Remote Active Tangible Interactions

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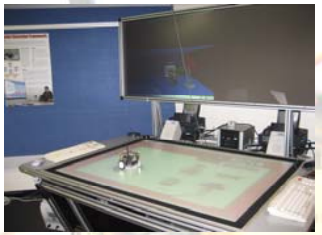
ABSTRACT
This paper presents a new form of remote active tangible interactions built with the Display-based Measurement and Control System. A prototype system was constructed to demonstrate the concepts of coupled remote tangible objects on rear projected tabletop displays. A user evaluation measuring social presence for two users performing a furniture placement task was performed, to determine a difference between this new system and a traditional mouse.

The Remote Active Tangible Interactions are based on Kojima, Sugimoto, Nakamura, Tomita, Nii, and Inami's Display-based Measurement and Control System (DMCS) robot system is a tabletop robot/tracking technology. The DMCS system was extended to allow multiple instances of the application to communicate with each other over a network.



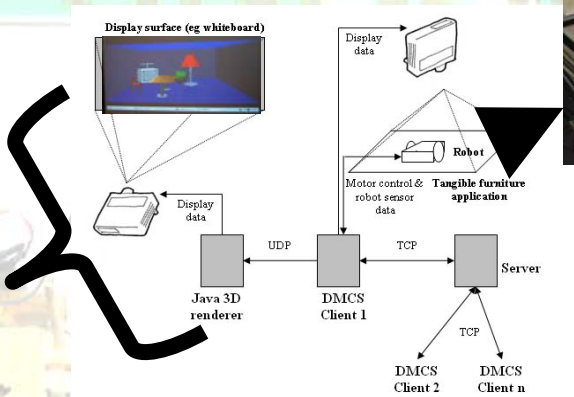
RATI
Remote Active Tangible Interface (RATI) provides an appropriate metaphor of linking physical objects together for distributive collaboration tasks, such a furniture placement.

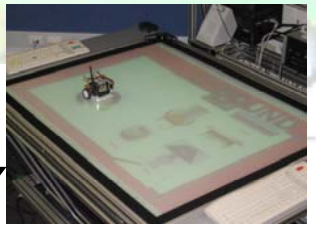
DMCS technology is a suitable solution for deploying remote active tangible interactions:
1) supports active rotation of tangibles
2) low relative cost of the tracking systems
3) allows for a large number of tangibles deployable on a single

Active TUI increases the sensation of social presence with users, when compared to a traditional GUI/mouse interface for remote collaboration.

Users felt:
1) more involved when collaborating with the TUI
2) interactions were more intuitive, personal and social
3) positive that a mature TUI implementation for distributed collaboration would be a useful medium to work with

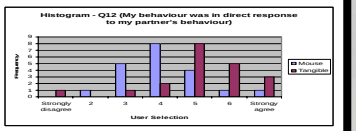
Total system



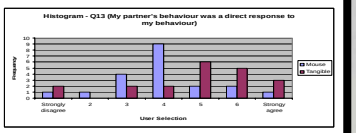


THE EXPERIMENT
1) An interior design application for our evaluation.
2) Two conditions mouse and RATI
3) Two measures for social presence Semantic Differential and Networked Minds.
4) 20 participants were recruited for the study, and they grouped into pairs for each session.

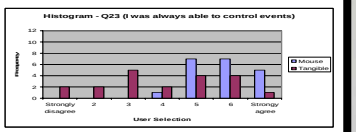
SELECTED USER RESPONSES



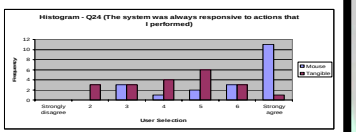
User's response to partner's behaviour



Partner's response to user's behaviour



User's ability to control events



System responsiveness to user actions

Scenario	Details
TV room	The TV is the main focus of the room. Try to think about having as much seating as possible for the TV.
TV and sofa must be in opposite corners	Which two corners is up to you, and all other furniture can be placed anywhere you like.
Two walls must not have furniture on them	Which two walls is up to you. Furniture in the corners of the two walls is ok. Furniture must be far enough from walls to walk comfortably along them.
Centre of room must be kept clear.	All furniture has to be kept on the walls of the room, so that the centre of the room is kept clear for children to play in.

Furniture Layout Tasks