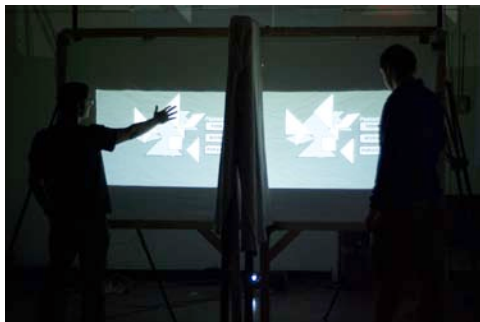


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# Privacy and Sharing Information on Spherical and Large Flat Displays



**Figure 1.** Spherical Multi-touch Display used in the Experiment.



**Figure 2.** Large Flat Vertical Display with Divider used in the Experiment.

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## **Abstract**

It is important for users to understand the fundamental tradeoff between sharing information and preserving privacy in collaboration. The more information is shared about one's actions, the less privacy is preserved. Sharing information may, in fact, counter-intuitively result in increased social stress in some cases. Maintaining privacy while allowing for the sharing of information is an important consideration for successful collaboration and we believe display form factor matters for this tradeoff. New form factors such as spherical displays support privacy naturally, by limiting a user's view to at most one hemisphere. In this video we show how different types of interactive large display form factor can provide a balance between privacy and the sharing of information in a cooperative game.

## **Keywords**

Spherical display, privacy, cooperation.

## **ACM Classification Keywords**

H5.3. Information interfaces and presentation (e.g., HCI): Group and Organization Interfaces

## **General Terms**

Design, experimentation, human factors.

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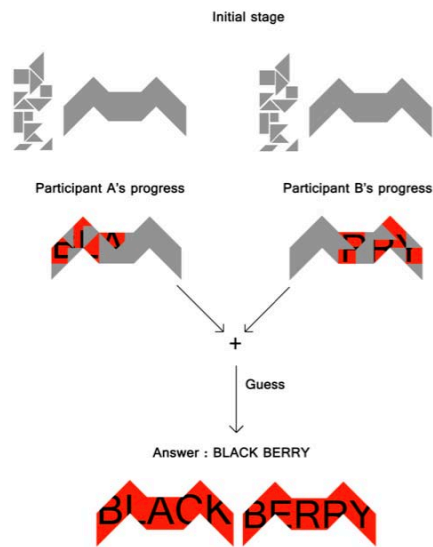
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**Figure 3.** Peeking Techniques: Peek button, Windowing, Scroll.



**Figure 4.** Shared Tangram phrase guessing game.

## Introduction

To better understand the effect of display form factor on the privacy tradeoff in collocated cooperative tasks, we investigated group activities in different single display groupware settings — a spherical display (Fig. 1) and a flat large vertical display (Fig. 2). In addition, we introduced a physical divider that split the flat display and used this as a baseline of our experiment, allowing similar privacy settings to the spherical display. Finally, to allow participants to occasionally access the other participant’s screen as needed, we designed a number of techniques that allowed participants to peek at each other’s workspace (Fig. 3).

## Shared Tangram Phrase Guessing

As an experimental task, we used a variation of the Tangram game, which is widely used to explore the creation and maintenance of common ground. We modified the basic Tangram game by combining it with a phrase guessing game to increase the need for peeking and communication between participants (see Fig. 4). Our Tangram phrase guessing game required two participants to work competitively as well as cooperatively to achieve the task goal. The Tangram puzzles consisted of several pieces. Each participant was provided with an outline of the shape they were trying to form with the pieces. Underneath each puzzle was a hidden word. Both participants had the same number and shape of pieces. However, they each had a different word hidden in the puzzle. Together, these words formed a two-word phrase. When a Tangram piece was placed in a correct location it revealed the portion, if any, of the hidden word.

The goal of the game was not to assemble whole puzzles but to guess the correct phrase as quickly as possible, individually. When a participant knew the

word on her/his screen, s/he pressed the “WORD” button on the screen. After participants guessed the phrase, they pressed the “PHRASE” button. During the game, they were free to speak to each other and look at each other’s work by walking around the display. In addition to physically moving, they were provided with three methods for viewing each other’s workspace. The first was a “Peek” button. When a participant touched this button, a window was created showing the other participant’s puzzle. When s/he touched this button again, the window was removed. The second was a windowing technique where two touches on the screen showed the information at the same location on the opposite side of the display. These two touches formed the top left and the bottom right corners of that window. The third was a scroll technique. When a participant swiped her/his hand on the screen, the display responded by scrolling the other participant’s puzzle into view. To ensure that any geometric distortion of the 2D graphical elements on a spherical screen would not negatively impact performance we removed the need to rotate the Tangram pieces. This allowed for a task environment that was well suited for a flat as well as a spherical display.

## Conclusions

Our video shows actual experimental episodes on different display settings and various peeking techniques. Results suggest that there is a clear preference for physically peeking on all three displays. Windowing was the second most preferred technique. Participant preferences for windowing over scrolling or peek buttons may indicate that they tried to minimize the amount of their own workspace that was obscured.