Who cares?
Reflecting who is reading what on distributed community bulletin boards

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ABSTRACT

In this paper, we describe the YeTi information sharing system that has been designed to foster community building through informal digital content sharing. The YeTi system is a general information parsing, hosting and distribution infrastructure, with interfaces designed for individual and public content reading. In this paper we describe the YeTi public display interface, with a particular focus on tools we have designed to provide lightweight awareness of others' interactions with posted content. Our tools augment content with metadata that reflect people's reading of content - captured video clips of who's reading and interacting with content, tools to allow people to leave explicit freehand annotations about content, and a visualization of the content access history to show when content is interacted with. Results from an initial evaluation are presented and discussed.

Categories and Subject Descriptors: H.5.2 User Interfaces

General Terms: Design.

KEYWORDS: situated display; information sharing; distant communities; video capturing; public commentary; annotation.

INTRODUCTION

While a number of technologies have been created and deployed to facilitate the smooth exchange of work artifacts and the coordination of work tasks among work groups, a major challenge for organizations has been the maintenance of an informal sense of co-presence and the fostering of trusting relationships between people who are situated at distance from each other. Such feelings of co-presence underlie group cohesion, and can lead to social networking among people with weak social ties.

Technologies that have been designed for foster such feelings of co-presence range from the highly realist (e.g. video based media-spaces, [2]), to those that offer abstract representations of others' activities [14], to those that allow informal notification messages [7].

Our work draws inspiration from previous work with environmental co-presence and awareness systems, but our focus is on awareness of others' interests, rather than their activities [see 3,4,5]. Similar systems have been reported for sharing project news items [10], sharing personal interests [13], sharing share research papers and technology news [18] and sharing general items of interest [5]. In all cases, public displays offer people a means to encounter digital information as they go about their daily business, a form of "everyday information encountering" [17], and therefore have the possibility for wider impact than information sent to individuals' personal devices through the narrow windows of single user displays and applications.

In the next section we describe the YeTi system which has been designed to foster cross-lab communication between our US and Japanese research labs (for more information see 8). The work here focuses on our video-based, interface extension to the existing YeTi desktop and public display interfaces. The name YeTi derives from the "**Ye**sterday **T**oday **i**nterface"; this reflects the time zone differences that have rendered synchronous systems like video-based media spaces largely useless as awareness and content sharing tools.

THE YeTi DISTRIBUTED COMMUNITY SYSTEM

YeTi is a system that combines large screen, interactive displays and a Web-based community space for sharing digital content between distant communities (see Figure 1). Community content is generated by community members: a user can post via e-mail or via a Web page on the YeTi community site. Various media types can be posted: Web pages (URL), plain text, HTML text, images, and digital movies. Content is formatted and displayed according to the media type.

Given all content is generated by distributed community members, items that are posted to the YeTi system are effectively *recommended* to readers by those who post. Such recommendations offer useful content, but also reflect something about the content "author" themselves. Thus the postings operate for social networking at two levels - the content level and the personal level.

Figure 1 The YeTi display settings in U.S. (left) and Japan (right)

An essential feature we have discovered in previous experiments is that people like to know what interest others' have in their posted content [3,4,5]. Although we have implemented interface tools for providing information about authors, and have provided recommendation tools that give more airtime for content that has been interacted with, we have found that people are curious about *who* has interacted with content they have posted – that is who the audience is for their postings. In addition, we have noted that seeing others reading content often spurs further conversation among collocated colleagues. Thus, not only sharing information, but also being aware of others' activities around shared information plays an important social role in fostering relationship between colleagues. Given these observations, we decided to offer the potentially more 'personal' touch of seeing an individual rather than just an aggregate expression of interest as offered by our recommendation algorithms: a short snapshot of video captured to reflect who has been reading content. We have also observed that people like to leave notes explicitly for others to see as comments on content on public displays [3], so have implemented a version of this on the YeTi community boards.

With these observations in mind, in this paper we will focus on the ways in which we create awareness of others' interest in items that are posted through these video and commenting features. We briefly describe the underlying YeTi system here, but focus primarily on these awareness features.

The YeTi INTERFACE

The YeTi interface has several interaction areas: the main content or 'Poster View', the overview or 'Thumbnail List', a 'Channel Selector', and control buttons for finding meta-information regarding the posted content currently showing on the poster, for printing and for gaining awareness of community members' responses to posted content. The interface is shown in Figure 2; the left image shows pictures that have been posted by a community member and the image on the right shows a company Web page with links to recent press releases. The image on the right also shows short videos captured when people previously have interacted with the content of the currently viewed posting.

The *Poster View* shows information posted by community members. Posted content is organized into channels; such as news, event related information, members' interest, activity updates, and so on. The Poster View central pane displays posted content in a sequence, updating every 30 seconds. If a user interacts with content by touching the interactive overlay screen, its updating is paused.

Control buttons allow users to handle and further explore poster content, including actions of printing content for further reading, seeing contextual information about a posting (e.g., who posted and when), sending and submitting hand-written comments (scribbles), and showing videos and scribbles associated with a posting.

The *thumbnail list* shows small images of all posted content. Thumbnail images are horizontally lined in order of posting. This can be scrolled horizontally, and a user can select specific content for display in the Poster View by touching a thumbnail. The list ordering corresponds to the display sequence used in the Poster View.

