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Note: This is not a stand-alone paper. It accompanies a video.

Staying Aware in Groupware Workspaces

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ABSTRACT

This video illustrates several widgets that help people maintain awareness of one another in shared workspaces. Many real-time distributed groupware systems provide a shared space where participants can see and manipulate work artifacts; however, these systems present only a fraction of the information that is available in a face-to-face setting. As a result, people are less able to keep track of where others are working, what they are doing, and what they are going to do next. The widgets in this video demonstrate two approaches that can help to solve this problem. First, *overviews* can be used to provide a high-level picture of the workspace and the locations and activities of the people in it. Second, *detail views* can show the particulars of another person's work area, giving a closer look at their interaction with the workspace.

INTRODUCTION

People maintain an ongoing awareness of others in physical workspaces like whiteboards and tabletops, and they do this using everyday perceptual abilities. For example, we can glance over at another person to see where they are working, or we might hear the sound of a particular tool that indicates what they are doing. In the virtual workspaces provided by real-time distributed groupware, these abilities are greatly reduced. Groupware systems reduce a person's visual field to the limited area of a computer screen, remove characteristic motions and sounds from actions, and complicate auditory and visual communication. The situation is made worse by groupware techniques like relaxed-WYSIWIS view linking that can hide people's visible actions from one another.

As a result of these changes, people receive only a fraction of the information about others that they would in a face-to-face setting, and it becomes much more difficult to maintain awareness. One kind of awareness that is often compromised in the move to a groupware system is *workspace awareness*: the up-to-the minute knowledge a person holds about another's interaction with the workspace [2,3,4]. This includes knowledge about who is in the workspace, where they are working, what they are doing, and what they intend to do next. Workspace awareness reduces the effort needed to coordinate tasks and resources, helps people move between individual and shared activities, provides a context in which to interpret utterances, and allows anticipation of others' actions.

We have designed several groupware widgets to help people maintain workspace awareness in shared spaces. These widgets are separate windows added on to a main workspace view. They can be divided into two groups: those that provide overviews of the entire workspace, and those that show the details of another person's work area.

WORKSPACE OVERVIEWS

Workspace overviews show a miniature of the entire workspace and the artifacts in it. They can provide a quick look at the task as a whole, and correspond to people's ability to look at the whole workspace in a face-to-face situation. Overviews are also a natural vehicle for awareness information in relaxed-WYSIWIS groupware.

The Radar View

The *radar view* [1,4,5] adds workspace awareness information to a basic overview (Figure 1). The radar display shows where each person is and what they can see by marking their view outline, and also shows fine-grained location by including miniature telepointers that represent each person's mouse cursor. The radar view also supports awareness of activity. The radar shows movement of and changes to artifacts in the workspace, giving *feedthrough* about others' actions. Telepointers provide a second source of information about what people are doing. To aid in determining the identities of workspace participants, the view rectangles contain portraits of their owners.

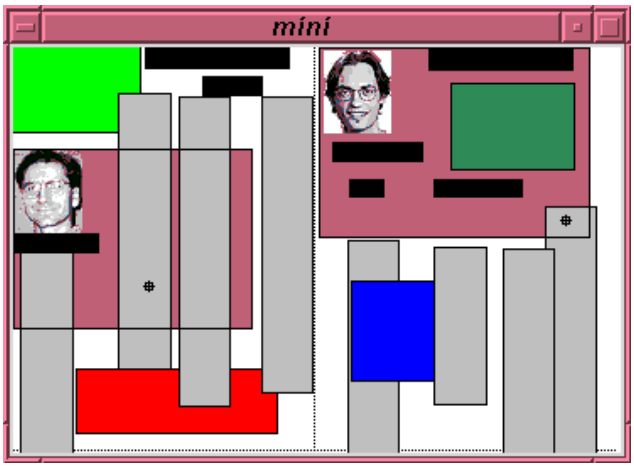

Figure 1. The radar view in a page-layout application. The main workspace view is not shown.

