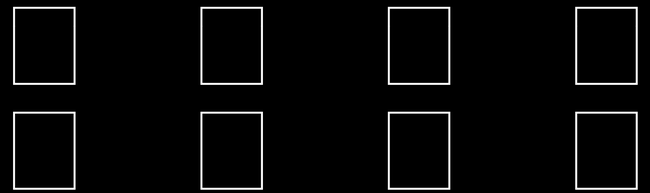
Explorative Analysis and Visualization of Large Information Spaces Research Training Group (GK) 1042

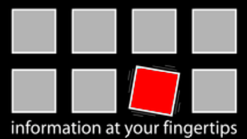
Novel Input Devices for Large, High-Resolution Displays
Design, Interaction and Evaluation

Werner A. König
Human-Computer Interaction Group

Universität Konstanz



DFG Colloquium
Konstanz, 26 June, 2008



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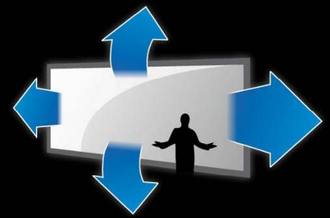

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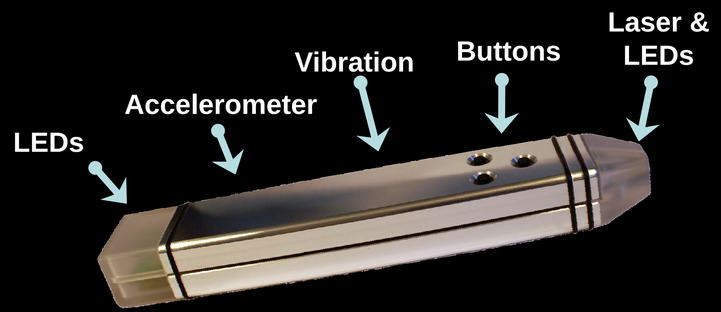
inteHRDis
Interaction Techniques for High Resolution Displays

Design of Input Devices: Lessons Learned

Laserpointer-Interaction as example:

- Design & configuration of filter techniques
  - Jitter-Compensation (in cooperation with Prof. Saupe)
  - Easy-Click
- Interactivity
  - Configuration dependent on user, context & environment
  - Highly interactive tools for iterative design process
- Reusability
  - Multi-Device Interaction
- Comparability
  - Controlled Test Environment
  - Interaction Logging



