BEING THERE - AND GOING BEYOND

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Abstract: As the use of information technology and Internet grows and as globalization of economy increases geographical dislocation of work teams, electronic support for collaboration (groupware) assumes increasing importance. Yet, there is little agreement on the best direction of its design. One of the natural approaches is partial emulation of physical work space by software but influential literature argues against this and it appears that current groupware follows this opinion. This paper presents both sides of this debate, argues that easily adaptable space-based groupware is the most powerful and fruitful underlying metaphor, and describes the principles of an application built on this principle. It is also noted that because groupware and socialware face similar challenges and have similar needs, a common framework could simplify their development and improve their quality.

1 INTRODUCTION

The importance of applications supporting collaborative work (groupware) grows proportionally to the spread of information technology, Internet accessibility, and geographical distribution of work teams. All of these factors have, in the last decade or two, grown much more prominent and it is thus natural that the number of groupware applications and tools supporting spatially distributed collaboration is rapidly growing as well. Yet the nature of groupware products still varies widely and there is no single generally accepted philosophy underlying their design.

Collaboration requires a variety of functionalities, such as synchronous and asynchronous communication, shared access to documents, support for user groups, facilities encouraging informal communication, and others. Many specialized products support one or more of these needs at the exclusion of others and are successfully used; e-mail and chat are the most obvious of them. However, there is a general agreement that the best way to support collaboration is to integrate all required functionalities into a single product (Andriessen, 2003). In the rest of this paper we will be mostly talking about such integrated products, calling them groupware *environments*.

As mentioned above, there is not much consensus on the nature of software support of work teams. Some environments are built on the principle of artificial 2D or 3D worlds (Collaborative Virtual Environments, or CVEs) (Greenhlag, 1999, Lea, 1997), while others are GUI-based. CVEs are most useful for those applications that require manipulation of geometrical objects, such as in architectural design, whereas GUI-based environments are widely used in areas where focus is on verbalized concepts and text-based artifacts, such as software design. This paper focuses on GUI-based environments. Within this category, three different metaphors have been used: document-based, meeting-based, and virtual space-based. The metaphor selected by the designer depends on the intended application and on the developers' view of what constitutes the focal point of collaboration.

Document-based groupware such as Foldera (Foldera, 2007) and CURE (Haake, 2004) is based on the fact that a major goal of computer-based collaboration is creation and sharing of documents. Foldera, for example, revolves around the concept of a folder of project documents that also serves as the basis for other activities. An e-mail created within a Foldera project folder, for example, is kept within the project context and propagated to project team members.

Meeting-based groupware such as Marratech (Marratech, 2005) stresses the importance of

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communication. In applications based on this principle, collaboration revolves around meetings held in virtual rooms, and powerful software supports various forms of communication and document sharing.

Virtual space- or room-based groupware, such as CVW (Maybury, 2001) and EnCore (enCore, 2007), is based on the intuition that when physical collocation is impossible, virtual collocation provided by a virtual space consisting of interconnected rooms and emulating those aspects of the physical world that are important for collaboration is the best metaphor. This approach found support in several studies (Harrison, 1996, Churchill, 1999), and various research projects in the 1990s explored the idea via prototypes and products such as Orbit (Orbit, 199?), worlds (Fitzpatrick, 1995), and TeamRooms (Roseman, 1996). Recently, however, interest in environments of this kind has diminished and we are not aware of any new research or products based on this metaphor. One of the major reasons for this appears to be an influential article published by Hollan and Stornetta in 1992 (Hollan, 1992), which argued that the assumption that the assumption that the best approach to the use of technology for collaboration based on emulation of the real world is flawed.

This paper examines Hollan and Stornetta's position and argues for its generalization. In the following, we will first explain Hollan and Stornetta's main points. We will then describe several applications that explore or support this position. The concluding section summarizes our position and points out that the principles that we propose apply not only to groupware but also to socialware.

