

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:
 Mineswpr 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

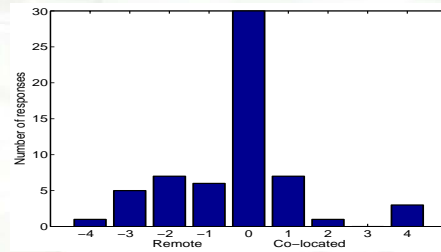


Measurements

Self-rating of how aware of co-located and remote participant
 Self-rating of awareness of other cursors
 Video analyzed to observe portion of each task subjects looked at each other (vs. shared application) and how many times they spoke to each other

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)



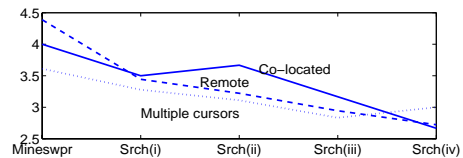
Confounders

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

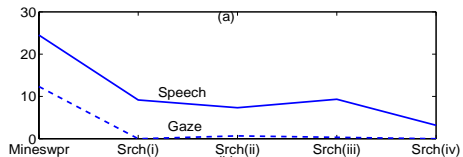
Results: Awareness of Other Cursors, Telepresence

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 (—) and remote (- - -) players and multiple cursors (· · ·). Scale: 5=very aware, 1=unaware.



Ave. no. of spoken utterances (—) and duration (sec) of gaze directly at any other participant (- - -) by task

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