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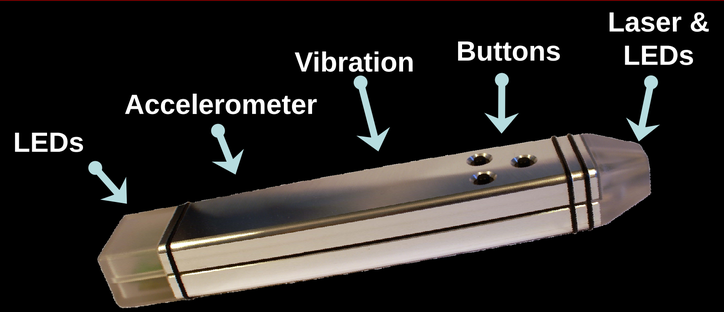
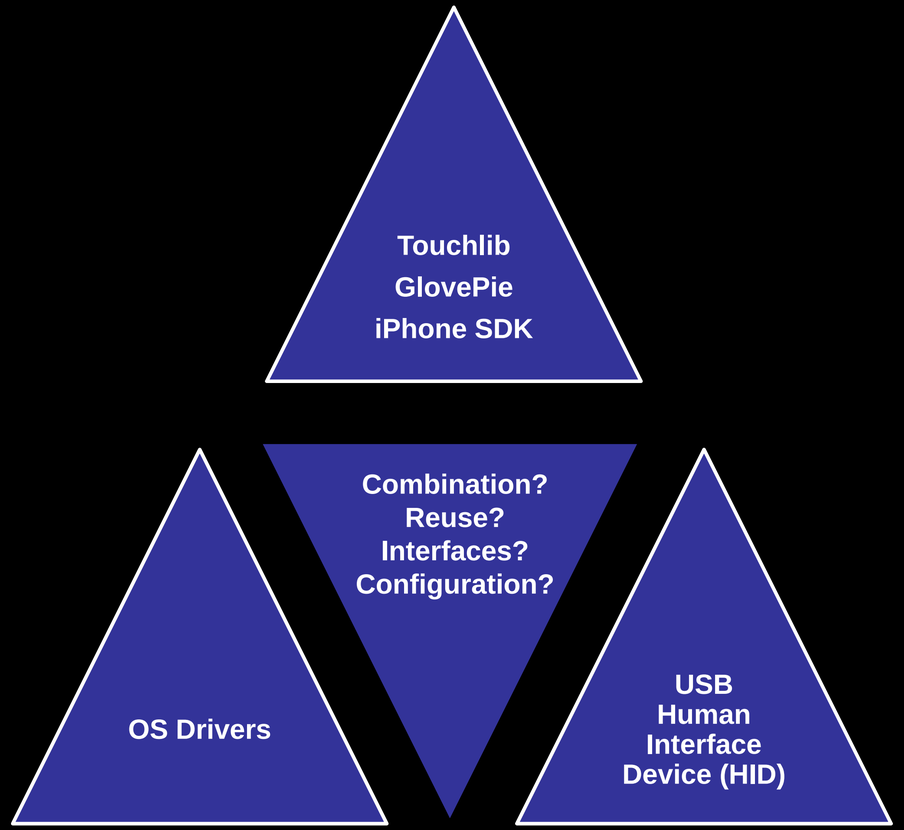
How to fulfill these requirements?