Posted content is organized into *channels* based on the geographical location of the community members and type of information being sent to the system. Content of each channel is summarized into a channel overview page. The channel overview pages also appear in the posting sequence, as well as being viewable by selecting channel icons (Figure 3). There are three kinds of content category: *news* (containing general news or specific news items of interests from community members), *events* (for information related

to any corporate or industry events), and *people & projects* (for introducing activities of community members).
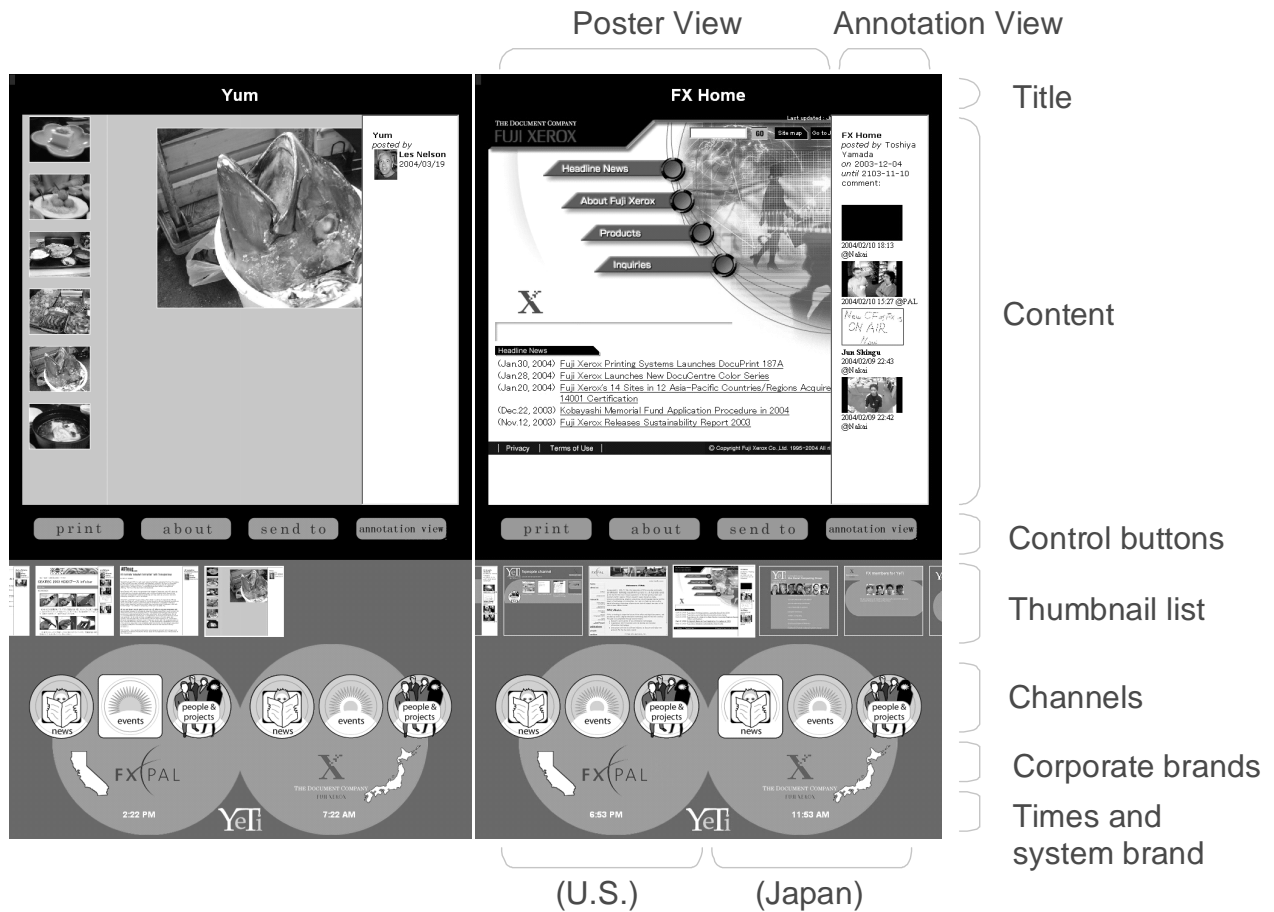
Title

Content

Control buttons

Thumbnail list

Channels

Corporate brands

Times and system brand

(U.S.)   (Japan)
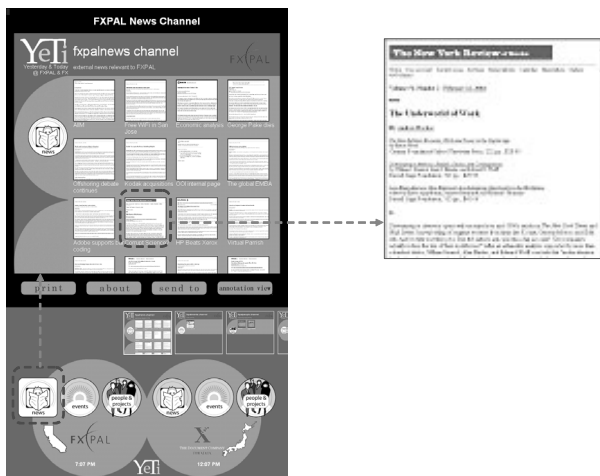
Figure 2 The YeTi interactive display interface

Figure 3 Channel page shows summary of contents posted to the channel and gives users to show the content in Poster View by touching thumbnail. Channel page is shown by users' selecting channel icon.

