Using Translucent Interface Components to Lessen Interference Effects in Single Display Groupware

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Abstract

Single Display Groupware (SDG) is a class of applications that supports multiple simultaneous users interacting in the same room on a single shared display through multiple input devices. Because users share the same display, they have the same view of the working area. *Interference* occurs when one user raises some interface component—pop-up menus, dialog boxes, secondary windows—that hides or obscures the view of the underlying work surface for other users. This is not only distracting, but may also impede people from continuing their work. In this paper, we describe our in-progress research on using translucent interface components in single display groupware as a way of lessening interference effects. In particular, we are comparing how translucent *vs.* traditional opaque menus affect levels of interference when users are playing a simple SDG "connecting the dots" game.

Research Description

Single Display Groupware (SDG) is a class of CSCW applications that deals with several co-located people viewing and interacting with the same output display. While all use the same computer, each person has their own input device that they can use simultaneously with others.

There are several technical issues in developing SDG applications. Most arise from the poor support in operating systems and programming languages when developing applications for multiple users and multiple input devices. In particular, most operating systems provide direct support for only one user, using a single pointing device and keyboard, to interact with it at a time. Similarly, programming languages provide interface components (or widgets) designed for single users. For example, widgets such as menus, dialog boxes, and toolboxes do not discriminate, recognize and appropriately respond to simultaneously input from several users and their input devices. Consequently, developing even simple (but effective) SDG applications is difficult.

Our research concentrates on designing interface components for SDG. One of our concerns is analyzing interface components in terms of the level of *interference* they may cause to SDG users. Interference occurs when an interface component appears over the working area in a place that obstructs or impedes someone's view of the underlying surface. Users can unintentionally interfere with other users' work e.g., by moving their cursor close to or on the top of another's work and then raising a pop-up menu or opening a secondary window that is positioned over another's work area. We believe interference is an important usability issue because of the characteristics of SDG: users share the same display and whatever appears on it, they share tools on the display (and these tools compete for space with the underlying worksurface), and screen real estate is tight,

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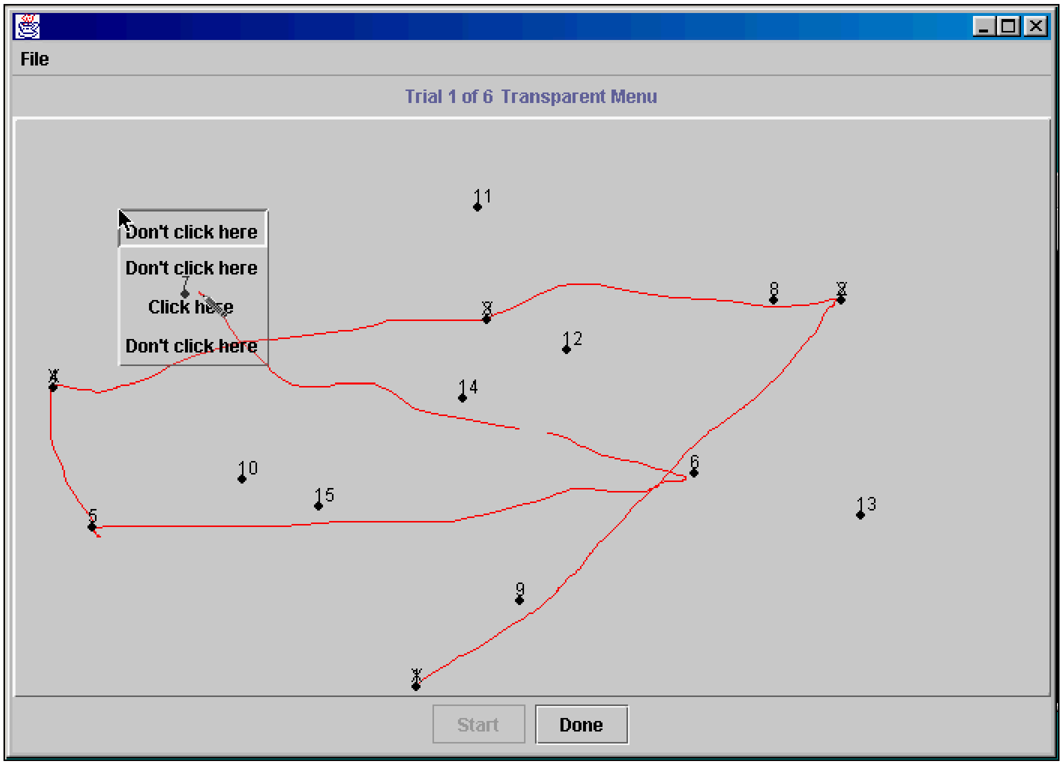