2 'BEYOND BEING THERE' - THE ARGUMENTS

In an influential paper called 'Beyond Being There' published by Hollan and Stornetta in 1992, the authors begin by noting that groupware designers use an unquestioned presupposition than when physical collocation is not possible, its emulation (creating an artificial sense of 'being there') is the best groupware paradigm. According to authors, such systems can never become as good as physical collocation because imitation by its very nature cannot be as good as 'the real thing'. Using emulation, distant collaborators will thus always be at a disadvantage with respect to their collocated coworkers and the only viable approach to put distant coworkers at an equal footing is to develop tools that would be preferred over face-to-face communication even by collocated workers. The authors then note that modern communication media can provide certain functionalities that exceed those offered by physical collocation and that exploring these and taking advantage of them can help us go beyond the limits imposed by emulation. They point the way by analyzing collaboration in terms of collaboration needs, media available to realize them, and mechanisms that allow meeting the needs in a given medium.

Physical collocation is the traditional collaboration medium and computationally-mediated communication provides a new medium. While collaboration needs are the same in both media, the mechanisms may be different and their realization more or less difficult in a particular medium. As an example, eye contact and gaze awareness are an natural and important mechanism of face-to-face communication, but very difficult to achieve in computationally-mediated communication. However, assuming that certain mechanisms are required for collaboration may be wrong because they may be replaced by different and equally effective mechanisms in another medium. To support their position, the authors then discuss examples of several electronic tools.

The first example is e-mail, perhaps the most successful form of computationally-mediated communication. Its success is due to the ability of electronic communication to support asynchronous communication, which is much less effectively achievable in 'real world'.

The next example is their own tool supporting 'ephemeral interest groups' of people who find shared interests around information objects and form short lived groups engaging in informal communication around these objects. This facility can again be much more easily realized in an electronic communication space where objects such as documents can be equipped with hooks to which such communications can be attached. Because of the importance of informal communications for work (Issacs, 1996, Whittaker, 1994), this facility adds a new dimension to collaboration, one that even collocated workers will like to use, where they will not have any advantage over distant coworkers, and where distance ceases to be a factor in collaboration.

The last example is the introduction of 'personas', information objects providing instantaneous access to relevant information about people such as participants in ephemeral

communications. Because people seek out other people more than anything else this tool again provides something that collaborating individuals will want to use, whether they are collocated or not.

Hollan and Stornetta anticipate that their position will meet with criticism, select the most important potential objections, and offer the following arguments in defense:

- Advantage of imitation. Some mechanisms available in real world cannot be implemented by imitation. Moreover, limiting our interest to only existing mechanisms prevents us from finding better mechanisms.
- Culture. Conventional communication takes place against a rich backdrop of cultural characteristics. However, new media and new tools always rapidly lead to the development of new cultural mechanisms providing a best fit to the new medium. Attempting to port mechanisms optimal in one medium to another medium is suboptimal and new mechanisms may surpass those working in the old medium.
- Intersubjectivity. Face-to-face communication takes advantage of the symmetrical status of the communicating parties, such as the fact that both see the same objects and one another. Electronically mediated communication cannot achieve this. However, controlled intersubjectivity may be an advantage, for example by allowing a user to redefine priorities that would otherwise be dictated by collocation, or by using non-intrusive awareness mechanisms.

Ideas presented in this important paper have several consequences. One was that they encouraged researchers to explore new approaches that go 'beyond being there', taking advantage of possibilities offered by electronic communication and not available in the real world. The other was that the paper discredited approaches based on emulation of the real world, chief among them groupware based on the virtual room metaphor.

To illustrate the first point and clarify what 'beyond being there' could mean, we will now give several examples of tools that were at least partially stimulated by the appeal to liberate design from its grounding in physical reality.

3 BEYOND BEING THERE - SELECTED PROJECTS

The following examples are selected from papers that cite Hollan and Stornetta among their motivating references.