Corporate brand logos represent each remote community. By touching a logo, a Web page for the community at that location is shown in the Poster View. Visitor or tourist related information for each location is also shown, as is the local time of each location. The *system brand* icon for Yeti gives access to an explanation of the system and the role of the poster in our organization.

Commenting by scribbles

A "scribble" feature (Figure 4) allows users to add comments that are then associated with the currently viewed content. Such comments can be sent via email to the person posting the content, to oneself, to other community members, or attached to the currently viewed content. Content-attached comments left on the public displays in this way are available for all readers to see, thus allowing readers to know others' views of the content. Creating a scribble is simple: touch the "send to" button on

the YeTi interface, causing a scribble window to open, and the user can then write a note with their finger. "From" and "To" fields are provided for sending each scribble, either to one of the registered community members (i.e., their email address) or to the YeTi system (i.e., attach the scribble to the posted content).
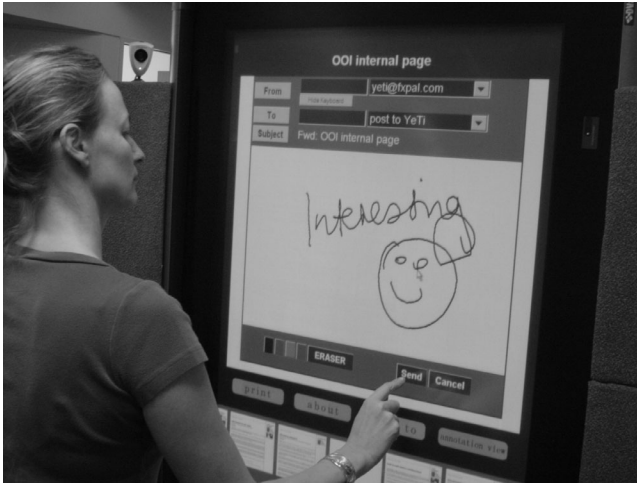

Figure 4 Writing and posting scribble comment to information displayed.

Shared comments are associated with specific content posted, and are shown in a list with thumbnails of captured video we describe in the next section. Scribbles are saved as JPEG image files that have resolution of 317 x 195 pixels. Shared scribbles are managed in database with meta-data such as associated poster ID, date created, creator (if specified from pull down menu by a user), and location posted from.

Captured video of readers' interactions
Video is a powerful medium for creating feelings of co-presence between remote community members. We placed a camera at the side of each Yeti display to record short videos segments of people interacting with content at the YeTi displays. Figure 5 shows the camera capturing the face of the reader standing in front of the display. The camera has a wide angle lens camera (with an angular field of view of 130 degree), in order to capture groups of people at the poster, not just single individuals. Notably, as the camera is physically accessible, it is easy for readers to move the camera to prevent capture should they prefer not to be recorded.

The video capture process begins on detection of a touch event on the screen, such as when someone selects a channel, pauses, prints, or browses a posting, or writes a comment. Captured video is associated with the posted content currently being viewed. When that posting is subsequently displayed, only the videos associated with that posting are shown.
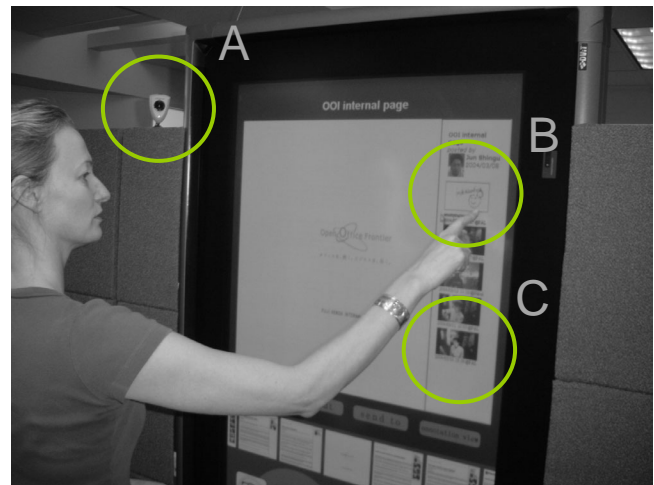

Figure 5 A camera is set at left side of the display (A), thumbnails of scribble comment (B), and video captured (C) associated with the information displayed are shown in a list.

The video capturing control of the YeTi system operates as follows:

- Capturing starts when a reader touches the screen.

- When continuous touch events are detected, capturing keeps going. If 6 seconds pass and no touch events occur, the system stops capturing.

- The captured video is stored into a database with relevant meta-data: poster ID, captured date and of the YeTi display location.

- A capture indicator is displayed in the corner of the screen while the video camera is on to give feedback to the user that recording is in progress.

Although our current implementation utilizes a screen touch as the trigger for video capture, we have experimented with designs for alternative implicit triggers (e.g. using face detection in the video or using sensor technologies like proximity sensing). Our decision to capture on detection of explicit content interaction was as a result of concerns regarding "unnecessary" capture – that is, situation where little interest in the posted material was actually being expressed, no actions around content were taken and people were doing casual drive-bys. We were sensitive to unnecessary video capture being mistaken for public area surveillance.