Idea: common interaction library



Heterogeneity of Devices & Drivers



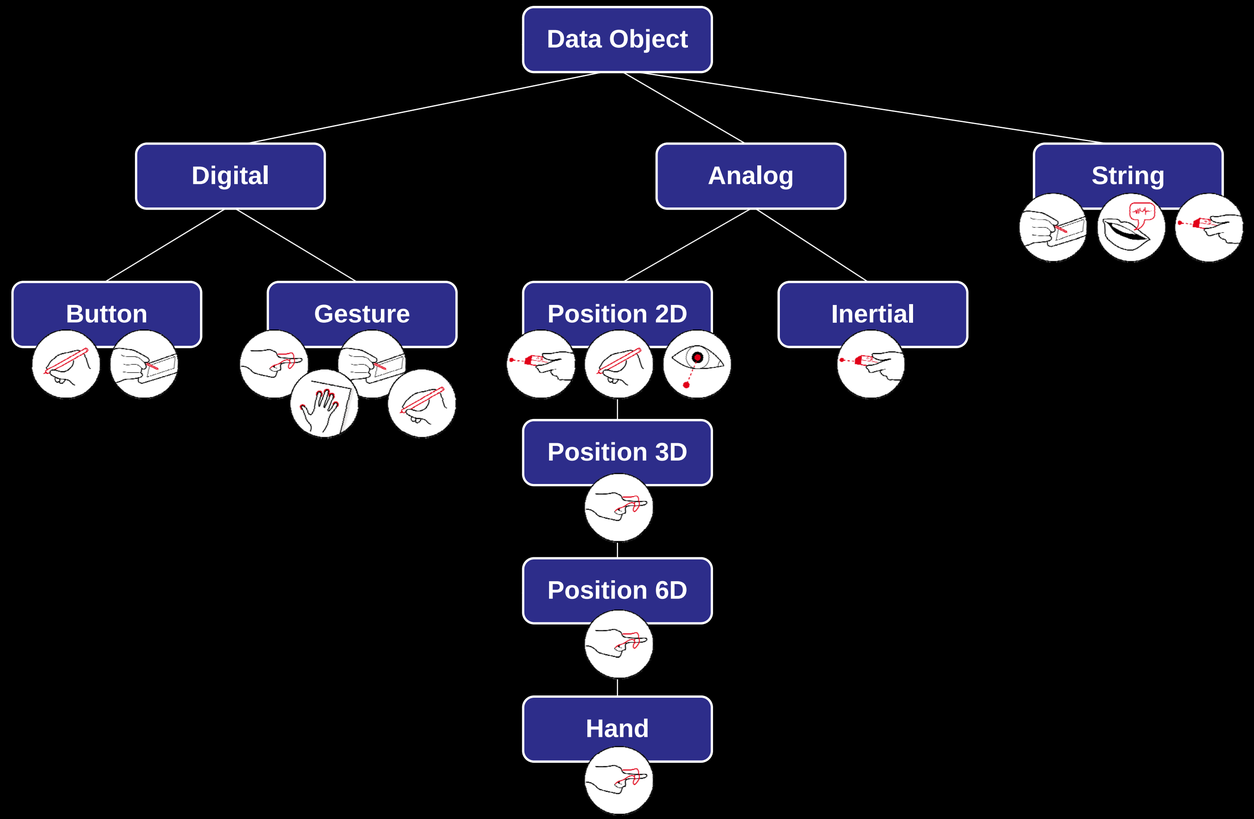
Classification of Input Devices

The Semantics of Graphic Input Devices, Victor L. Wallace, SIGGRAPH'76

Device Type	Sampling Output	Event	Echo
Locator	Location	1. Select 2. Edge	Cursor
Button	Identifier	Touch	Reinforcement
Pick	Reference	Hit	Reinforcement
Keyboard	Text + Cursor	Keystroke	Text
Valuator	Value	1. Select 2. Edge	Numerals

Apple iPhone SDK, http://developer.apple.com/iphone/
Device Class Definition HID, http://www.usb.org/developers/hidpage/
GlovePIE – Glove Programmable Input Emulator,
http://carl.kenner.googlepages.com/glovepie
Touchlib – A Multi-Touch Development Kit, http://nuigroup.com/touchlib/

