Tangible User Interfaces... (TODO)

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Abstract

In this paperl compare and analyze different Tangible User Interfaces. TUIs move away from the common input devices like mouse and keyboard and towards a direct interaction with physical objects in order to make the operation with devices more natural. This includes for example the handling of physical objects on tabletops, projections of information onto pieces of paper or using additional devices to get more detailed data. The examples we are going to cover in this paper include applications in architecture, information visualization and learning tools.

CR Categories: K.6.1 [Management of Computing and Information Systems]: Project and People Management—Life Cycle; K.7.m [The Computing Profession]: Miscellaneous—Ethics

Keywords: radiosity, global illumination, constant time TODO

1 Introduction

In common user interfaces the ineraction is limited to indirect input methods such as mouse and keyboard. A more natural way of interaction would be to be able to directly touch and manipulate the objects of interest. One of the main goals in using Tangible User Interfaces is to combine visualization of data with direct interaction.

In this paper we first give a general overview on how Tangible User Interfaces (TUI) work and what the main challenges are.

In the next section we will give some examples of TUI and describe how some of the challenges can be solved.

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- 3 examples
- 4 discussion

References

- ALMGREN, J., CARLSSON, R., ERKKONEN, H., FREDRIKSSON,
 J., MLLER, S., RYDGRD, H., STERBERG, M., AND FJELD,
 M. 2005. Tangible user interface for chemistry education. In Visualization, Portability, and Database. Proc. SIGRAD 2005.
- AVRAHAMI, D., WOBBROCK, J. O., AND IZADI, S. 2011. Portico: tangible interaction on and around a tablet. In *Proceedings of the 24th annual ACM symposium on User interface software and technology*, ACM, New York, NY, USA, UIST '11, 347–356.
- HERMANN, T., BOVERMANN, T., RIEDENKLAU, E., AND RITTER, H. 2007. Tangible computing for interactive sonification of multivariate data.
- HOLMAN, D., VERTEGAAL, R., ALTOSAAR, M., TROJE, N., AND JOHNS, D. 2005. Paper windows: interaction techniques for digital paper. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*, ACM, New York, NY, USA, CHI '05, 591–599.
- HORNECKER, E., AND BUUR, J. 2006. Getting a grip on tangible interaction: a framework on physical space and social interaction. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*, ACM, New York, NY, USA, CHI '06, 437–446.
- ISHII, H., UNDERKOFFLER, J., CHAK, D., AND PIPER, B. 2002. Augmented urban planning workbench: Overlaying drawings, physical models and digital simulation. 203–211.
- JORDÀ, S., GEIGER, G., ALONSO, M., AND KALTENBRUNNER, M. 2007. The reactable: exploring the synergy between live music performance and tabletop tangible interfaces. In *Proceedings*

- of the 1st international conference on Tangible and embedded interaction, ACM, New York, NY, USA, TEI '07, 139–146.
- JUN LEE, YOUNGTAE ROH, J.-I. K., AND WOOHYUN KIM, SUNGPIL HONG, H. K. 2009. A steerable tangible interface for multi-layered contents played on a tabletop interface. In DVD of ITS '09, ACM.
- KOIKE, H., SATO, Y., KOBAYASHI, Y., TOBITA, H., AND KOBAYASHI, M. 2000. Interactive textbook and interactive venn diagram: natural and intuitive interfaces on augmented desk system. In *Proceedings of the SIGCHI conference on Human Factors in Computing Systems*, ACM, New York, NY, USA, CHI '00, 121–128.
- LAPIDES, P., SHARLIN, E., AND SOUSA, M. C. 2008. Three dimensional tangible user interface for controlling a robotic team.
- SHAER, O., AND HORNECKER, E. 2010. Tangible user interfaces: Past, present, and future directions. *Found. Trends Hum.-Comput. Interact.* 3, 1–2 (Jan.), 1–137.
- SHAER, O., KOL, G., STRAIT, M., FAN, C., GREVET, C., AND ELFENBEIN, S. 2010. G-nome surfer: a tabletop interface for collaborative exploration of genomic data. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*, ACM, New York, NY, USA, CHI '10, 1427–1436.
- SPINDLER, M., TOMINSKI, C., SCHUMANN, H., AND DACHSELT, R. 2010. Tangible views for information visualization. In *ACM International Conference on Interactive Tabletops and Surfaces*, ACM, New York, NY, USA, ITS '10, 157–166.
- ULLMER, B., AND ISHII, H. 1997. The metadesk: models and prototypes for tangible user interfaces. In *Proceedings of the 10th annual ACM symposium on User interface software and technology*, ACM, New York, NY, USA, UIST '97, 223–232.
- ULLMER, B., ISHII, H., AND JACOB, R. J. K. 2003. Tangible query interfaces: Physically constrained tokens for manipulating database queries. In *Proceedings of Interact03*, 279–286.
- UNDERKOFFLER, J., AND ISHII, H. 1999. Urp: a luminoustangible workbench for urban planning and design. In *Proceed*ings of the SIGCHI conference on Human Factors in Computing Systems, ACM, New York, NY, USA, CHI '99, 386–393.