The system captures one encounter per user per item of posted content into a single video file. The YeTi camera keeps capturing until there is a change in content. When the posting displayed is changed by the system automatically transitioning to the next item of posted content, capturing stops. If another touch event occurs on the new displayed content, capturing resumes.

We set a minimum duration for storing recorded video. When the length of a video recorded is less than this minimum duration, the video is not regarded as significant enough to save into the database. Initially, we set minimum duration to 3 seconds.

Playing captured video

Through viewing video, we can get an idea of who reads the content, who was talking about the content and with whom, and in general what kind of situations are occurring when a posting is seen.

Captured videos and scribbles are treated as annotation to the postings. When a user selects a posting by touching its thumbnail, the posted content is shown in the Poster View central pane. Videos are not shown because it is assumed a user wants to see the posting itself. A user can switch to show or hide the video list by touching the "annotation view" button. Only videos that are associated with the posting are played in the Annotation View (Figure 6). If there is not enough space to show all of related videos, we select the most recent ones to be shown. Touching the video thumbnail in the Annotation View starts the video playing. We do not play audio due to concerns with sound pollution; many offices are located near to the YeTi display in the US location and the Japanese location is an open-plan, cubicle office space. We imagine providing audio may work well in other settings.
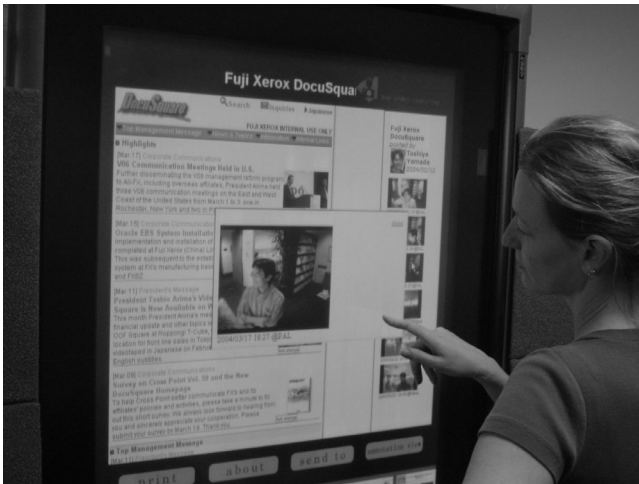

Figure 6 Enlarging and showing video from thumbnail list. Video plays in large window when a user touches and selects specific video thumbnail from the list.

When a scribble comment is selected by touching a scribble thumbnail from within the Annotation View, video captured when the scribble was posted is also shown and plays (Figure 7).

Representing access history along a timeline

We believe that visualization of people's interests and their activities within these hybrid physical-digital, shared information spaces may contribute to people's understanding of 'what's going on', 'what has happened' and 'who is/was concerned with posted content'. To address this potential, we have also introduced a timeline representation of a posting's access history. This provides a view of summarized information of users' activities on each posting.
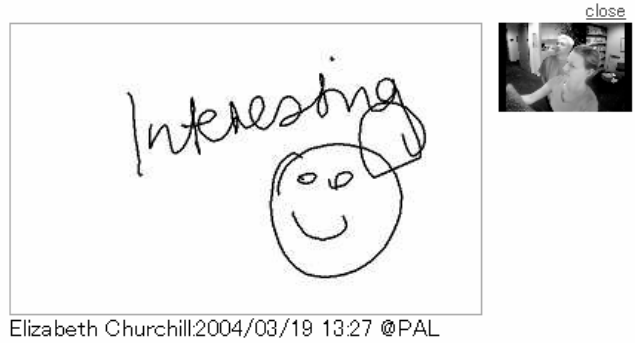

Figure 7 Enlarged scribble comment with video. When a user touches a thumbnail of scribble on the list, scribble image is enlarged and shown with video playing that captured when the user posted the scribble comment.
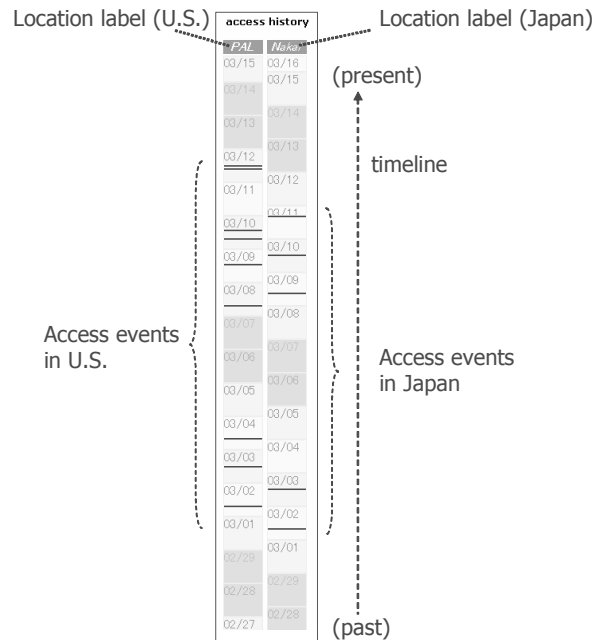

Figure 8 Timeline representation of accessing history to information posted. A horizontal thick line indicates date and time of occurring users' access event associated with information displayed.

Figure 8 shows a history view of user access to a posting. This view displays the frequency of interaction activities

along a timeline. Each touch event at the screen is recorded and associated with the posted content, along with the location of physical poster display, a timestamp and the type of touch event. Such an access history provides a cumulative view of interest about the content over time. Explicit representation of the access history by location shows reading differences between communities. Access history also acts as an implicit recommendation of information by members of each community and between communities.