Data Type Hierarchy



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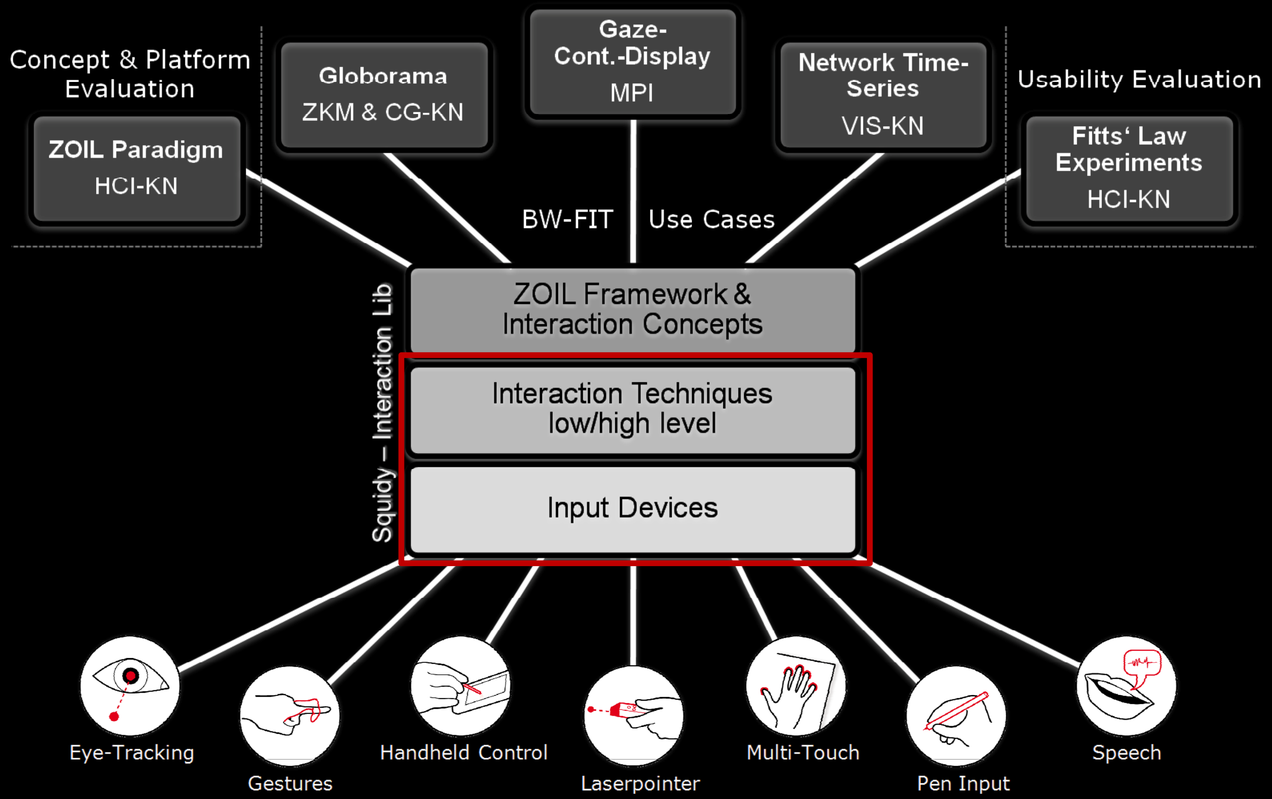
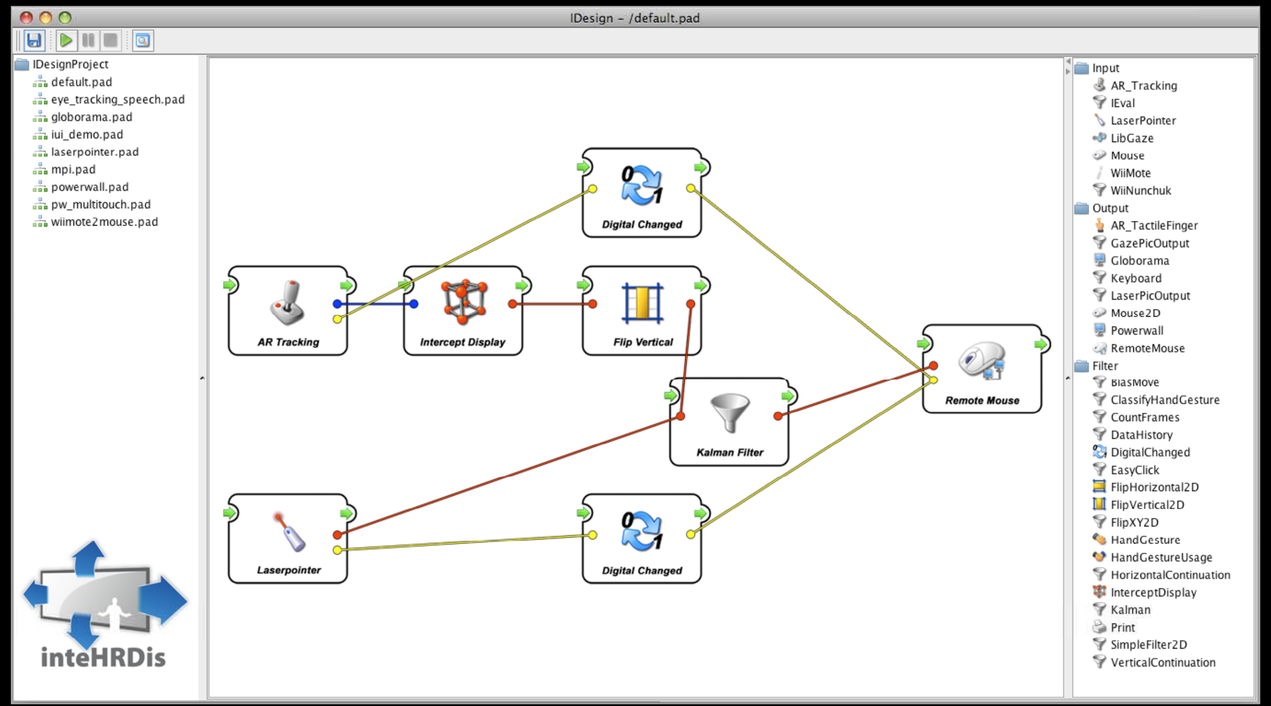
Squidy – Conceptual Architecture



