



BY ELIZABETH CHURCHILL, ANDREAS GIRGENSOHN, LES NELSON, AND ALISON LEE

Blurring the notional boundary between the digital and the physical in social activity spaces helps blend—and motivate—online and face-to-face community participation.

# BLENDING DIGITAL AND PHYSICAL SPACES FOR UBIQUITOUS COMMUNITY PARTICIPATION

Much effort has gone into creating online spaces for people to meet, network, share, and organize. However, relatively little effort has gone into creating awareness of online social activities in physical community places. Here we describe how we developed and promoted two especially engaging online community spaces—CHIplace and CSCWplace—using large-screen, interactive displays that mix online community information with content generated at the conference itself. Our goal is to raise awareness of the value of online virtual communities within the offline, face-to-face events. We describe the two deployments—at CHI

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ILLUSTRATION BY TOMASZ WALENTA

**People directory**

Here is an [alphabetical listing](#) of all members.

**People who joined recently**

[J Barbour](#)  
[A. Chris Long](#), Carnegie Mellon University  
[James M. Ungar](#), ACM SIGCHI Student Member  
[janedoe fiooa](#)  
[Zhan Ye](#)  
[Xianjun Zheng](#), University of Illinois  
[Mark Dempsy](#), Freewater Software, Inc.  
[Koerok](#)  
[Kris Vander Stelt](#), Fuel Interactive




[Adrian Bullock](#)  
 Swedish Institute of  
 Computer Science

**A random selection of members**

If you provided a picture for your profile, it may show up in our random selection. You can [click here](#) to see a different selection.



[Mark D. Gross](#)  
 Design Machine  
 Group/ University of  
 Washington



[Allen Cypher](#)  
 Kanisa



[Loren Terveen](#)  
 AT&T Labs -  
 Research



[Patric Galloway](#)  
 Waldegg  
 HCI Director Aldea  
 Systems



[George Lescouras](#)  
 Dept. of  
 Informatics,  
 University of Athens



[Gernot Hüller](#)  
 Mobilkom Austria



[Juan Casares](#)  
 Carnegie Mellon  
 University



[Luca Chittaro](#)  
 University of Udine



**Loren Terveen**  
 General Conference

*Researcher*  
 AT&T Labs - Research  
 USA

**Involvement in CHI:** I learned about CHI as a graduate student. My first interest was AI, especially natural language discourse, then I gradually became interested in communication between people and computers from a more general perspective... and soon I was doing HCII!

**Interests:** My main current interests are recommender systems, online communities, and techniques to allow people to capture and share personal history.

Figure 1. CHIplace Web pages. (a) Main CHIplace people page with a list of the people who joined most recently and a gallery of randomly selected pictures of members.

Click on the faces to rate the trivia. Good trivia will rise to the top. Look at the bottom for new trivia.

**CHI Trivia**

<b>Gary Perlman</b> Poster: 4 Jun 27, 2001	15 1 0	Who has published the most PAGES at CHI conferences (this puts more weight on full papers)? <a href="#">Answer</a> (viewed 232 times)
<b>Allison Lee</b> Poster: 1 May 14, 2001	14 6 1	Did you know that CHI2002 is the 21st year since the beginning of CHI. However, CHI2002 is only the 20th CHI conference. Do you know why? <a href="#">Answer</a> (viewed 272 times)

(b) CHIplace trivia includes several traces. The author trace indicates an author's participation and includes the author attribution and an indication of how many trivia messages the author has created. The number of times the trivia answer is viewed indicates interest in the trivia question. The number of positive, neutral, and negative votes for the trivia reflects interest in the overall trivia subject.

**Hands-On Interfaces** (featured Feb 18, 9 messages)  
 Chair: [Michel Beaudouin-Lafon](#) (Université de Paris Sud)

A Tangible Interface for Organizing Information Using a Grid [\[Abstract, PDF\]](#)  
[Robert Jacob](#) (Tufts University & MIT Media Lab), Hiroshi Ishii, Gian Pangaro, [James Patten](#) (MIT Media Lab)

Cognitive Cubes: A Tangible User Interface For Cognitive Assessment [\[Abstract, PDF\]](#)  
[Ehud Shadfan](#) (University of Alberta), Yuichi Itoh (Osaka University), Benjamin Watson (Northwestern University), [Toshimune Kitamura](#) (Osaka University), Lili Liu, [Steve Scahlan](#) (University of Alberta)

Illuminating Clay: a 3-Dimensional Tangible Interface for Landscape Analysis [\[Abstract, PDF\]](#)  
 Ben Piper, Carlo Ratti, Hiroshi Ishii (MIT Media Lab)

For discussions specific to one paper, we suggest [posting a new topic](#) with the title of the paper as the subject.