SYSTEM ARCHITECTURE

Figure 9 shows the overall structure of the YeTi system. The YeTi system consists of several client machines that display information and accepts interaction by users, and a server machine that runs various services for processing and managing the posted information.
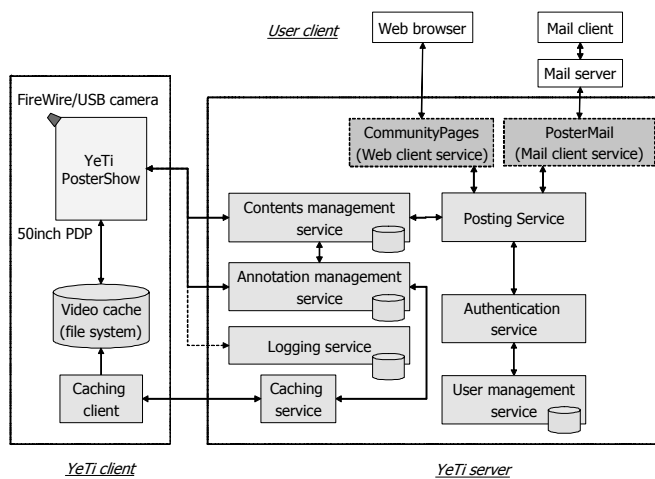

Figure 9 The YeTi system architecture

Each client machine has a plasma display rotated to portrait orientation for displaying information in a poster format. A touch screen is used for interacting with the displayed content. A camera connected via USB to the client machine is used for capturing users' behavior in front of the display as video.

The PosterShow software component is standalone client display application. It show the various posted information, detects users' touch events, and accesses content managed by the contents management service. PosterShow has been written in VisualBasic™ and some of specific functions for viewing and interacting with the Thumbnail list, posting and sending scribbles, and displaying annotation lists are implemented in JavaScript, Java Applets, and Java Server Pages and integrated into whole framework. Exchanging data between client and server is realized via HTTP by utilizing Java Servlets and Java Server Pages. PosterShow adopts a layered approach [14] to implement its appearance

and interaction design for easily modifying and adding new functions.

The server part of the YeTi system consists of several services for handling information and interaction to be shared. The YeTi system supports two types of postings from users; those are through e-mail and web pages. *PosterMail* is responsible for handling users' posting via e-mail, which works to extract data for posting, authenticate of user posted and send information to *Posting Service* if posting is valid. *Posting Service* manages poster information into database and also formatting contents posted for representing to a display. Posting Service also has web client interfaces.

A *Content Management Service* manages information posted by users; including text, movies, pictures, and URLs to Web content, as well as comment texts added by users during the posting process, and other metadata such as channel type, date posted and date expired. An *Annotation Management Service* manages annotations (posted comments and captured videos). An *Authentication Service* and *User Information Service* are responsible for managing information about users and authenticating access to the YeTi system through e-mail and web pages. Those services are implemented in a MySQK relational database and accessed through Java Servlets.

Most data such as posted contents and scribbles are managed in the server for sharing between clients. However, video data is cached into each client machine for reducing the load on getting and playing video. For caching video data to clients, we use a *Caching Service*; this service is implemented using the GNU wget utility that enables data transfer using HTTP protocol.

A *Logging Service* is responsible for logging users' interactions with the YeTi system. Logged data is used not only for offline analysis and evaluation of the system usage, but also for feeding runtime visualizations of access to the system. Each content access event at the display is recorded with related information such as type of an event, displayed posting content identification, timestamp with time zone, and client physical location.

PRELIMINARY USE RESULTS

The YeTi system has been deployed in two locations, research laboratories in United States and Japan (Figure 1). Each setting has a number of researchers, technical staff, support staff and management staff (approximately 50 and 70 people, respectively). There is ongoing collaborative research occurring between two laboratories, but most lab members have never visited the other laboratory and have therefore not met each other face-to-face. Although little content is shared informally between members of the two labs, regular management video conferences take place between the two locations.

Yeti has been in use for three months to share information between the two distant locations. In our preliminary deployment of the YeTi system, we did not place any restrictions on content specific types or language of posting. Both displays in U.S. and Japan are located in corridors in an office space setting and can be accessed by any members of laboratories. Although the system has only been fully functional for a short time, we have some preliminary observations that we summarize below.
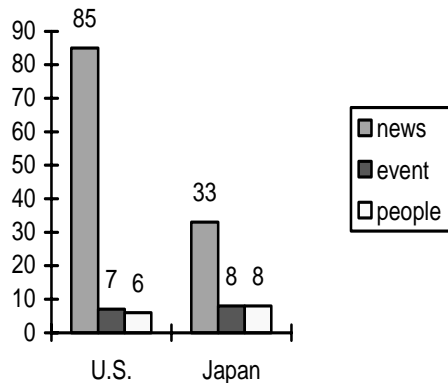

Figure 10 Content posted by channel

Content and scribbles posted

147 content items have been posted to the system, of which 10 were system postings (e.g., channel and organizational overview pages); thus, 137 items were posted from two locations by members of the research groups. Postings from the U.S total 102 items, with 35 from Japan. Of these 137, 127 postings were of URLs or text, and 10 of images. There have been 114 items (89.0 %) of URLs or text-based contents in English, 13 items (10.0 %) in Japanese and 1 item in French.

