A Study of Co-worker Awareness in Remote Collaboration over a Shared Application

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Motivation
Recent developments in groupware allow teams of co-located and distributed users to work simultaneously on a shared application, but . . .
Differences in the relative awareness of co-located and remote users have been identified

Previous Work
Mixed Presence Groupware (MPG): Allows both co-located and distributed users to share a visual workspace in a synchronous manner (Tang, Boyle and Greenberg, 2004)
Presence Disparity: Presence of remote collaborators is weakly perceived relative to co-located collaborators (Tang, Boyle and Greenberg, 2004)
Transparent Interface Device Layer: Generic multi-cursor support for both distributed and co-located users. Supports legacy Java applications. (Hutterer, Close and Thomas, 2006)

This Study
18 subjects in 6 groups of 3
Asymmetric configuration: Two people standing at ViCAT table, one seated at PC at remote site. Sites connected via AccessGrid (PC: headset; table: acoustic echo canceller)
Everyone had control of own cursor in shared application (game)
Five tasks:
- Mineswp: Minesweeper game, all on same team
- Srch(i): Search game, all on same team
- Srch(ii): Co-located team (at table) vs. remote person
- Srch(iii): Distributed team vs. other person at table
- Srch(iv): Everyone for themselves

Results: Awareness of Co-located and Remote Participants
Visual: Looked at application 96% of time. Looked at co-located participant 5% and remote 95% of time they were not looking at shared application.
Spoken: Spoke to co-located participant 34% and remote 66%
Self-rated: Rated more aware of remote participant (see Likert score difference (co-located minus remote) distribution)

Confounders
Tasks required concentration on application
Orientation at table favoured communication with remote player
Peripheral vision/hearing probably important
Very different group dynamics from one group to next

Results: Awareness of Other Cursors, Telepresence
13 subjects said mouse cursors gave better awareness, 5 said video (audio) link gave better awareness of what remote player was doing

Results: Comparison Between Tasks
Participant perceptions of awareness of co-located (\textsuperscript{\textldots}) and remote (\textsuperscript{- - -}) players and multiple cursors (\textsuperscript{. . .}). Scale: 5=very aware, 1=unaware.

Conclusion
Seems to contradict earlier awareness disparity observation (based on both self-rated and observed measures)
Dependency on cursors interesting but probably task-dependent
Strongly supports use of arm shadows: major focus on ‘task space’ in this study
More studies needed, including different configurations of users