3.1 Virtually Living Together

An important aspect of communication is its emotional component. This is the issue addressed by Tollmar and his coworkers (Tollmar, 2000) in examples given in a paper largely dedicated to a design process that the authors recommend for creating and testing new media for interpersonal communication. The thrust of their experiments with 'telematic emotional communication' is to explore 'sensorial modalities that provide richer and subtler forms of telepresence than text, sound, and image', particularly in close relationships. In this sense, their work is aimed more at social communication but has relevance to groupware as well

Tollmar's examples include several simple but innovative devices including The Frame, The White Stone, and 6th Sense. The Frame is an indicator of a person's presence at a distant location. It consists of a display showing a photo of the person of interest, raised or dimmed depending on whether the person is or is not present. The purpose of the White Stone is to support a feeling of emotional awareness of another person. It consists of a pair of devices, each equipped with a heat or touch sensor and a beeper. When one of the persons activates the device by touching or holding it, the other device beeps and can be used to respond in the same way. The 6-th Sense is a 'Light Sculpture', an assembly of several individually controlled lamps. The person remotely controlling the sculpture can vary the intensity of individual lights creating a choreographed display communicating emotional presence of the other person.

How do these experiments relate to Hollan and Stornetta's ideas and to groupware? Hollan and Stornetta suggest that technology is best utilized by finding uses that go beyond imitation of physical reality and these three devices explore this concept.

3.2 Mutually-Immersive Mobile Telepresence

Jouppi's paper (Jouppi, 2002) describes an experimental system that allows users to visit remote locations using a robotic surrogate. The work was

motivated by the recognition that face-to-face meetings cannot be successfully replaced by existing technology and that business travel is expensive. The authors identify difficult to imitate aspects of collocation, including the width of the visual field, high resolution, identification of gaze (eye contact), directional sound, spatial mobility, and ability to manipulate objects. Mobility is identified as the key parameter because it enables casual encounters and autonomous exploration of remote space. Virtual space solutions have not achieved expected results and the authors thus explored encounters mediated by a remotely controlled robot usable by technically non-sophisticated users, unobtrusive and natural to use, focused on essential aspects of collocation, and inexpensive. An essential design criterion was to provide an immersive experience for both the remote user and the visited users.

Because immersive experience can only be achieved by relatively sophisticated technical parameters, the researchers spent much effort on technical issues: The navigation system has been designed for obstacle avoidance (multiple sensors and custom software), teleoperated robotic arms are equipped with haptic feedback for object manipulation, and multiple displays mounted on the robotic platform provide approximate physical presence of the remote user. Signals from eight cameras on the robot are combined to approximate human vision of the surrounding space. Sound captured by several microphones and played back by multiple speakers can be controlled with respect to the relative volume of the four audio channels and is digitally processed to deal with problems such as echo of the sound transmitted between from one location and replayed at the other end.

Authors report that while reaction to the first encounter with the robot is a surprise, users soon start to interact with the remote person much as if they were collocated. The experiment is considered a success and authors conclude that the concept has the potential of an economical substitute for many types of business travel.

How does this research relate to the philosophy of groupware design based on the concept of going 'beyond being there'? Instead of imitating physical world, MIMT uses technology to create an intermediate layer that provides a feeling close to collocation. However, MIMT does not satisfy Hollan and Stornetta's condition that the technology should put the remote user at the same level as collocated team members. Robot-mediated co-presence may be satisfying but is only second best to real co-presence.

3.3 The Swisshouse

Swisshouse (Huang, 2004) is an 'inhabitable interface', an experimental building constructed to explore support for various forms of co-presence of 'unsophisticated users' distributed across continents. The prototype is a combination of a physical environment and computer support designed not only for collaboration but for general multi-modal communication across distance. The building combines built-in video and audio components with RFID tags worn by users and purpose-designed reconfigurable architecture. Some of the activities considered in the design were information finding and browsing via inhabitable interfaces, teaching and learning involving both collocated and distant participants, art exhibitions, and meeting and brainstorming across distance. The design provides several axes of variability: reconfigurability of physical space, modularity and adaptability of embedded hardware, and software programmability.

The building consists of easily reconfigurable spaces divided into places such as a semi-private Knowledge Cafe with a small kitchen, media spaces used for break-out sessions and private conversations, Personal Spaces, and a Digital Wall with rear projection for information sharing, distance learning, interactive presentations, exhibitions, etc. Events at one node are visible at other virtual sites and vice versa. Thus, for example, identities of current visitors, their locations, and time zones are displayed on the basis of RFID tags and stored information. The prototype building had been in use for two years and used for activities such as virtual cocktail parties, remote lectures, brainstorming sessions, and cultural exhibitions. It is in daily use.

