Distributed Tabletops :
Territoriality and Orientation in Distributed Collaboration

INDEX

Abstract

- Previous research has shown that orientation and territory serve key roles during tabletop collaboration.
- However, no one has yet investigated whether they can play similar roles in distributed collaboration.

Territoriality and Orientation in Distributed Collaboration

Introduction

- In this paper,
  - design and implement distributed tabletops to address this problem and hence improve distributed collaboration.
  - show that distributed tabletops allow geographically-separated collaborators to use orientation and territory to mediate their interactions as they would in co-located collaboration.
  - suggest that distributed tabletops offer further benefits such as an increased sense of presence.
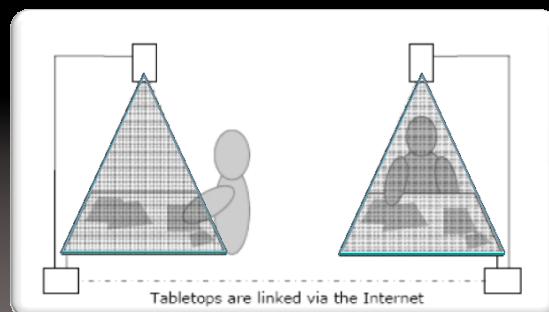
Distributed Tabletops

- Each distributed collaborator sits alone at their own tabletop interface.
- Digital artifacts are displayed on the table, and the collaborators can position, reorient and interact with the artifacts simultaneously as they would with a conventional tabletop interface.

Tabletops are linked via the Internet
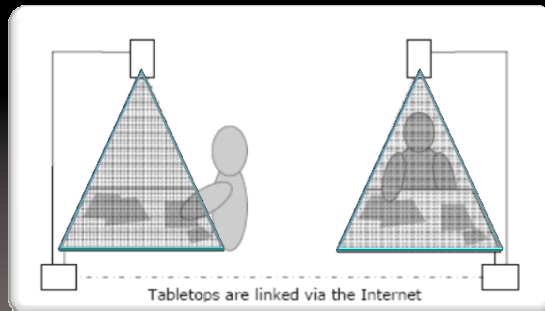
Distributed Tabletops (cont.)

- Each distributed collaborator sits alone at their own tabletop interface.
- Digital artifacts are displayed on the table, and the collaborators can position, reorient and interact with the artifacts simultaneously as they would with a conventional tabletop interface.
- The distributed tabletops display exactly the same image at all times.
- However, the most important aspect of this system is that collaborators do not see exactly the same perspective of the workspace.
- Embodiments such as arm shadows could be projected onto the displays.

Tabletops are linked via the Internet

Discussion

- This rotated perspective of distributed tabletops is crucial in supporting orientation and territory among the distributed collaborators.

- In order for B to interact with artifacts in A's personal territory, B must first reach across the workspace towards A's personal territory, and A will therefore see the arm embodiment approaching from B's personal territory.

- Collaborators will be mutually aware of each others' personal territories.

- It is therefore reasonable to expect that distributed tabletops will give distributed collaborators the notions of orientation and territory.
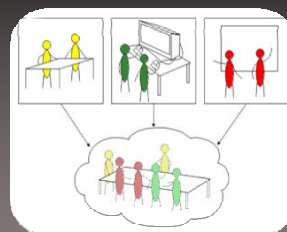
Discussion (cont.)

- Distributed tabletops provide the participants with an increased sense of spatial presence.

- Using the distributed tabletops, participants are aware of their collaborators' personal territory, and would be reluctant to retrieve artifacts from it, suggesting that they have a greater sense of presence than in conventional distributed groupware.

- HyperMirror
  - participants were always careful to make sure that they did not obscure each others' images by standing in front of each other, even though they were not physically in the same place.

Discussion (cont.)

- MPGSketch
  - the notions of territory and orientation for digital artifacts in distributed collaboration
  - the effect is very different because on a whiteboard there is no opportunity to reposition or reorient the artifact.


Discussion (cont.)

- Distributed tabletops can be extended readily to support any number of distributed collaborators, simply by increasing the number of tables and the size of the shared workspace so that there is sufficient space to give each participant a personal territory at the edge of the workspace.

- Finally, Distributed tabletops support collaboration between two distributed subgroups where the members of each sub-group are co-located around a single tabletop (mixed-presence group)
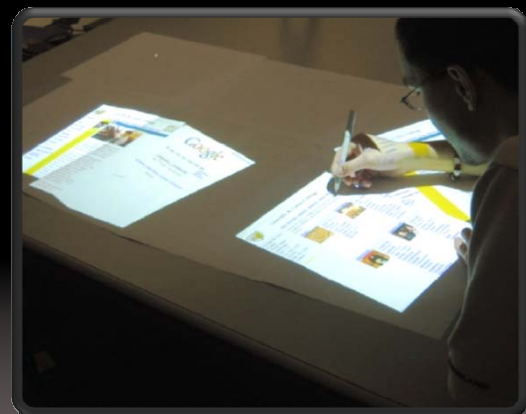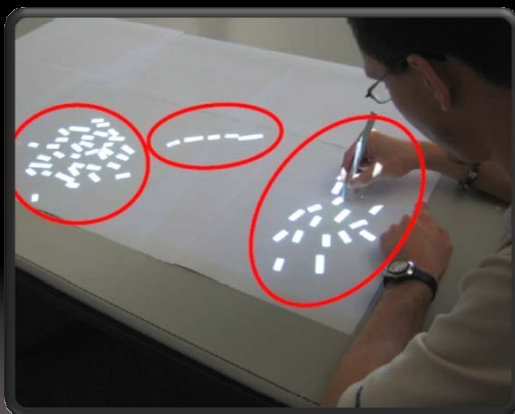
Implementation

- This system connects two geographically-separated tabletop displays to create a distributed tabletop.
- Each participant has a digital stylus which they use to reposition, reorient and interact with the digital artifacts on the display.
- The system is designed so that both participants can interact simultaneously.
- Repositioning and reorienting is accomplished in a single gesture using the Rotate 'N Translate technique.
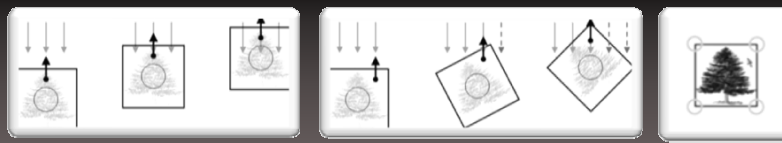
Implementation (cont.)

- Magnetic poetry application & Collaborative web-browsing application

Implementation (cont.)

- The architecture is carefully designed to allow simultaneous interaction from both participants while minimizing pixel transfers between the two tabletops, in order to create a responsive interface with a reasonable frame rate. (30 fps)

- This is particularly difficult because we use a high resolution display to support tasks such as collaborative web-browsing, and so the potential for large time-consuming pixel transfers is high.

- Furthermore, windowing protocols and remote display protocols are generally unsuitable since they assume that only a single user interacts at any one time, and also that areas of pixels will move but not rotate

- T3 tabletop toolkit

Conclusions and Further Work

- The project have presented and implemented distributed tabletops that allow distributed collaborators to use territory and orientation to mediate their interactions, as though they were co-located around a tabletop.

- The distributed tabletop also bring further benefits such as increased presence and easier transitions between personal and group working.

- Further work will investigate the extent to which the implementation realises this design goals, using an observational study and a variety of tasks to compare distributed and co-located participants.