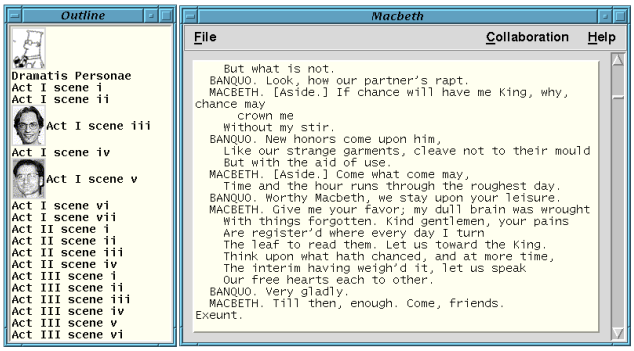

Figure 2. The structure radar (left) and the main workspace view of the text of *Macbeth* (right).

The Structure Radar

In some cases, an overview of the symbolic structure of the workspace may be more useful than a miniature of the artifacts themselves. Text documents, for example, can benefit from this approach. In Figure 2, a structure-based overview (at left) shows the acts and scenes that make up the structure of *Macbeth*, with the text of the play in the window at right. Within the overview, people's portraits indicate their locations in the text.

DETAIL VIEWS

Overviews provide only a low resolution representation of others' views, especially if the workspace is large. Detail views are a second class of widgets that provide a more specific look at the activities of a single person.

The Multiple-WYSIWIS View

If more detail about the artifacts in a participant's view is required, the *multiple-WYSIWIS* widget shows a scaled-down duplicate of another person's view of the workspace (Figure 3). The widget has a higher resolution than the radar, but shows only one person's view. All of the person's actions in the workspace, including cursor movement and manipulation of artifacts, are visible within the display. This widget provides some of the benefits of the WYSIWIS approach by once again giving the group a common (though composite) view of the workspace, but still allows people individual control of their main views.

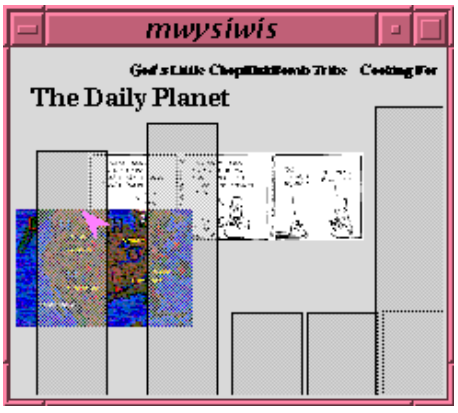

Figure 3. The Multiple-WYSIWIS showing one person's view on the workspace of a page-layout application

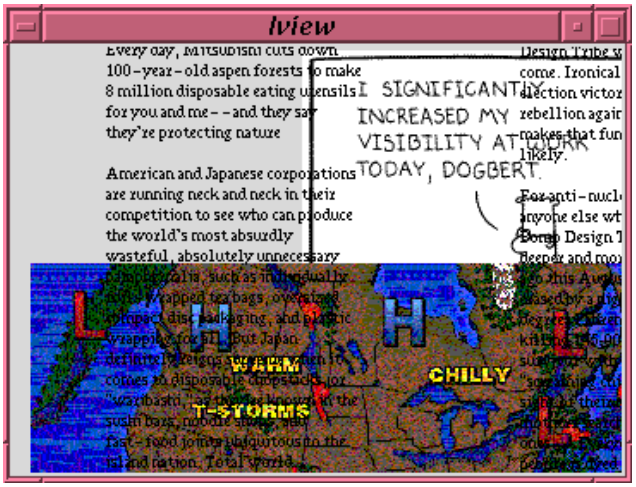

Figure 4. The WYSIWID view showing full details of the workspace around a remote participant's cursor.

The "What You See Is What I Do" View

In some cases, people need to see the details of another person's actions at full size. Since limits on screen space usually preclude a full-size duplicate of another person's view, we have designed a "what you see is what I do" (WYSIWID) widget that provides full-size details, but shows only a limited part of the other person's view (see Figure 4). The widget shows only the immediate context around another person's cursor, since most actions in graphical applications will involve the mouse. As a person moves their cursor on a remote machine, the background of the widget pans to keep the display centered around the pointer.

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