

## Motivation

The aim of this thesis is to research and establish longitudinal evaluation methods within the field of Human-Computer Interaction. While a variety of cross-sectional evaluation methods exist, these often fail to involve the user's real work place situation and the novelty of the presented technique or device. Longitudinal research methods provide ways to take into account such aspects but are still hardly used and researched in HCI [2]. We focus our research on the domains of information visualization and novel input devices for large high resolution displays.

## Information Visualization: HyperGrid vs. HyperScatter

In this longitudinal experiment we compared two visualization techniques for digital library search systems [3]. Both techniques have been designed within the MedioVis project (Mathias Heilig, GK Member). We also collaborated with Dr. Peter Bak on this subject matter.

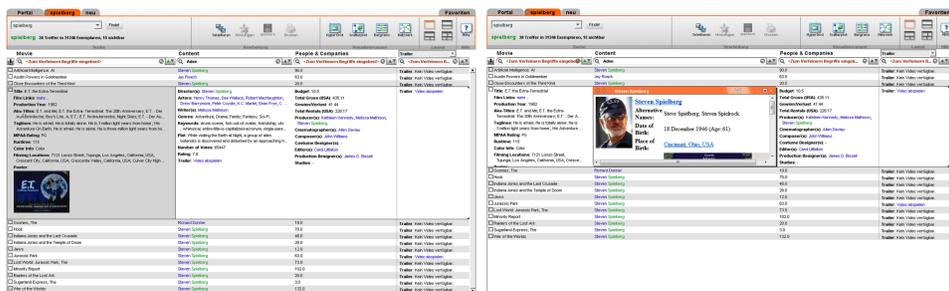


Figure 1: HyperGrid visualization technique

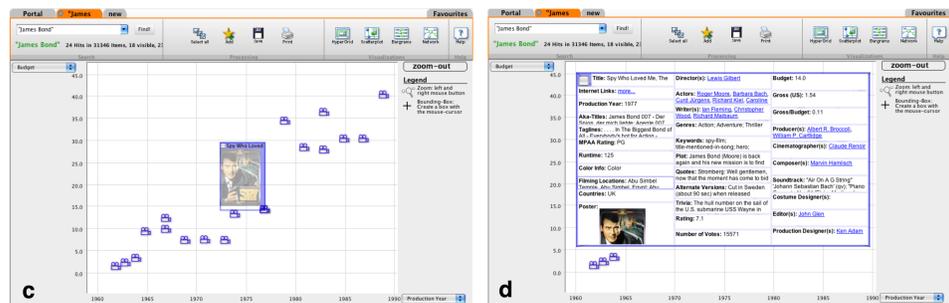


Figure 2: HyperScatter visualization technique

## Key Features:

- Duration: Two weeks, one week for each technique
- Design: Counter-balanced field study, five participants
- Methods: Triangulation of diaries, interviews and interaction logs
- Visualization techniques: table-based HyperGrid (see fig. 1) and scatter-plot based HyperScatter (see fig. 2)
- **Results:** The HyperGrid turns out to be better suited for known-item search tasks while the HyperScatter provides better explorative features. Since both techniques used a similar interaction model, users could easily swap between them. Due to the study design, more complex usability problems could be identified. Furthermore analyzing the interaction logs allowed us to see how long it took our participants to recognize the whole functionality.
- **Future research:** We will further investigate how different data-gathering methods can be combined in such longitudinal designs. Our focus hereby is on the analysis and visualization of interaction logs in combination with qualitative methods [1]. In the long-term we will build up a research framework for such longitudinal research methods by defining research questions, measurements and data analysis methods.

## Input Devices for large high resolution displays: Laserpointer

In this longitudinal experiment we analyzed the long-term performance of a laserpointer as input device. The Laserpointer-Interaction was designed within the inteHRDis project (Werner A. Koenig, associated GK member). Research focus was on learning effects and the ISO compliance of a novel test environment (BubbleTest, designed by Hans-Joachim Bieg, see fig. 3).



Figure 3: Laserpointer Test Environment: BubbleTest

## Key Features:

- Duration: Five consecutive days per participant
- Design: Iterated lab experiment, eight participants
- Methods: Controlled experiment, Fitt's Law & ISO 9241-9 compliant
- Interaction device: Laserpointer (see fig. 1) and standard mouse as benchmark
- **Results:** The performance of the laserpointer interaction increased significantly during the week (about 1 bits/s). Transfer tasks showed that this increase is partly due to the task itself. More research is needed to distinguish between task and device performance.
- **Future research:** We will analyze the effects of user motivation and technological anxiety in such longitudinal research designs. Furthermore we will investigate the application of longitudinal field studies for input devices such as the Laserpointer interaction.

## References

- [1] Jens Gerken, Peter Bak, Hans-Christian Jetter, Daniel Klinkhammer, and Harald Reiterer. How to use interaction logs effectively for usability evaluation. In *Position Paper presented @ CHI 2008 Workshop BELIV'08: Beyond time and errors - novel evaluation methods for Information Visualization*, Apr 2008.
- [2] Jens Gerken, Peter Bak, and Harald Reiterer. Longitudinal evaluation methods in human-computer studies and visual analytics. In *Position Paper presented @ InfoVis 2007 Workshop on Metrics for the Evaluation of Visual Analytics*, Oct 2007.
- [3] Jens Gerken, Mischa Demarmels, Stefan Dierdorf, and Harald Reiterer. Hyperscatter - modellierungs- und zoomtechniken fuer punktdiagramme. In *to appear in: Mensch & Computer 2008: Viel mehr Interaktion, 8. Konferenz fuer interaktive und kooperative Medien*, Oldenbourg Verlag, Sep 2008.