

Interaction Methods in Distributed Collaborative Environments

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Outline

- Motivation
- State of the Art
- My Contribution

Collaborative Environments

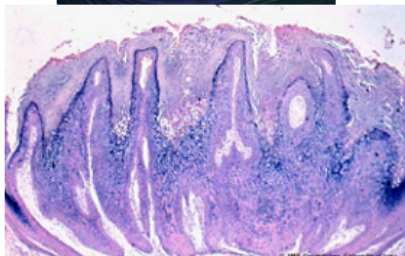
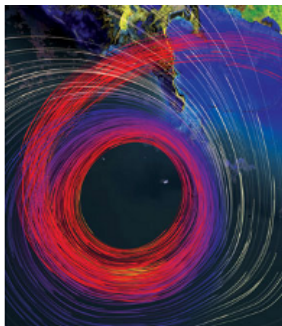
Videoconferencing \Rightarrow Data-rich Collaboration

- Group-to-Group collaboration of globally dispersed teams
- Truly shared content = *deixis*
- Wall-sized displays based collaborative systems
- Keyboard and mouse interaction is not beneficial

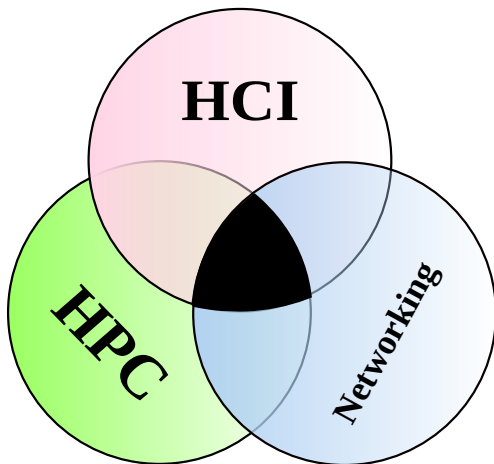


Large-scale data visualization

- Medicine
- Biology
- Disaster Response (war rooms)
- Geography
- Cartography
- Astronomy



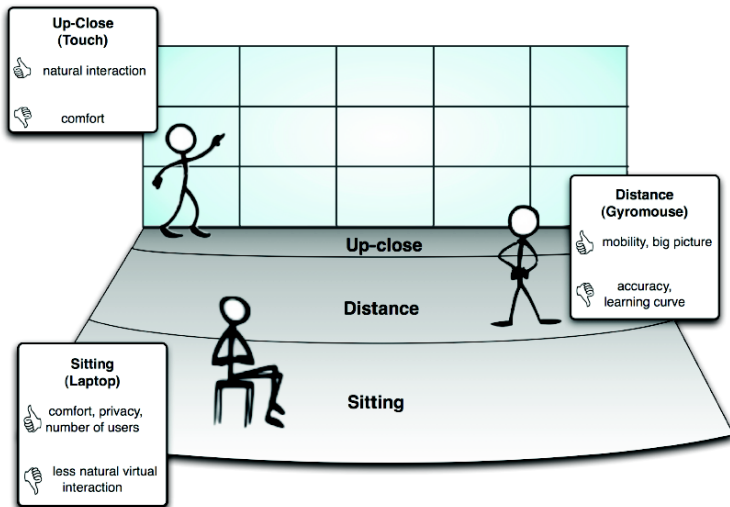
Research Areas



Tiled-Display Visualization Middleware Systems

- **DMX – Distributed Multihead X Project**
 - XDMX – Distributed Multihead X Project. Available at <http://dmx.sourceforge.net>
- **Chromium**
 - Humphreys, G., et al. (2002). Chromium: a stream-processing framework for interactive rendering on clusters. *ACM Transactions on Graphics*, 21(3), 10.
- **Equalizer**
 - Eilemann, S., et al. (2009). Equalizer: a scalable parallel rendering framework. *IEEE Transactions on Visualization and Computer Graphics*, 15(3), 436-52.
- **CGLX – Cross-Platform Cluster Graphic Library**
 - Doerr, K.-U. and Kuester, F. (2010). CGLX: A Scalable, High-performance Visualization Framework for Networked Display Environments. *IEEE transactions on visualization and computer graphics*, 17(3), 320-332.
- **SAGE – Scalable Adaptive Graphic Environment**
 - Renambot, L., et al. SAGE: the Scalable Adaptive Graphics Environment. In *WACE '04*, ACM (2004), 8 pp.