Figure 10 shows the percentage of contents posted to channels according to locations and categories. Analytic categories and results are shown in Figure 11: business news items; technology news and research related items; community and project related news; general news and interest items; event related information; personal items; and humorous items.

22 scribble comments have been attached to 13 postings, 16 from U.S. and 6 from Japan during the 38 days since the scribble posting function was prepared. Nine scribbles are related to information posted or comments to other members, 13 are not related to the information, but used experimentally such exploring how the feature works or demonstrating its function to someone else.

Frequency of use

We have logged over 20,000 accesses to the display (click events) over three months. Figure 12 shows a histogram of the weekly access totals. After the video capture capability was introduced into the system on Feb. 8th, the number of accesses may be seen to increase in the U.S. There is no significant change in accesses in Japan.
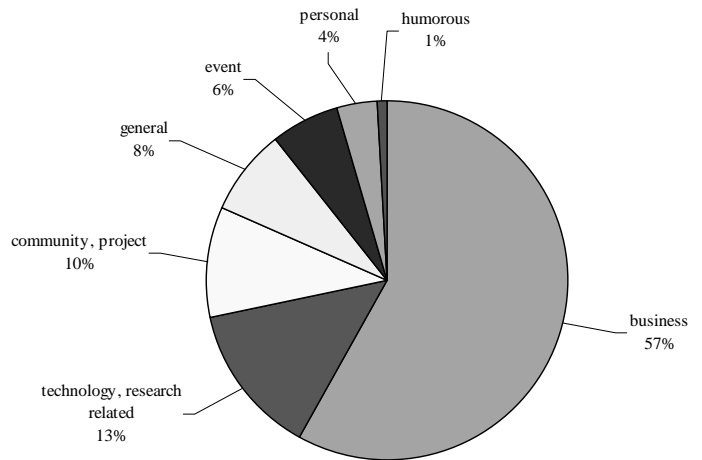

Figure 11 Content posted by category

Extending an analytic scheme previously derived for assessing interaction with interactive public displays [5], we categorized events into four types of user activity: *active reading* (scrolling contents, following links, clicking background for pausing, printing), *navigation and browsing* (selecting channel, scrolling thumbnails), *messaging* (replying to content author, forwarding content to other, posting scribbles) and *seeing meta information* (seeing attributes of contents, seeing video and access history). Breakdown of accesses for the 87 working days of the Yeti system is shown in Table 1. Changes of access frequency before and after introducing the functionalities of capturing and showing video, posting comments and showing access history is given in Table 2. The most visible change is in the increased level of activity around meta-data.
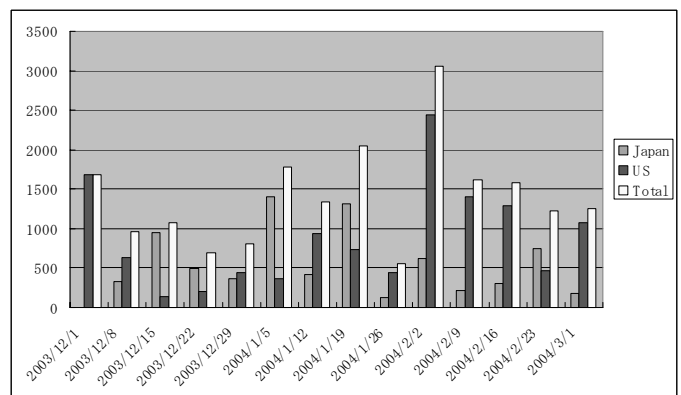

Figure 12 Histogram of number of accessing by week (from Dec.4, 2003 to Mar.10, 2004).

Video captured

Over one thousand video clips have been captured and stored over 38 working days since the deployment of this

capability. We have grouped these into 292 sessions by manually inspecting the videos and categorizing them according to which consecutive clips contain the same user or group of users captured all at once in front of the poster. Of those sessions, approximately 70% are captured in which a user interacts alone, while nearly 30% are users interacting or gathering together in front of the display (Table 3). This number includes sessions where the system was being demonstrated. There is no significant difference between US and Japan by location with regard to reading practices. Analysis of the captured videos show that gestures are simple and do not vary much; readers look at and scroll content. On a few occasions (less than 1% of the videos), readers wave at the camera. Groups are observed talking about content and pointing to sections of posted content. There was little change over time in the behaviors captured.

Category	U.S.	Japan	Total
Active Reading	83.0 (60.2%)	35.3 (61.7%)	118.3 (60.6%)
Navigating	32.7 (23.7%)	14.7 (25.7%)	47.4 (24.3%)
Messaging	1.3 (0.9%)	0.5 (0.9%)	1.8 (0.9%)
Seeing meta info	20.9 (15.1%)	6.7 (11.7%)	27.6 (14.1%)
Total	137.8	57.2	195.0

Table 1 Mean and percentage of users' activities per day

	U.S.		Japan		Total	
Category	Before	After	Before	After	Before	After
Active Reading	63.8	107.6	34.0	37.0	97.8	144.6
Navigating	34.0	30.9	18.9	9.3	52.9	40.2
Messaging	1.3	1.3	0.5	0.6	1.8	1.9
Seeing meta info	2.8	44.1	1.2	13.7	4.1	57.9
Total	101.9	184.0	54.6	60.6	156.6	244.6

Table 2 Changes of daily access frequency before and after introducing video capture and commenting

	U.S.	Japan	Total
Solo session	135 (71.4%)	71 (68.9%)	206 (70.5%)
Group session	54 (28.6%)	32 (28.1%)	86 (29.5%)
Total	189	103	292

Table 3 Actual number and percentage of interactive sessions

Feedback from users

We interviewed 9 members of staff regarding their use and impressions of the YeTi (4 in U.S. and 5 in Japan).