Paper Preview: Hands-On Interfaces		
topic	topic starter	last post
Discussion of papers in session "Hands-On Interfaces"		9 messages
<a href="#">Excellent paper</a> Respondents: <a href="#">Loren Terveen</a> , <a href="#">jaime montermayor</a> , <a href="#">Robert J.K. Jacob</a>	<a href="#">Shumin Zhai</a>	Feb 22, 2002
<a href="#">Cognitive Cubes: A Tangible User Interface for Cognitive Assessment</a> Respondent: <a href="#">Ehud Shadfan</a>	<a href="#">Loren Terveen</a>	Feb 20, 2002
<a href="#">Illuminating Clay: A 3-D Tangible Interface for Landscape Analysis</a>	<a href="#">Loren Terveen</a>	Feb 20, 2002
<a href="#">Welcome</a> Respondent: <a href="#">Michel Beaudouin-Lafon</a>	<a href="#">CHIplace Administrator</a>	Feb 18, 2002

All times in PST (GMT-08:00)

(c) The session page for a particular paper session includes content information (such as titles, authors, and electronic copies), social information (such as number of posted messages and discussion authors), and access to the discussions.

2002 in Minneapolis and at CSCW 2002 in New Orleans—and provide utilization data regarding participants' experiences within and between the physical and virtual locales.

More and more online networking spaces are being established for communities of interest, practice, and circumstance. While much has been said and written about the interaction in such spaces among people who

never meet physically, online forums mapping to face-to-face social networks are increasingly popular. Examples of communities of interest include [www.tribe.net](#), [www.friendster.com](#), and [www.meetup.com](#), and of communities of practice, CHIplace and CSCWplace. The latter two were designed for people involved in the design and use of computer applications. For them, community participation takes place both online and offline, with offline meetings taking the form of conferences, seminars, and workshops.

We have found that development of online forums in communities of interest and practice is usually a slow process. Little is done to promote them, and, unlike physical community gathering places, casual, drive-by encounters are unlikely. When developing such forums, we therefore provide windows blurring the notional boundary between digital and physical activity spaces and look to blend online and face-to-face community participation. We focus on enabling unplanned, everyday encounters with online commu-

# We intentionally invert the logic of virtual environment construction, which has historically involved representing real physical objects within digital spaces.

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nity activity by publishing the interactive, multimedia content associated with online community spaces in physical gathering places through large-screen public displays. PlasmaPlace is one such experiment we've conducted involving the design and use of a large-screen, interactive interface to create a presence for an online community in face-to-face social settings. In bringing the content of online, digital community spaces directly into physical places, we intentionally invert the logic of virtual environment construction, which historically has involved representing real physical objects within digital spaces.

## Design of Online Spaces

CHIplace and CSCWplace, both built on the same Web-based infrastructure, are the online spaces we helped create, deploy, and maintain prior to the ACM CHI 2002 and CSCW 2002 conferences to facilitate interaction among researchers and practitioners in human-computer interaction (HCI) and computer-supported cooperative work (CSCW), respectively. The designs of these places embodied three principles:

- Cooperation is the main behavioral intent that must be supported;
- Identity and social interaction are key elements underlying cooperation; and
- These two elements can be supported via social, technical, and socio-technical means.

They were informed by two research thrusts: the first on the social psychological research into cooperation and social dilemmas, the second on mediated social interaction.

Research into the social dilemma issues underlying cooperation has identified the importance of persistent identity and repeated social interaction in promoting participation and cooperation and in reducing selfish behaviors [1, 5]. A persistent and consistent identity lets people identify and find out more about one another and provides a foundation for social accountability in the future. Moreover, if people repeatedly interact socially with one another, they are less likely to

behave out of pure self-interest. The importance of these factors has been demonstrated in studies of good reputation in economic transactions.