Interaction Zones



Main Issues

- **Multiple interaction zones**
 - Jagodic, R., et al. (2010). Enabling multi-user interaction in large high-resolution distributed environments. *Future Generation Computer Systems*. Elsevier B.V.
 - Ponto, K., et al. (2010). CGLXTouch: A multi-user multi-touch approach for ultra-high-resolution collaborative workspaces. *Future Generation Computer Systems*, 27(6), 649-656. Elsevier B.V.
 - Stødle, D. (2009). *Device-Free Interaction and Cross-Platform Pixel Based Output to Display Walls*. Dissertation Thesis. University of Tromsø.
- **Synchronization of events (multi-sensor configuration, strokes across sensors, multi-party cooperation)**
 - Michel, M. and Stanford, V. (2006). Synchronizing multimodal data streams acquired using commodity hardware. *VSSN '06*, 3. ACM Press.
 - Nam, S. et al. (2010). Multi-application inter-tile synchronization on ultra-high-resolution display walls. *MMSys '10*, 10. ACM Press.
- **Distinguishing users (cursors, devices)**
 - Dietz, P. and Leigh, D. (2001). *DiamondTouch*. *UIST '01* (p. 219). ACM Press.
 - Schwirten, T., et al. (2010). *radarTOUCH*. *ITS '10* (p. 314). ACM Press.
- **Runtime gesture recognition**
 - Wobbrock, J. O., et al. (2007). Gestures without libraries, toolkits or training: a \$1 recognizer for user interface prototypes. *UIST '07*, 159. ACM Press.
 - Li, Y. (2010). *Protractor*. *CHI '10* (p. 2169). ACM Press.
 - Kratz, S. and Rohs, M. (2011). *Protractor3D*. *IUI '11* (p. 371). ACM Press.

Preliminary conditions

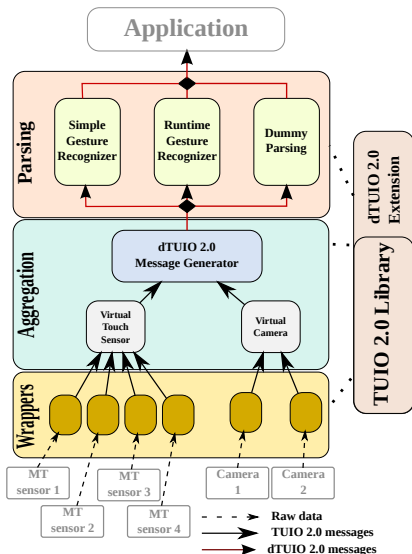
- Tiled-display walls and tiled-tabletops
- Based on SAGE middleware
- Use of commodity HW
- Come-and-use – unobtrusivness and zero orchestration
- Group-to-Group collaborative environment
- Recognition of gestures in distributed environment
- Distinguishing users interacting with the system

Preliminary work (2010/2011)

- Preliminary outcomes of group-to-group collaborative environment, informal experimental evaluation of coupling strokes in tiled-displays
 - Towards Collaborative System Based on Tiled Multi-Touch Screens Rusňák, Vít – Ručka, Lukáš. In TEI '11 Work-in-Progress Workshop Proceedings. Funchal, Portugal, 2011. od s. 73-78, 6 s.
- Shared map over network – supportive application for experimental evaluation of videoconferencing tool GColl

MUSE Framework

- Highly-configurable component-based framework
- Sensor coupling (sensor abstraction)
- Distinguishing users
- Association of actions to users
- Multiple gesture-recognition algorithms
- Various sensors support (from touch sensors to cameras, even the DancePad)



Future Work

- Spring 2012** MUSE Framework completion, Thesis proposal defence (UIST 2012 conference)
- Summer 2012** Framework Evaluation (journal paper) (CHI 2012 conference)
- Autumn 2012 – Spring 2013** Integration of collaborative applications (FGCS journal)
- Summer 2013 – Autumn 2013** Multi-site Group-to-Group collaborative framework (Human Computer Interaction journal)
- Winter 2013/2014** Dissertation Thesis writing
 - June 2014** Dissertation Thesis submission

Any question?

Thank you!