AwarenessMaps:
Visualizing Awareness in Shared Workspaces

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ABSTRACT

In cooperative activity users require information about their cooperative environment. AwarenessMaps provide the members of shared workspaces with an overview of users and shared documents: the PeopleMap shows an array of pictures of active users fading out over time; and the DocumentMap provides a schematic overview of the structure of a shared workspace and indicates recent changes.

Keywords

Visualization, awareness, shared workspace.

INTRODUCTION

In any kind of cooperative activity users require information about their cooperative environment. In face-to-face settings this information can be captured easily. In settings with remote cooperation, technological support is needed to provide this awareness. The following core requirements for awareness support in distributed workgroups and virtual communities are important [1, 3]:

- *Social awareness* about the presence and availability of users and *workspace awareness* about the state of and manipulations to shared artifacts should be provided in a single tool. In the past several approaches and systems have been suggested to provide awareness information. They can be divided into two groups: approaches primarily aiming to provide social awareness such as instant messenger systems (e.g., Hubbub [4]); and approaches primarily aiming to provide workspace awareness such as notification systems (e.g., Web Discussions [2]).

- The awareness information should be *relevant to the user's current task* and be presented in an adequate format. In systems with a huge body of documents (e.g., in workgroups of knowledge workers or large virtual communities) the system should also provide up-to-the-minute information about the structure of the document base.

- Capturing and presenting the information should cause *no additional effort* to the users. For instance, many instant messenger systems require users to log in and set their online status manually.

The AwarenessMaps we are going to present are based on these requirements.

AWARENESSMAPS

The AwarenessMaps have been designed to augment the BSCW system (Basic Support for Cooperative Work), a Web-based shared workspace system. Shared workspaces are nested repositories that can contain various kinds of information such as documents, URLs, results of Web searches, and threaded discussions. They are typically owned and managed by a group of users, who have to authenticate in order to access the contents of the workspace, change the existing content, or upload new documents. The BSCW system is mainly used for managing shared workspaces of multi-party projects (e.g., multi-national projects of the European Union), and for sharing documents among teachers and students [1]. BSCW workspaces and the user population can become huge. For instance, the public BSCW server currently has more than 100.000 registered users (cf. http://bscw.gmd.de).

The standard BSCW server already offers several mechanisms for providing awareness information. For instance, users can see awareness icons next to the document icons, which immediately indicate recent activities on the shared documents (cf. the 'Events' column in Figure 1); and users can subscribe to a daily activity report, which is sent out via email and summarizes all changes in the workspaces of a user within the last 24 hours. Nevertheless, in a system with thousands of users and thousands of documents it is hard keep in touch with the other members of the workspaces and to keep track of all the members' changes to the shared workspace.

AwarenessMaps provide users with up-to-the-minute information on other members of the respective shared workspace (PeopleMap) as well as its structure and the contents (DocumentMap).

PeopleMap

The PeopleMap shows an array of pictures of users with recent activities (cf. the area below 'Your location:' in Figure 1). The pictures are displayed in the order of the actuality of the represented user's last activity and fade out over time. That is, when a user performs an action in a workspace (e.g., reads or uploads a document) their picture is inserted on the very left of the PeopleMap in a sharp format. Pictures fade out with the increasing age of a user's actions. Typically, a linear fade-out over 24 hours is used: the pictures get increasingly transparent and the pictures of users who have not performed any action within the last 24 hours fade out completely and are not visible any more.

PeopleMaps allow some simple, yet powerful, user interaction: Users can navigate their mouse over a picture to view tool-tip like information on the name of the user and the manipulated document as well as the type and time of action. A click on a user's picture opens an additional window with detailed contact information on the respective user including a URL with the user's email address.
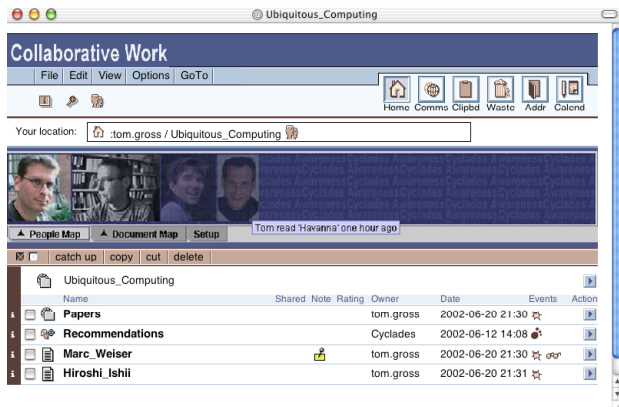

Figure 1. Shared workspace with a PeopleMap.

DocumentMap

The DocumentMap provides a schematic overview of the nested structure of a shared workspace consisting of folders, sub-folders, and documents. The structure is mapped into an array consisting of nested rectangles. The mapping is based on space-filling algorithms for the visualization of hierarchical information structures from Johnson and Shneiderman. The algorithms are described in [5]; some Open Source implementations of treemaps are available at http://treemap.sourceforge.net/. We will not go into details here.

In our visualization each rectangle represents an individual document; the bounding rectangles represent the folders containing it. Figure 2 shows a simple example, in which a shared workspace consists of two top-level folders (where the five left-most rectangles represent documents contained in the first top-level folder; and the remaining rectangles represent documents contained in the second).
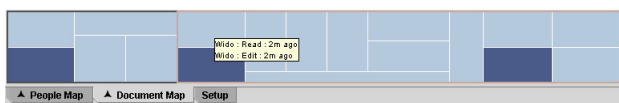

Figure 2. DocumentMap (part of shared workspace).

The layout of the DocumentMap is recalculated and redrawn, whenever the underlying structure of the shared workspace changes. Basically documents are represented in light blue color. When a document is manipulated (e.g., created, updated, read), the color of the associated rectangle changes to dark blue. Similar to the PeopleMap the color changes back to light blue after a period of 24 hours.

Users can interact with the DocumentMap in several ways: they can navigate their mouse over a rectangle to view the document's name and path in a tool-tip like representation. For recently manipulated rectangles users can get the manipulation history by navigating their mouse over a rectangle with the shift-key pressed. A left-click on a rectangle opens the respective document. A right-click on a rectangle shows the complete hierarchy of the folders containing the respective document and allows users to jump to any of those locations.

Implementation

The AwarenessMaps are implemented as applets in Java using Java's Swing user interface components. The applets communicate with an event database, which stores all the events generated upon user actions and changes to shared workspaces.

SUMMARY

AwarenessMaps provide the members of shared workspaces with awareness information about each other as well as about the structure and current state of the shared artifacts. Users can easily switch between the PeopleMap providing social awareness and the DocumentMap providing workspace awareness.

As the AwarenessMaps capture and present the information about a whole workspace, users do not get lost in huge workspaces. At any position (i.e., in any depth of the workspace folder structure), they get an overall picture about the whole workspace and can easily contact other users who are active at the same time or navigate to hotspot where a lot of changes are happening.

Finally, the information is captured and presented automatically—without any effort from the user. Users have the option to configure the system. They can specify that they do not want to be displayed in the PeopleMap in order to protect their privacy. And they can close the AwarenessMaps, if they do not need the information or want to reduce download times.

The AwarenessMaps have been used in the distributed CYCLADES project with partners from France, Germany, Greece, and Italy. However, thorough evaluations have yet to be done.

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