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Building Community Mirrors with Public Shared Displays

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Abstract: Community support is currently gaining more and more importance in all areas from knowledge management to customer support. This paper addresses the usage of non-desktop user interfaces, namely public shared displays, as an additional interface to community support applications. By displaying information from within the community such Community Mirrors can support insiders and outsiders gaining awareness of the community. We present an overview of how such devices can be used for community support, and briefly describe three applications we have designed.

1. Introduction

Starting from early studies on computer-supported collaborative work, the role and potential of community support is gaining more and more importance in the development of new applications for information and communication technologies.

The success of community support applications depends on the active participation of a significant percentage of the community members. Hence, the availability and modality of access to the community support application can be considered a major issue. However, experience so far demonstrates that the common user base of community support applications is mainly composed of computer literate individuals, accessing the systems with desktop computers at home or at the workplace. In fact, community support applications are often based on large bulletin boards, and the main user interface usually is a Web browser.

Ubiquitous Computing and mobile computing, i.e. new user interfaces that are emerged in the real world, may address the boundaries of community support and offer possibilities for enlarging the reach of community support applications.

One field, where new user interfaces for community support might prove especially useful is awareness support, i.e. visualizing the activity in the community, the relationships and interactions among the community members, and presenting this information at locations and in situations where the community members meet.

We call such awareness applications for communities “Community Mirrors”. Community Mirrors provide information about the community and its activities for community members to support interaction and matchmaking in the community.

In this paper we first discuss some basics on communities and community support to derive possible application areas for Community Mirrors, then summarize existing work, and finally present three Community Mirror applications we are currently developing.

2. Community Support and Community Mirrors

We began our project on Community Mirrors with revisiting basic work on community support. The goal of the task was to answer the question, what communities are and in which tasks they can be supported, in order to derive possible application areas and requirements for the usage of public Community Mirror displays.

2.1 Communities

In general a community is a group of people who share some interest, identify with a common idea or more generally belong to a common context. Thus, a community can be seen as a descriptive identity for a set of people.

Early sociological work points out, that communities always need a locality and interaction [9]. While the demand for a common physical locality is no longer seen necessary, the demand for interaction is still valid. However, no active interaction among all community members is required but rather the possibility to interact with the rest of the community. In more practical terms this possibility to interact implies the existence of a common communication medium, of common protocols and awareness of the existence and of the membership in the community.

Other characterizations highlight the need for mutual collaboration in the community, e.g. the will to exchange knowledge or to help each other [10]. A community should not just be seen as a set of people who have something in common and who have the possibility to communicate, but as a set of people who are willing to help each other, who are collaborating to the advantage of all.

Besides the collaboration among the members itself, the main activities in communities are communication and finding people to communicate with. Hence, community support can be seen as "communication and matchmaking/awareness support".

2.2 Community Support

The use of networked computers to support communities can be traced back to the beginnings of the Internet: The second service in the initial Internet, the file transfer service was soon "misused" to transfer messages from one person to another – email was invented [8]. Quickly mailing lists followed and Newsgroup services were available – both on the Internet (Arpanet) and on alternative networks formed of loosely connected computers (e.g. the FidoNet). These first community support services of the Internet still exist. Additionally, different (Web-based) platforms emerged, that provide virtual places for communities. Such solutions are labelled as platforms for community support (community platforms).

However, community support did not start with computers. Support for the building and the maintaining of communities can be classified in classical approaches like private letters, leaflets, magazines, paper whiteboards, specialized radio and TV programs, and approaches based on networked computers (bulletin board systems, MUDs, MOOs).

Both support types, the classical and the electronic ones, provide a medium that can be used for the interaction among the members. And both have their advantages and disadvantages. For classic media the advantages are availability, familiarity, and ease of use. For electronic media the advantages are dynamicity, speed, ease of replication, and distribution; disadvantages are barriers to usage, problems with access, and lack of availability.

Generalizing the functionalities of different electronic community support tools and matching them with the basic characterization of communities presented in the previous section one can identify the following basic concepts of community support applications:

- Providing a medium for direct communication and for indirect exchange of content and comments within the common scope of the community.
- Providing awareness of other members and helping to discover relationships (medium for matchmaking). This can help to find possible cooperation partners for direct interaction.

2.3 Public Shared Displays for Community Support

Support of informal communication and awareness is important both for teams and communities as it helps people to establish common ground that is necessary for meaningful conversations and relationships. Common ground, as Clark defines it in his book "Using Language" [5], is information that two parties share and are aware that they share. According to Clark, "*Everything we do is rooted in information we have about our surroundings, activities, perceptions, emotions, plans, interests. Everything we do jointly with others is also rooted in this information, but only in that part we think they share with us*". Some information on how the concept of common ground can be used to design technology for collaboration can be found in [2].