How does this work relate to 'beyond being there'? Whereas Hollan and Stornetta focus of going beyond imitation of existing real world structures, Swisshouse transcends conventional architectural typologies in which new media technologies are added to existing architecture, and offers architecture in which both the inhabitable and the media technology are primary building blocks. Although the project does not emulate real world but includes and extends it, one could argue that Swisshouse builds on the real world and thus departs from the original spirit of Hollan and Stornetta's paper.

3.4 Chit Chat Club

This project (Karahalios, 2005) explores a 'social virtual-physical hybrid' media space. It brings

together physically- and virtually present individuals by means of a schematic human-like sculpture equipped with networked multi-media interfaces. Its goal is to explore whether relatively simple means can minimize the disadvantage of physical separation and provide the benefits of on-line communication such as low risk interaction. The assumption is that a physical interface (the sculpture) can provide a focus for communication, become an interaction catalyst, and alleviate difficulties of conventional interfaces, such as restricted visual interaction.

The face area of the simple sculpture serves as a display for a projector placed in the hands of the sculpture whose remotely controlled signal can express a small range of schematic facial expressions. The sculpture's camera is aimed at the live neighbors and carries their images to the distant user who can thus see the Club environment from the perspective of the physical avatar. The sculpture and the participants sit around a table in a cafe setting. When remote participants connect to the Club they first choose the face type of the avatar sculpture. They can then converse with cafe participants via audio, view the Club environment on their display, and control avatar's projected emotional facial expression. A significant effort was spent on devising effective remote control to ensure that the cognitive load does not interfere with communication.

Chit Chat Club was used by hundreds of users and their interactions recorded and analyzed. The paper reports that the human-scale nature of the interface creates a new type of space that is neither computer-like nor conventionally physical. It was observed that user experience is one of 'asymmetric togetherness' - while the distant user has a fuller view of participants at a smaller scale and on a flat 2D surface, the local participants perceive more of the catalytic effect and the physicality of the avatar.

How does the project relate to Hollan and Stornetta's position? The researchers went beyond the obvious use of video to portray the two sides of the communication and blended the user interface with a semblance of a human physical presence. It can again be argued that the result is a form of emulation of real world and that it does not put present and remote participants on the same level. It thus does not fully reflect Hollan and Stornetta's vision.

3.5 Conclusions

We described several projects whose authors accepted Hollan and Stornetta's challenge and attempted to use electronic technologies in innovative ways that go beyond improving technical parameters of emulation of physical reality. None of them attempted to include the tools in an integrated environment and all of them remained isolated. This is, of course, to be expected given the research nature of the work. More interestingly, most of the tools in some way emulated collocated physical reality and thus contradicted the essence of Hollan and Stornetta's position.

4 BEING THERE - AND BEYOND

Let us summarize:

- The most effective way to provide support for collaboration is by integrating all required functions into one application - an environment.
- Groupware can only be useful if it is widely accepted (Grudin, 1994) and this directly leads to the conclusion that groupware users must perceive it as useful, easy to learn, and easy to use. Intuitive environments thus have an advantage over artificial ones.
- Due to differences among various work domains and teams, hard-coded groupware cannot satisfy the needs of all users at all times. Because technology rapidly evolves and work processes change, even a single work team's requirements are not fixed. Groupware must be easily adaptable, customizable, and modifiable.
- Collaborative environments are built on the basis of a paradigm reflecting the designers' view of what constitutes the most effective representation of the work process and environment. Three paradigms are prominent - work as activity centered on documents, work as activity revolving around communication (meetings), and work environments emulating conventional physical work space. The first two paradigms are prevalent among today's groupware.
- There is a widely held position (largely based on Hollan and Stornetta's paper) that the best support for collaboration can be achieved by 'thinking outside the box' and developing tools that make the most of available technology, rather than by emulating physical environments. This leads to diminished interest in groupware based on virtual-space-based environments.