Interviews were semi-structured and conducted in front of the display. Questions and discussion focused on the effects of capturing and showing video, creating and reading scribbles and reviewing the access history.

Video capturing. Most members (7 of 9) answered that the captured video and scribbles were helpful in understanding readers' behavior. In addition, content "authors" were curious about others' responses to their posts. We received similar responses from 3 members who have never posted, all stated that if she/he posted, she/he would like to see "the face reading it". Unanimously people were especially interested to see remote readers' behavior, far more so than that of collocated colleagues. In fact, better resolution video was requested, and one interviewee pointed out that resolution of the video was no sufficiently good to allow recognition of readers.

One interviewee mentioned that he often paid attention to the video rather than the content displayed. Another stated he was attracted to the display when he saw videos playing. By contrast, one interviewee felt the video distracted from reading the content on the display; however, the video is only visible by selection so we conclude this should not be a major problem.

We received wide-ranging positive and negative feedback regarding being captured on video while reading. Eight of 9 members noticed they had been videoed. One interviewee mentioned he explicitly sought out being caught on video. Six interviewees didn't mind and felt it did not hinder them or impede their desire to read from the display. Two interviewees mentioned being sensitive about being captured at first, but after an initial concern were not worried about it. One interviewee suggested the video discouraged him from interacting with the YeTi display. We also observed that one interviewee tried to stand off to the side of the display so as not to be captured on video. Four of 9 interviewees thought their behavior changed at the display because of the camera. We also received requests for better end-user control of whether video is captured and for how long. Further, a delete option was suggested.

Posting scribbles. Five of 9 interviewees noticed the scribble application, with 2 posting scribbles to the screen. Two interviewees noted that, if they had a closer working relationship with their remote colleagues, they might use scribbles on the display as a communication channel. As most interviewees (8 of 9) don't have close working relationships with remote colleagues, they didn't think it necessary to create direct communications of this kind. Four of 9 interviewees felt posting and sharing scribbles was valuable, but 2 interviewees felt it was hard to write and read messages on the screen, an interface issue that clearly needs addressing. There was a request for better drawing tools and better resolution of the final image. One

interviewee wanted a keyboard to the display to enable more input.

Showing access history. Five of 9 interviewees did not notice the access history display. We speculate that this is because the access history visualization is only available after pushing the 'annotation view' button twice. After being shown the access history visualization, 5 of 9 interviewees suggested the information would be of interest when evaluating the level of interest people pay to a posting.. As with the captured video, content authors were particularly interested in this feature, and it was considered to be a good indicator of "what to post next."

Requests for features In addition to the features mentioned above, we received a request to allow for video browsing of all captured video not just videos that have been recently captured. We believe this indicates that users/authors want to understand more fully all activities that have taken place around posted information, not only activities around recent content. We also received a request to capture the creation of comments (scribbles) as they are being produced; it was argued that this would contribute to fostering communication between remote colleagues members by active interest in content, and would circumvent the problem of anonymous (unsigned) scribbles.

DISCUSSION
In this section, we discuss some of the pros and cons we have observed with utilizing video, comments and access histories in our distributed community bulletin board system.

Who's the audience?
One of reasons cited for not posting to community bulletin boards was that people were not sure who the 'audience' for their content was. This was particularly emphasized in the case of YeTi, as many people had not met others at the remote location. Comments following the addition of video indicate people felt positive about seeing others' comments and video of interactions. Although further evaluation over time is required, our tentative conclusion is that captured video and the scribble comments helps remote colleagues know what is being read, what thoughts it sparks, and more importantly who is reading what information. Seeing others at remote locations interact with content via video clip generates *interest in new people* ("Who *is* that looking at that page?") as well as *interest in content* ("I wonder what was so fascinating about that posting?"). Such observations are encouraging; knowing people, even strangers, read content offers a feeling for the social and intellectual landscape of the remote location. We cast the video and scribble annotations as a social form of "edit wear and read wear", where actions on computational objects (e.g. documents) are recorded to provide a sense of their use [7].

Video clips grab people's attention
We also found that the video clips and comments acted as 'bait' for inviting readers to the display, and caused conversations around the display between collocated colleagues. In some cases, the video and the comments caught people's attention rather than content itself, which led us to realize that the content and the "human interest" around content were synergistically providing the overall interest in the display and the content. Such factors have been noted frequently when considering the "social navigation" of information [19].

"Privacy" and surveillance were minor concerns
Initially we had concerns about "privacy" and concerns over surveillance when capturing video clips from of interactions with the system. However, we have not received any explicit complaints, and concerns were outweighed by interest and curiosity. Clearly this is in part a function of the specific social context of our organization(s), so it is not clear how this feature will be accepted in other social settings.