Closely related to common ground is the concept of awareness, which has already been researched intensively in the collaboration support domain. Dourish and Belotti define awareness as "*an understanding of the activities of others, which provides a context for your own activities*" [6]. Context for the own activities can be different types of information, ranging from the availability of co-workers to notifications about people or information that might be relevant to your own work or leisure activities. Schlichter et al. regard providing awareness as the most common dominator in collaboration support [19]. They list contact facilitation and collaborative usage of knowledge as the main activities in communities to be supported by awareness. While groupware focuses on workspace awareness, community support focuses on people/presence awareness (due to the lack of a common workspace).

Common ground and awareness suggest that providing a detailed and aggregated view of a community, a Community Mirror, can help community members in their activities. From the theories one can classify different types of information that can be useful for the individual community members: awareness of community members, information contributed by community members, and activities in the community information space.

Awareness of community members – Information about already known community members can help in coordinating activities. For unknown community members this information mainly serves contact facilitation. In addition to information about particular community members, aggregated information of community membership can be helpful for insiders and outsiders.

Information contributed by community members – Communities cluster people with similar interests. Hence, information contributed by community members in the context of the community is potentially interesting for other community members. This information also provides hints about the interests of the contributing users, and thereby supports contact facilitation. In this category again both the display of detailed and aggregated information is possible and useful.

Activities in the community space – A special type of information contributed by community members implicitly are activities they are performing in the community space. These events, again in detail or aggregated, can help other community members in identifying information or people that can help them in their activities.

2.4 Application Architecture

The displays we are envisioning for presenting this information should be public, shared, interactive, and personalized:

- Public display: The display is in a public space, and can be used by all people that have access to the space.
- Shared display: The display can be viewed/used by more than one user at once.
- Interactive display: The users can interact with the display.

- Proactive/Personalized display: The display can react on the user (without the user directly interacting with the display, e.g. by recognizing users by radio frequency identification and adapting the displayed information to the users [14]).

In our work we first concentrated on public shared displays – i.e. displays that are placed in a (semi-)public space and can be accessed by several users at once – and thereby constitute a social place where people can meet. This feature (social place) can further enhance the pure information distributing effect for the single user of the display. Interactivity and (automatic) personalization are considered as optional features in our designs [11].

In contrast to existing solutions for (community) awareness support that consist of single applications dealing with information gathering, storing and visualization, we follow the idea of connecting Community Mirrors to existing community support platforms. Web-based community support platforms can be enhanced by additional shared displays or kiosks. This architectural consideration also suggest including mobile devices for information display and interaction. We consider this in our projects, but do not address it further in this paper.

For implementing such hybrid systems different applications have to be integrated. Based on this need we have built Cobricks, a modular toolset for building community platforms that easily can be accessed from other platforms or from external applications like Community Mirrors (see www.cobricks.org for more information).

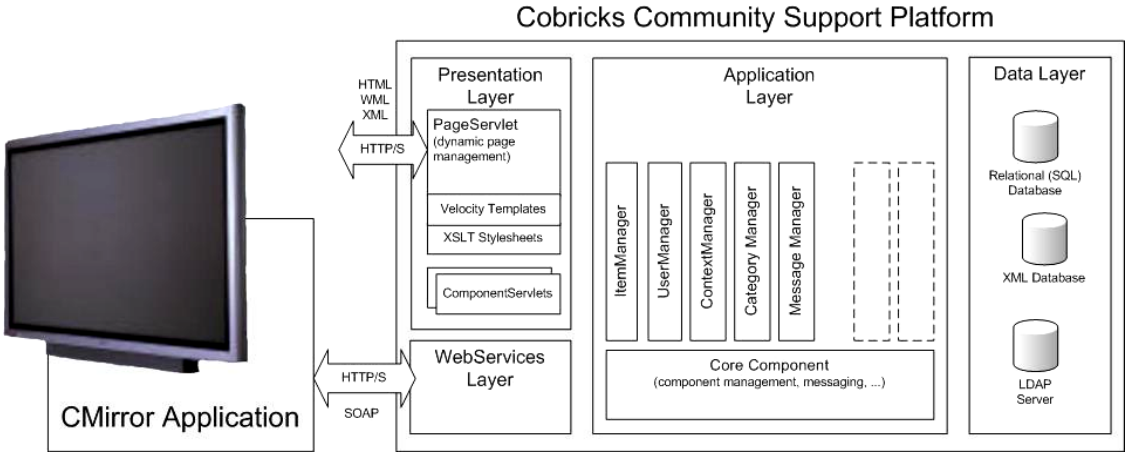

Fig. 1: Cobricks overall architecture

One part of Cobricks is the CMirror application framework. Using this framework, Community Mirror applications can be built that display different information from a Cobricks platform. The framework provides all functionality for screen layout and for communicating with the community platform.