Figure 1 – “Connecting the Dots” with translucent menus

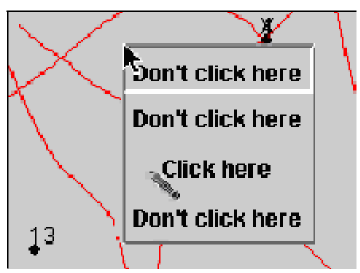

Figure 2 - “Connecting the Dots” with opaque menus

We believe that *translucent interface components* may help minimize interference among users. First, these components are semi-transparent: all participants not only see what is on the component, but can also see through it to the area underneath. Second, the component responds only to its owners input; all other participant’s actions are directed to the correct objects underneath it on the work surface.

To test this idea, we are comparing and analyzing the use of translucent pop-up menus (Figure 1) to that of opaque menus (Figure 2) in an SDG setting. Our study (which is now in progress) will look at the level of interference that translucent and opaque popup menus can cause to users in an SDG situation. We use a simple “connect the dots” SDG application that allows two users to interact at the same time (Figure 1). With this study we want to measure how the opaque and translucent menus raised by one person affects the performance of the other person who is connecting the dots: this will be measured by recording the task completion time. We will also collect their impressions of the usefulness of translucent menus in this setting.

Specifically, we will generate ‘worst case’ levels of interference by having one person try to slow down or impede the other person’s work. Each person has a specific role: the *player* is the person connecting the dots, and the *interferer* is the person popping up the menu. The interferer is directed to try and pop up their menu over the area where the player is connecting the dots. Each game consists on fifteen numbered dots, which the player has to connect in numeric order by drawing a line to the next dot and then clicking on that dot. Near misses are noted, but the player is allowed to keep on going. The interferer’s job is to try and raise their menu in a way that hinders the person from reaching and clicking on the next numbered dot. An example game is illustrated in Figure 1. There are three types of trials in the test: a *solo trial*, in which only one user plays (i.e. connects the dots without any interference); an *opaque menu trial*, in which both play and the menus are opaque; and a *translucent menu trial*, in which both play and the menus are translucent. Each pair of users will play several trials in a specific order, randomly defined by the system.

Figure 1 shows a snapshot of the “connecting the dots” application using translucent menus with two users playing. The player is identified by a cursor that has a shape of a pencil while the interferer has a black arrow cursor. The interferer popped up a menu when the player was selecting number 7. It is a translucent menu, so it is possible to see through it (the lines previously drawn, the number 7). We also see that the player has clicked dots 1 through 4 (marked with an X), but missed dots numbers 5 and 6 since they are not marked. Figure 2 shows a similar situation with opaque menus: while the two cursors are visible, the area underneath the menu is not i.e., the drawn lines and numbered dots are occluded.

The tests are now in progress, and preliminary results will be presented at the workshop. Our initial data suggests that translucent menus do lessen interference effects in SDG, and that subjects prefer them to opaque menus. If translucent menus prove successful, we will apply this technique to other interface components.

Authors' Background

Ana Zanella is a Ph.D. student in the Department of Computer Science at the University of Calgary. She has a B.Sc. in Computer Science from Pontificia Universidade Catolica do RS, Brazil, and a M.Sc. in Computer Science from Pontificia Universidade Catolica do RS, Brazil. Ana's current research interests include CSCW, Co-located Groupware, Single Display Groupware, widgets for Single Display Groupware, Multiple Input Devices.

Saul Greenberg, a Professor in the Department of Computer Science at the University of Calgary, is an active researcher in Human Computer Interaction and Groupware. He is the author and co-editor of several books, including "The Computer User as Toolsmith" (Cambridge University Press, 1993), "Computer Supported Cooperative Work and Groupware" (Academic Press, 1992), "Groupware for Real Time Drawing" (McGraw Hill, Europe), and "Readings in Human Computer Interaction: Towards the Year 2000" (Morgan-Kauffman, 1995). He has served on many academic reviews committees, and is on the editorial board of the "International Journal of Human Computer Studies" and "Computer Supported Cooperative Work".

Justification for Participation

Our research, although in its initial phase, shows potential in terms of new ideas for the design of widgets for SDG applications. Our goal in participating in the workshop is to meet other researchers interested on SDG design issues, to hear about their work, and to share with others the research we are doing.