In terms of expressed concerns, a few users made efforts not to be captured by changing the angle of the camera during interaction with the display, standing outside of the range of the camera, and/or waiting for the capture period to end before moving forward to read content. We also received comments from users who wanted to control the recording of video by themselves; it has been suggested that we introduce a "delete" function for captured video, and also make the capture indicator more prominent. Such end user control functionality will be implemented in the near future.

The relatively low level of concern, we believe, in part because the video capture function only works by when the display is being touched. We do not have fulltime recording so only actively interested people are captured, and thus do not capture unrelated activities in the vicinity of the posters. Further, people reported being less concerned about being captured on video because the posters are located in public, not personal, spaces – both are in corridors. Finally, people seemed less concerned about the video because of its "poor quality"; familiar people were recognizable but little detail could be perceived. "Poor quality" video or abstract renderings of activity have been used in other systems to give a sense of what's going on whilst preserving people's anonymity [16].

SUMMARY
The YeTi system combines projection of community content into public places using large screen, interactive, situated displays and access to community content through an online, Web-based community scrapbook. YeTi aims to provide a platform for playful interaction with community generated digital content in public places.

We have described "reading awareness" features that have been introduced to the YeTi public display to allow content authors and readers to gain more awareness about the audience for content. Features include a means of capturing short videos, posting shared comments and showing access history over content. Preliminary field trials and user interviews reveal considerable interest in these features, and some support for our contention that seeing others' activities around shared content leads to piqued interest in distant community members. We believe that piquing others' interest in this way contributes to the social fabric of organizations and communities.

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REFERENCES

1. Agostini, A., De Michelis, G., Divitini, M., Grasso, M.A. and Snowdon, D. Design and Deployment of Community Systems: Reflections on the Campiello Experience. Interacting with Computers, Vol. 14, No. 6, pp 691-714, 2002.

2. Bly, S.A., Harrison, S.R. & Irwin, S. Media Spaces: Video, Audio, and Computing, *Communications of the ACM*, 36(1), ACM Press, pp. 28 – 46, 1993

3. Carter, S., Churchill, E.F., Denoue, L., Helfman, J., Murphy, P and Nelson, L. Digital Graffiti: Public Annotation of Multimedia Content. Proceedings of CHI 2004, ACM Press, 2004.

4. Churchill, E.F., Girgensohn, A., Nelson, L. and Lee, A. Blending Digital and Physical Spaces for Ubiquitous Community Participation. Communications of the ACM, February 2004, Vol. 47, No. 2, pp. 38-44, February 1, 2004.

5. Churchill, E.F., Nelson, L, Denoue, L., Helfman, J., and Murphy, P. Sharing Multimedia Content with Interactive Displays: A Case Study. Proceedings of DIS 2004, ACM Press, 2004.

6. Fass, A.M., Folizzi, J. and Pausch, R. Messydesk and MessyBoard: Two designs inspired by the goal of improving human memory. Proceedings of DIS2002, ACM Press, 2002.

7. Greenberg, S. and Rounding, M. The Notification Collage: Posting Information to Public and Personal Displays. Proceedings of CHI 2001, pp.515-521, ACM Press, 2001.

8. Helfman, J., Nelson, L, Murphy, P and Churchill, E.F. The YeTi community bulletin board and corporate memory. ACM DIS 2004 Design Award submission, see www.fxpal.com/people/churchill/Demos, 2004

9. Hill, W.C., Hollan, J.D., Wroblewski, D. and McCandless, T. Edit wear and read wear. Proceedings of CHI, p.3-9, ACM Press, 1992.

10. Houde, S., Bellamy, R., Leahy, L. In Search of Design Principles for Tools and Practices to Support Communication within a Learning Community, SIGCHI Bulletin, 30, 2, April 1998.

11. Huang, E. M. and Mynatt, E. D. Semi-public displays for small, co-located groups. Proceedings of CHI, ACM Press, 2003.

12. Lee, A., Danis, C., Miller, T. and Jung, Y. *Fostering Social Interaction in Online Spaces*. In Proceedings of INTERACT 2001: IFIP TC.13 International Conference on Human-Computer Interaction, IOS Press, pp. 59-66, 2001.

13. McCarthy, J., Costa, T.J., Huang, E.M. and Tullio, J. Defragmenting the organization: Disseminating Community Knowledge Through Peripheral Displays. Workshop on Community Knowledge, ECSCW 2001.

14. Nelson, L., Churchill, E.F., Denoue, L., Helfman, J. and Murphy, P. Gooey Interfaces: An Approach for Rapidly Repurposing Digital Content. Proceedings of CHI 2004, ACM Press, 2004.

15. Pedersen, E., McCall, K., Moran, T. and Halasz, F. Tivoli: An Electronic Whiteboard for Informal Workgroup Meetings. Proceedings of InterCHI'93, ACM Press, 1993.

16. Pedersen, E., Sokoler, T., AROMA, Abstract Representations of mediated presence supporting Mutal Awareness, Proceedings of CHI'97, ACM Press 1997.

17. Savolainen, R. Everyday life information seeking: Approaching information seeking in the context of 'Way of Life'. Library and Information Science Research, 17, 259-294, 1995.

18. Snowdon, D.N. and Grasso, A., Diffusing Information in Organizational Settings: Learning from Experience. Proceedings of CHI 2002, ACM Press, 2002.

19. Wexelblat, A. History-rich tools for social navigation, Proceedings of CHI 98, ACM Press, April 18-23, 1998.