster and have each site set up a QuickTime server locally, eliminating the single point service at ASU. QuickTime 6 utilizes MPEG-4 technology and is capable of broadcasting in multicast.

Figure 2: Proposed design for the Telemediated Art space in the College of Fine Arts at the University of Utah.
Another problem of the current design is that we need to use computers to “receive” each site broadcast. If we chose to individually display each site, this requires five additional computers and projectors. We can only use the monitor output for the projections which makes it impossible to mix RGB video without purchasing five scan converters. A scan converter takes the RGB signal from the monitor and converts it into NTSC video. Our ultimate goal is to broadcast using hardware encoders and decoders such as Vbrick or Minerva systems. Each site would have one encoder and four decoders. This is very appealing in that the codecs have direct NTSC video connections allowing us to connect directly with video switchers and mixers.

The third issue that has been problematic is the inability to communicate in realtime during the performance. We have used cell phones and chat programs to communicate instructions to other sites while attempting to direct a contact. The solution to correct this problem requires building a separate communications system that is independent of the performance system. The communications system will utilize Access Grid technology to create a realtime, five-way link with each site. Over this connection the technical crew and director can relay instructions, cues, and comments in parallel to the event taking place. The proposed design is given in Figure 2.

Presentation of the results

Traditionally academic activities have presented their results using two media, papers and/or videos. Certainly a traditional academic paper is without doubt insufficient to present the results of telemediated art research, because it cannot capture the temporal richness of the activity. While it is expected that the results of a project like ADaPT can be described better using video technology, it has become apparent that even video technology is not sufficient to adequately describe telemediated art. There are two serious deficiencies in the video presentation:

i) In a video presentation it is not possible to preserve the sound of the original event while adding commentary on the aesthetic and/or technical aspects of the process. As the sound is an essential part of the artistic activity, it can not be eliminated.

ii) In telemediated art there are endless possibilities for a wide range of aesthetic experiences, as each site can integrate or “mix” the network feeds in different ways. The static and linear nature of the video makes impossible to preserve this unique characteristic of telemediated art.

Our experience with ADaPT indicates that these limitations are directly related to the linearization of the material necessary to include it in a video stream. We postulate that using DVD authoring technology, (http://www.apple.com/dvdstudiopro) this can be avoided, because it is possible to present different video streams, still images and sound, while depicting textual material commenting on aesthetic and/or technical issues. To test our hypothesis we are in the process of developing a DVD demonstrating the ADaPT collaboration activities.

Sensitive Studios

At this point in our project, we are at the very beginning of shaping our understanding of the aesthetic opportunities offered by interactive, distributed environments, i.e. telemediated art, especially if we take into consideration the possibilities of online
interaction across vast distances and time zones. One of our main tasks is to transform our studios into virtual laboratories that enable us to rehearse new performance operations which will inevitably be connected also to media and art practices, interface designs, and visual and sonic languages. In this sense, the Internet provides an extended studio for creative production, as it compels us to play with spatial attention to moving image and sound interfaces. We play with simultaneity and asynchronicity, loops and superimpositions, with delays, break-downs, and temporal suspensions that are part of new kinds of cultural conversations and identifications. What concerns us in the exploration of performance on the Net are the intersections of technology, body and code; the aesthetics and politics of programming, the poetics of online communication or online contact improvisation, and the relays between architectural structures, institutional structures and distributed networks. As practical research, telematic dance thus challenges the physical parameters of the studio frame and the framing of dance on film/video. The principles of networked dance, and especially the organization or structuring of content and the appearance of transmitted digital "performance objects," will evolve from the use we make of the sensitive studio environment and the collaborative techniques of real-time media creation.

**Theoretical Concerns**

Telematics may provides a bridge between individual artists in different parts of the globe, empowering exploration and exchange of ideas not necessarily tied to political or economic conditions. Direct connections between artists in disparate locales provides the basis for a new trajectory, where the artists closest colleagues and confidants are actually geographically dispersed and where local traditions and practices are readily shared electronically. The invisible networks created become online communities of artists and scholars who share their artistic and cultural information in the process of collaborating and creating distributed works of art. These works can be easily shared with an ever-growing electronic audience. With the extensive deployment of broadband technologies, the opportunities for this type of online communication and collaboration may increase and move beyond academia. Telepresence is a considerable challenge for the field of dance since we have no existing aesthetic or cultural models for real-time dance interaction with a physically remote location, nor do we know much about the role or presence of our potential Internet audiences. The bridging of spatial distance via telecommunications, especially if we are operating in camera-originated environments, allows us to examine the emerging conventions of "networked dance" as new types of montage, layering, filtering, editing, mixing, and transcoding. These techniques or conventions will to a certain extent be derived from our experience of staged multimedia performance, scenic design, lighting, video, and electronic music. In this sense, networked dance can also be considered an extension of our prior experience with the technical production and cultural aesthetics of videodance. In terms of audience address, the webcasting of telematic dance could be considered a form of online "site-specific" installation.

In telepresence, the relations between the real and the virtual are always paradoxical, and the staging of online performances foregrounds the ambiguous nature of being "present" in a camera-originated and transmitted environment. The telematic dancers can interact with each other, and navigate image-interfaces while being captured
in real-time. The "shared mediated space" is not real but an effect of digital layering or compositing, and thus the interacting performers are also "users" at the same time. If they choose to open QuickTime windows of each site together with the composite site, they would be witnessing five different image-interfaces streaming at the same time, creating a panorama of movement images and sonic worlds. Acting over distance here means that the performers have to accommodate the intoxicating instance of the continuous digital streams and respond immediately to events on the screen or in the projection. The dancer in one site cannot physically affect or manipulate the information on the screen. But the dancer's response can be captured and transmitted, and thus entered into the continuous stream and mixed with other transmissions. Telematic dance is polymorphous movement in a shared stream.

The drive for meaning-making through artistic expression is at the core of the human experience and is the ground from which springs the creation and appreciation of all works of art. As we engage with artistic works, the multidimensionality of our personal, social and cultural histories are brought to bear in the moment, defining both how we see, experience and also construct our world. This too is a form of interactivity and perhaps ultimately it is the primary force behind these investigations. Advanced network operations provide for the creation of telematic space, a metaphoric space of imagery and sound, in which we have the potential to meet, interact and find meaning.

Institutional perspective for program development

ADaPT’s research directly addresses a primary goal of the College of Fine Arts, which is to successfully integrate digital technology with more traditional forms of artistic expression by supporting the use of emerging computer and networking technologies. The College believes the best way to accomplish this includes:

- Updating the College network and computer technologies to better support existing classes, and to pave the way for new directions toward better integration of computer technology in the arts.
- Developing new and/or expanded space to support our exploration and integration of digital technologies in the arts.
- Coordinating with other Colleges, especially the Center for High Performance Computing, the School of Computer Science and the Graduate School of Architecture, to foster and encourage interdisciplinary thought and collaboration in the creative process and digital technology.

The work of ADaPT has led other faculty in the College to wonder about the relevance of this kind of technology to their own creative processes. The College is fostering the expansion of this research area in a number of ways. This includes identifying faculty already using digital and networking technologies in their creative process, introducing these individuals and groups to one another in the hopes that they will begin to build a community around technology research in advanced networking, assisting them in identifying funding sources, arranging tours of facilities that support Internet2 access to stimulate their thinking, and more.

It is important to note that this research promotes trans-disciplinary activities involving students and scholars other than dancers, say media artists, visual artists, musicians, sculptors, engineers, biologists, communications scholars, etc., as it offers
challenges on more than one front, since the trans/media aspect of the work opens it up for many different aesthetic or communicational models of operation.

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