Both CHIplace and CSCWplace included a number of mechanisms to enable people to construct and evolve persistent and verifiable identities. Each registered participant created a profile that was presented as a people page (see Figure 1a) containing user-contributed information, as well as trace information. Traces of a person's activities and behaviors (such as interests culled from what they read), as well as other people's interests in an individual's contributions, are important to maintaining a persistent and up-to-date identity for that person (see Figure 1b). Several social browsing tools enabled people to become acquainted with and then be held accountable for their behaviors on the site, as in Figure 1a.

In the case of mediated social interaction, extensive CSCW research has sought to develop methods for fostering and maintaining computer-mediated interaction. Four basic elements are crucial to allowing participants to develop and extend social interaction sites: common ground; awareness; interaction enablers and mechanisms; and place-making [6]. In CHIplace and CSCWplace, we created special areas for engaging participants; Figure 1c shows one of the conference proceedings paper preview areas where participants could engage in discussions about the papers. We provided interaction tools, as well as other tools to support content-sharing and discussion. Traces, in the form of numeric counts, of people and activities facilitated awareness of participation and interaction in these areas. As the areas became imbued with participant activity and discussion, they acquired cultural and social meaning reflecting norms and practices associated with the form of social organization, or place-making, that occurred there.

*PlasmaPlace.* In designing a public interface for online community activity, we pursued three design goals:

- Mix content created by local and remote participants;
- Advertise the ongoing and persistent activities of the

- online communities; and
- Encourage participation at all levels.

Consequently, we sought to provide a system—called PlasmaPlace—for presenting content blended from a variety of sources related to online community activities, including CHIplace, CSCWplace, conference Web sites, local information sites (such as restaurants), and daily content (such as photos and Weblogs) uploaded directly to PlasmaPlace. The PlasmaPlace system collected this content and, where appropriate, re-purposed and re-represented it to be attractive to passersby from a large-screen display. It allowed quick navigation of the content to people stopping to browse, then encouraged them to follow up by guiding them to online community resources. The PlasmaPlace installations were each located in the Internet access rooms of the conferences, so computers were available nearby for public use.

The design of PlasmaPlace involved two elements: visual look and feel and display-processing and interaction mechanism.

*PlasmaPlace appearance and content.* Based on our own experiments concerning the most effective way to post content on the PlasmaPlace display, we identified the following design criteria:

- People respond positively to faces and other indications of community member identity, including names and contact information;
- People are attracted to large central displays as a focus of attention;
- People respond positively to having an overall sense of the content in the display;
- People respond positively to the poster-board format and the poster genre of information presentation; and
- People respond positively to changing content and are sensitive to the rate of that change; too quick is distracting or disturbing; too slow makes it appear static and less interesting.

The PlasmaPlace design, oriented in portrait format, intentionally mimicked the design of physical poster boards, as they are a familiar format for advertising content.

Content displayed at the CHI 2002 installation consisted of: upcoming events listings (areas A and C in Figure 2a); comments and information from conference attendees posted during the conference as blogs (area B); pictures from the conference uploaded directly to the poster (area D); and names and faces of people in the online community (area F). This arrangement provided a comfortable view of selected content,

while also permitting at-a-glance views of other content that might be of interest.

We used the same layout and content arrangement for the CSCW 2002 installation (see Figure 2a), though aspects of the PlasmaPlace interface design were adapted for the conference theme and its location (New Orleans).

*Display processing and interaction.* We designed all content areas of the display to cycle automatically when users were not interacting with them. For example, information from areas B–D and F cycled into the main viewing area (area E) in order, while the content in the smaller display areas cycled from their respective sources.

We designed two basic modes of interaction with the content: selection of general content area of interest (such as schedule, people, and photos) and browsing within that content area. Browsing consisted of a simple forward and backward traversal through a repeating list of content.

At CHI 2002, we used a large trackball for input selection to simplify the installation. People could use the two buttons on the trackball to switch the display selection to the next or previous item in the PlasmaPlace selection order. Spinning the trackball scrolled the selected display.