- Research stimulated or influenced by Hollan and Stornetta's position resulted in interesting tools that may play a useful role in groupware and socialware applications, but has not yet led to a theory of complete groupware environments. It is interesting that many of the projects in fact attempt to recreate collocation and in this sense emulate real world, contradicting Hollan and Stornetta's basic position.

These points lead us to believe that the best approach to groupware design is to develop a framework based on the most powerful, most general, and most intuitive paradigm and to provide means for its easy extension, modification, and adaptation via modular design, built-in programming support for easy extension and modification, and utilization of modern technological constructs. This approach satisfies the requirements listed above, allows enrichment of the basic paradigm by modeling other paradigms, and opens the way for technological innovation. This modifies the 'beyond being there' vision to a 'being there and beyond' position that takes advantage of the intuitive nature of collocated physical work environments and allows going beyond them in Hollan and Stornetta's sense.

We have currently developed a skeleton of such a framework called FVE (Federated Virtual Environment). FVE is based on the virtual space paradigm, is is implemented on a pluggable software platform (Eclipse, 2004), and provides users with a range of widely used tools for program-based modification via scripting, using interpreted forms of widely known programming languages including Java, Ruby, and Python.

REFERENCES

Adams L., et al. (1999): Distributed Research Teams: Meeting Asynchronously in Virtual Space, HICSS'99.

Andriessen J. (2003): Working with Groupware, Springer-Verlag.

Budinsky F., et al. (2004): Eclipse Modelling Framework, Addison-Wesley.

Churchill, E., Bly S. (1999). Virtual environments at work: Ongoing use of MUDs in the workplace, In Proceedings of WACC'99.

EnCore (2007): EnCore Consortium, http://encore-consortium.org/

Fitzpatrick G., et al. (1995): Work, Locales and Distributed Social Worlds, ECSCW'95.

Foldera (2007). http://www.foldera.com/index.htm

Greenhalg Ch. (1999): Large Scale Collaborative Virtual Environments, Springer-Verlag.

Grudin J. (1994): Groupware and social dynamics: eight challenges for developers, Communications of the ACM, v.37 n.1

Haake J. M., et al. (2004): Supporting Flexible Collaborative Distance Learning in the CURE Platform, HICSS'04.

Harrison, S., Dourish, P. (1996). Re-Place-ing Space: The roles of place and space in collaborative systems, In Proceedings of CSCW'96.

Hollan J., Stornetta S. (1992): Beyond Being There, CHI'92.

Huang J., Waldvogel M. (2004): The Swisshouse: An Inhabitable Interface for Connecting Nations, DIS 2004, Cambridge, USA.

Issacs E.A., et al. (1996): Piazza: A Desktop Environment supporting Impromptu and Planned Interactions, CSCW'96.

Jouppi N. (2002): First Steps Towards Mutually-Immersive Mobile Telepresence, CSCW'02, New Orleans, USA.

Karahalios K.G., Dobson K. (2005): Chit Chat Club: Bridging Virtual and Physical Space for Social Interaction, CHI'05, Portland, USA.

Lea R., et al. (1997): Virtual Society: Collaboration in 3D Spaces at the Internet, Journal of Collaborative Computing, no. 6, 1997.

Mansfield, et al. (1997). Evolving Orbit: a progress report on building locales; In Proceedings of Group'97.

Marratech (2005): The Arrival of the Virtual Office. http://www.marratech.com/blog/archives/2005/08/the_arrival_of.html

Maybury M. (2001): Collaborative Virtual Environments for Analysis and Decision Support, CACM, December 2001.

Roseman M., Greenberg S. (1996): TeamRooms: Network Places for Collaboration, CSCW '96.

Schuckmann C., et al. (1996): Designing object-oriented synchronous groupware with COAST. CSCW'96.

Tollmar K., et al. (2000): Virtually Living Together, DIS'00, New York.

Whittaker, et al. (2004): Informal Workplace Communication: What It Is Like and How Might We Support It? CHI'04.