3. Related Work

Public shared large screen user interfaces are not a new concept, having been pioneered in the 1970's by Myron Krueger [12]. Recent work has mainly focused on supporting collaboration between co-located or distributed users. For the co-located support the central concepts are to provide an interface, which can be used simultaneously by more than one person, and to provide a large working area that can fill the field of view.

An example of usage of large screens to support collaboration is the DynaWall [7]. DynaWall, developed at GMD/Fraunhofer-IPSI, is a large screen display with an active area of 4.5 x 1.1 meters and a resolution of 3072 x 768 pixels It is formed by three

networked, back-projected electronic whiteboards each which its own controlling PC. User interaction is by hand-gesture and pen input.

Only recently a trend investigating large screen displays for publishing and matchmaking in communities has started to emerge, specifically addressing settings like conferences and exhibitions. Some public displays have been created that attempt to address the issue of providing common ground to inspire conversation. McCarthy's Groupcast is a peripheral display that recognizes passers-by and posts content of interest to at least one of the users [13]. The Silhouettell system [17] also uses large screens to project information of common interest to people meeting before the shared display.

More examples for current systems supporting communities can be found in [16], e.g. the Plasma Poster from Fuji Xerox Palo Alto Laboratory [3, 4], the Magic Wall from Accenture Research, and the CWall from Xerox Research Lab Europe [1, 20]. In most projects the development was for done office environments, i.e. communities sharing the same physical work location. The Plasma Poster is intended for knowledge sharing at the workspace and has also been extend to conference usage in CHIplace and CSCWplace by Churchill et. al. [4].

Outside of research, several large, interactive shared displays have also been deployed. For example BBCi has built street-level window displays that allow passersby to not only see and hear interviews in progress, but also to submit their own questions using SMS text messaging. Likewise, the Vodafone Lisbon office contains a giant cube display on which passersby can request news, short animations, and games, again using SMS text messaging. See [18] for more information on these examples.

The main shortcut of existing applications is that they usually are self-contained. The full potential of Community Mirrors however can only be made available when connecting large screen displays to existing (community) platforms. Additionally, it would be ideal if existing large screen displays could be used for more than one community platform.

4. Application Areas and Prototypes

Based on the theoretical considerations and possible functionalities we have started to build Community Mirror applications for several application areas. In this section we will briefly describe three projects that are nicely covering the possibilities for Community Mirrors.

4.1 Library Mirror / Engramm

For identifying interesting topics or people to contact it is useful to have peripheral awareness of what other people (in the community) are working on or looking for.

We have taken up this idea for the main library of our university, and have implemented a Community Mirror application that anonymously visualizes what library users (both in the physical library and via the Internet search engines) are searching for. This visualization is displayed on a large screen projection in the entrance area of the library and optionally on mobile devices.

The design of the library mirror includes the real-time visualization of queries, the visualization of aggregated query information (Figure 2), and the display of announcements of the library. We also address how users can interact with the visualization to obtain additional information. See [15] for more details on this application.

Fig 2: Library Mirror

4.2 Meeting Mirror

An important activity in communities of practice is attending (physical) community meetings, i.e. events during which members of the community come together for communication and for exchanging information.

While much effort has gone into creating online spaces for people to meet, network, share, and organize, relatively little effort has gone into creating awareness of online social activities in physical community places [4]. Support for awareness and matchmaking during such physical events currently is limited to simple badges and printed participant lists. These tools usually cannot be influenced a lot by the community members whose information is distributed through them.

We took these observations as a starting point to look closer into possibilities to support community meetings and designed a Community Mirror application for supporting matchmaking during such community meetings [11]. The Meeting Mirror application provides an interactive visualization of the participant list of the meeting. In addition to the visualization this application also addresses issues of identity management for managing the access rights to a user's personal information. We envision the Meeting Mirror in the form of a pillar (see Figure 3), the current implementation however uses flat screens only.

4.3 Announcement Mirror

The third application we are evaluating is an announcement mirror, i.e. an application that visualizes the content, community members are publishing on a community platform for other members.

We have implemented such an Announcement Mirror displaying selected contents from the community platform of a university department on a large screen display.

Fig. 3: Meeting Mirror

5. Conclusions

In this paper we have presented the general idea of Community Mirrors, have discussed some possibilities for their application, and have presented three applications of such community awareness visualizations. These examples offer both applicable solutions for different community support scenarios, and provide inspiration for new developments in the area of Community Mirrors.

The most important message of this paper is that different user interfaces should be used to provide access to existing and new community support platforms. Large screen displays are especially effective for providing an overview of what is going on in the community (awareness). Mobile devices might be added to the setup for interaction with the platform – this is something we are also planning to address in the future.

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