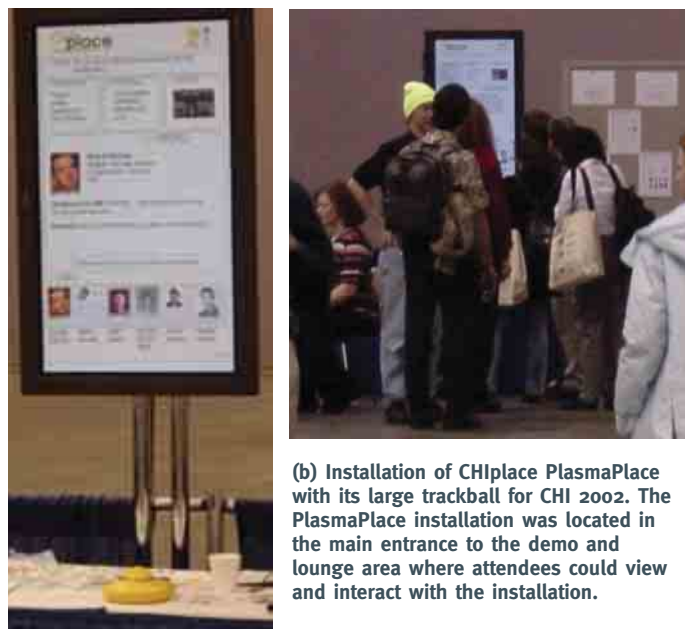
For CSCW 2002, we used a touchscreen overlay instead of the trackball. People touching any of the selectable areas—Happenings, Schedule, Photos, and People—caused the cycling to pause and move that content into the main viewing area. Touch selection allowed people to follow any Web links displayed in this area. However, we restricted navigation to a predefined list of sites and domains, reinforcing the notion that full access to content and online facilities should be made through a normal desktop session available nearby. When a user tried to navigate beyond these environs, a message would appear with instructions about how to use the nearby Internet room facilities.

*Usage observations.* The PlasmaPlace posters attracted considerable interest at both conferences. Interaction data logged at the displays indicated frequent interaction and that activity peaks mapped well to conference break times (see Figure 3). Our informal observations of how the posters were used found people noticing, touching, and talking about the PlasmaPlace screens, as in Figure 2b.

Conference participants also discussed and signed up for the online community spaces. Our usage logs found that 92 CHIplace and 11 CSCWplace participants registered for the online forum using the public computers compared to 1,058 during the 14 months before CHI 2002 and 154 during the two months before CSCW 2002. The CHIblogs feature we introduced just before



**Figure 2. PlasmaPlace designs and installations.** (a) PlasmaPlace designs for CHIplace and CSCWplace, respectively. In each case, the poster is divided into a header area (area A), several smaller areas (areas B–D and F), and the main area (area E). Content from areas B–D and F are cycled through the main area periodically; otherwise, users select one of the areas for prime viewing in the main area. The poster’s colors, type, and logos were adapted for each of the conferences.



**(b) Installation of CHIplace PlasmaPlace with its large trackball for CHI 2002.** The PlasmaPlace installation was located in the main entrance to the demo and lounge area where attendees could view and interact with the installation.

the start of the CHI 2002 conference for participants to submit tidbits, stories, events, questions, insights, and interactions received a total of 26 entries (two with photos), with eight of them receiving supplemental comments. At CSCW 2002, in place of blogs, we added a camera-upload interface for people to submit photos. On the first day, 20 photos were uploaded.

Comments collected at the conferences and our own analysis of the touchscreen interaction—selection, pausing, and scrolling of content—indicated that images were the most popular content for PlasmaPlace

viewers; 62% of the recorded interaction events were related to the selection of images from the conferences. Selection of personal profiles accounted for 19% of all interaction events. Content related to the conferences themselves accounted for 8% of interaction events; 6% of the interaction events were related to scrolling, browsing, and navigating content; and 5% involved seeking information about the online community spaces.

*Inspiration.* Our work draws inspiration from previous research in digital community displays and in the blurring of digital and physical social spaces. In the former, large-screen, situated interactive displays are increasingly used in retail spaces and workplaces, at professional gatherings, and in recreational spaces for remote and collocated collaboration, as well as for information coordination and distribution [3, 7]. An example of public displays being used in conference settings to encourage social networking is Intel’s Proactive Displays, which were installed at the Ubicomp 2003 conference in Seattle. Attendees created personal profiles on public computers; identification tags would trigger this content to be displayed when they passed by sensors. The idea of joining physical spaces through mediating technologies is not new. Media space experiments have proved successful in various settings (such as supporting activity awareness among distributed work groups) [2].

