Investigating Remote Pointing Input for Co-located Collaboration on Tabletop Displays

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VISION

Previous work on remote pointing for tabletop displays has shown that it is effective for acquisition of distant targets. Additionally, when given the choice users chose to use pointing, rather than touch, for the majority of their interactions with the tabletop display [5].

Whalen et al. [6] found that direct input (such as a stylus or touch) provides benefits over indirect input (such as a mouse or trackball) by providing collaborators with greater awareness of their partner's actions. We believe that the TractorBeam, a hybrid point-touch interaction technique for tabletop displays, may provide similar benefits in co-located collaborative activities.

With the TractorBeam technique, users are able to use direct touch or pointing on nearby objects, and remote pointing for distant objects (Figure 1). We believe that this pointing method may preserve some of the benefits of direct input outlined by Whalen et al., while allowing users to use one consistent input device (a stylus) and to reach distant objects with minimal physical exertion.

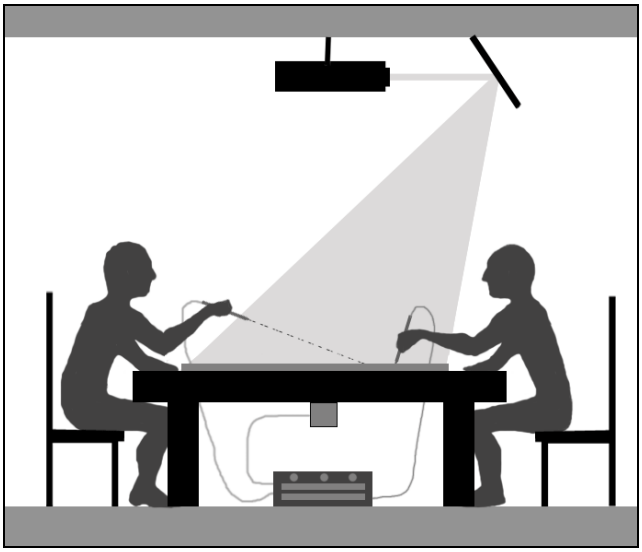

Figure 1: The user on the right interacts by directly touching the display with the stylus, while their partner uses the TractorBeam's remote pointing functionality to reach an item across the table.

EXPERIENCES & CHALLENGES

In HCI research there are standard metrics for evaluating single-user computer input devices. For example, Fitts' Law [3] and the ISO 9241 Part 9 standard [2] are some of the generally-accepted measures of input device performance.

However, when evaluating multiple devices for collaboration, these standard metrics may not apply. In supporting co-located collaboration the goal is not necessarily to find the fastest or most efficient solution, but rather to enrich the collaborative task, so faster input techniques may not necessarily be better.

In evaluating the TractorBeam it is important to also consider issues such as workspace awareness, user comfort, and personal space, as well as the relative tradeoffs between these issues.

Gutwin and Greenberg [4] define distributed workspace awareness as "the understanding of who is in the workspace, where they are working, and what they are doing." But awareness is also an important issue in co-located workspaces. If they are aware of each other's actions, partners will be better able to coordinate their collaborative tasks. The question is, how do we measure this awareness? Basic approaches may include looking for collisions or unnecessary duplication of work, or asking participants to report their perceived degree of awareness.

Abowd and Mynatt [1] noted facilitating rich natural interactions as an important goal of HCI research. We believe that the stylus-based input of the TractorBeam does facilitate natural interactions, in that people often use pens to interact with paper on regular tables. However, mice have historically been used with desktop computers; so many users are familiar and comfortable with mouse input for computer applications. We need to decide whether it is better to have natural interaction, or a familiar device.

Whalen et al. [6] found that collaborators were hesitant to interact with items that were close to their partner when using a stylus; they interacted with items in their partner's personal space more frequently when using a mouse. Depending on the task at hand, we may wish to promote or limit a user's access to others' personal space. Although the TractorBeam uses a stylus, the remote pointing ability would allow a collaborator to access their partner's personal space without physically reaching into it, similar to using a mouse. However, as with the stylus, the visual cues of the pointing action would reveal the action easily. Thus it is unclear whether the TractorBeam would promote or discourage interaction with others' personal space.

WORKSHOP GOALS

We are interested in participating in this workshop in order to gain insight into appropriate methods for evaluating collaborative use of the TractorBeam technique. Our three mean goals are:

1. Find common behaviours and characteristics to look for in evaluating co-located collaboration.

It is difficult to quantify collaboration. But there may be common characteristics and behaviours that can be used to determine the overall success or effectiveness of a collaborative activity.

2. Compile a suite of tasks suitable for evaluating co-located collaboration.

One of the main obstacles in conducting co-located research is coming up with a task that is both realistic and feasible given the constraints of a research study. Ideally, it should be compelling for the participants and also applicable to "real world" situations.

3. Learn from others' experiences evaluating co-located collaboration.

This workshop provides a wonderful opportunity for co-located collaboration researchers to share the knowledge they have gained through their previous work in this area.

BIOS

J. Karen Parker

Karen is a computer science researcher with interests in Human-Computer Interaction (HCI) and Computer-Supported Co-operative Work (CSCW). In particular, she is interested in issues surrounding the computer support of co-located collaboration. She recently received her Masters from Dalhousie University in Halifax, Nova Scotia, where she was a member of the EDGE Lab (Exploring Dynamic Groupware Environments). She is currently on work study at the Banff New Media Institute (BNMI).

Maria Lantin

Maria is the Visualization Researcher in the Advanced Research and Technology (ART) lab at the Banff Centre. Prior to coming to Banff she worked as Director of Research at IDELIX Software, an award winning producer of detail-in-context visualization software. Maria's current research focus on the concept of "performative visualization" which takes traditional visualizations to multiple devices and modalities in a directed performance. Her other research interests include rapid prototyping, physical interfaces, and wireless sensors

Sara Diamond

Sara Diamond is an internationally respected television, new media and visual artist, critic, teacher and curator. She has led programs in the Media and Visual Arts area in new media, visual art and television at The Banff Centre since 1992. She has reinvigorated research at The Banff Centre, with the Human Centered Interface Project and visualization research. Diamond has recently been appointed Director of Research. She has produced television series, new media and photographic installations and performances as an artist and is currently developing software.

REFERENCES

1. Abowd, G.D. and Mynatt, E.D. (2000). Charting Past, Present, and Future Research in Ubiquitous Computing. *ACM Transactions on Computer-Human Interaction*, *7*(1): p. 29-58.
2. Douglas, S.A., Kirkpatrick, A.E., and MacKenzie, I.S. (1999). Testing pointing device performance and user assessment with the ISO 9241, Part 9 standard. In *Proceedings of CHI '99*. p. 215-222.
3. Fitts, P.M. (1954). The information capacity of the human motor system in controlling the amplitude of movement. *Journal of Experimental Psychology*, *47*(6): p. 381-391.
4. Gutwin, C. and Greenberg, S. (1999). The effects of workspace awareness support on the usability of real-time distributed groupware. *ACM Transactions on Computer-Human Interaction*, *6*(3): p. 243-281.
5. Parker, K., Mandryk, R.L., and Inkpen, K.M. (2004). *TractorBeam: Seamless integration of local and remote pointing for tabletop displays*. Dalhousie University: Halifax.
6. Whalen, T., Ha, V., Mandryk, R.L., Scott, S.D., and Hancock, M. (2004). *Direct Intentions: The Effects of Input Devices on Collaboration around a Tabletop Display*. Dalhousie University: Halifax.