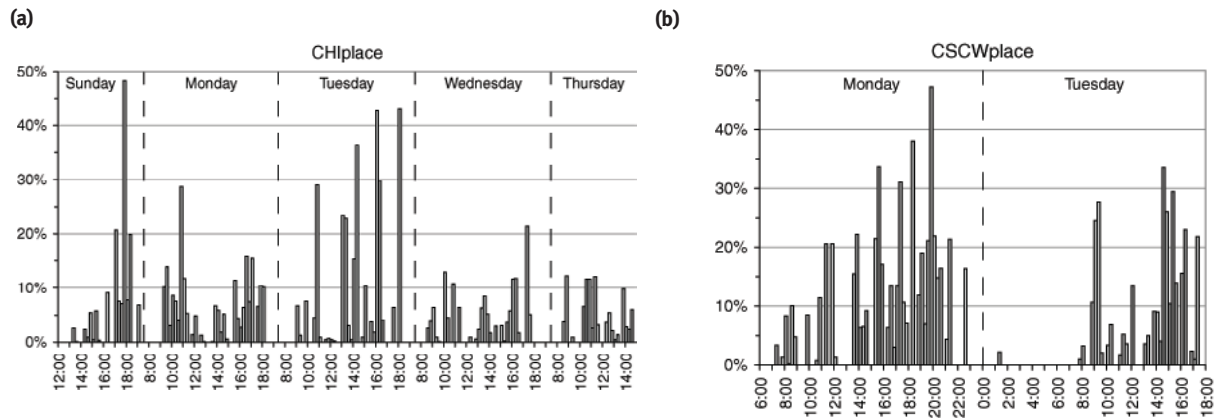
Similarly, offering representations of online activity in the offline, physical world is also increasingly common. An example is AROMA, or the Abstract Representation Of presence supporting Mutual Awareness, where data from sensors is re-represented abstractly across a network of displays to provide awareness of other people’s activities [8].

Research in graphical virtual environments has explored the concept of “hybrid realities” in which, say, video streams of real-world activity are projected into graphical, virtual landscapes

[9]. Art installations, including the SimGallery Project [2], offer online, functional analogues of physical spaces gamers might visit while playing and visitors in the physical environment can explore from kiosks.

## Conclusion

We used interactive, large-screen, public displays to promote awareness of the activities of two online communities—CHIplace and CSCWplace—at the CHI 2002 conference and at the CSCW 2002 conference, respectively. The design of the displays mixed content



**Figure 3.** We charted all interactions at the (a) CHI and (b) CSCW posters for each 15-minute segment over the course of the conference to identify patterns of interaction. Each bar represents the percentage of time during a 15-minute segment in which attendees interacted with the poster. For example, if a bar fills 50% of the 15-minute segment, it means people interacted with content for half that time, or 7.5 minutes.

from the online community spaces with content created by attendees at the conferences; this content included blogs and photos. Usage data indicated that the PlasmaPlace display was popular among conference attendees who noticed, touched, and talked about the PlasmaPlace screens elsewhere throughout the conferences. The display was also an effective advertisement for the online community spaces. Not only did attendees contribute content related to the conferences themselves, some joined as members of the online spaces.

In reviewing the installations, we found that the communities we designed for reflected certain special characteristics that must be considered by any system designer when thinking about the general applicability of our efforts and their underlying principles and theories. As in many communities of practice, social networking and the maintenance of ongoing professional relationships are central to these communities. However, face-to-face meetings are infrequent (only once every year or two), and the communities consist largely of computer professionals and others highly skilled in related disciplines. Thus, the sharing of digital media artifacts is common and involves people with a high level of curiosity about experimental technology intervention.

To explore the general applicability of our finding that people respond positively to the blurring of the boundary between online and offline participation in communities, we recently installed a digital community bulletin board in a café/gallery in San Francisco, linking it to an online community space where content about café activities is posted. Our future research will address the effect of the display (called the eyeCanvas) on people's activities in the physical space of the café, as well as on the uptake and use of the online space by local community members. Our design process began with interviews of café management, clientele, and contributing artists. We expect to follow up with observations of their activities, along with comparative

analysis of online activity on the café Web site before and after the introduction of the eyeCanvas. **C**

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We credit the concept of an online interaction space for CHI 2002 and the support for the deployment of the CHI 2002 PlasmaPlace to the CHI 2002 conference co-chairs Loren Terveen and Dennis Wixon. We acknowledge Jason Brotherton's and Khai Truong's work in starting and maintaining CSCWplace, and Joe McCarthy, CSCW 2002 Conference co-chair, for deploying CSCW 2002 PlasmaPlace.