Design Objectives

- Common interaction library
  - Generalization of input data & interaction tasks
  - Filter techniques as reusable components
  - Support of multi-modality and collaboration
- Standardized & individual interfaces:
  - Client-Server Architecture based on Dataflow
  - Device Interface: TUIO/OSC, TCP/IP, UDP, JNI
  - Vis Interface: Squidy API or mouse/keyboard emulation
- Interactive, visual configuration
  - Covers whole design lifecycle of input devices
  - Fast & interactive prototyping for industry and scientific research

Squidy – User Interface Concept



Design Approach

- Interactivity
  - Visual configuration at run-time
  - Direct Manipulation & Semantic Zooming
  - On-the-fly compilation
  - Multi-modality & Collaboration
- Reusability
  - Independent components, multiple instances
- Scalability
  - Multi-Threading, Client-Server Architecture
- Immediacy
  - High throughput, minimal lag (< 25ms*)
- Support of different user roles
  - Interaction Designer / Researcher
  - Programmer

*** Lag as a determinant of human performance in interactive systems, MacKenzie, I. S. and Ware, C., CHI'93.**

Conclusion

- Generalization of input devices and filter techniques in a common interaction library
- Interactive, visual configuration by semantic zooming and direct manipulation
- Applied with diverse input devices (e.g. Laserpointer-Interaction) at diverse events (e.g. ZKM PanoramaFestival, Ideenpark 2008) and at different groups (e.g. HMI Twente, MPI Tübingen, ZKM Karlsruhe)
- TODO:
  - Refinement of user interface concept
  - Formative evaluation study with Squidy

Publications

- König, W. A., Böttger, J., Völzow, N., Reiterer, H., **Laserpointer-Interaction between Art and Science**, *IUI'08: Proceedings of the International Conference on Intelligent User Interfaces*, ACM Press, Canary Islands, Spain, p. 423 - 424, 2008.
- Föhrenbach, S., König, W. A., Gerken, J., Reiterer, H., **Natural Interaction with Hand Gestures and Tactile Feedback for large, high-res Displays**, *MITH'08: Workshop on Multimodal Interaction Through Haptic Feedback, held in conjunction with AVI'08: International Working Conference on Advanced Visual Interfaces*, Napoli, Italy, 2008.
- Jetter, H.C., König, W. A., Gerken, J., Reiterer, H., **ZOIL - A Cross-Platform User Interface Paradigm for Personal Information Management**, *CHI 2008 Workshop, "Personal Information Management: PIM 2008",* Florence, 2008.
- König, W. A., Bieg, H.-J., Reiterer, H., **Laserpointer-Interaktion für große, hochauflösende Displays**, *Mensch & Computer 2007: Interaktion im Plural, 7. Konferenz für interaktive und kooperative Medien*, in: Tom Gross, Oldenbourg Verlag, p. 69 - 78, 2007.
- König, W. A., Bieg, H.-J., Schmidt, T., Reiterer, H., **Position-independent interaction for large high-resolution displays**, *IHCI'07: Proceedings of IADIS International Conference on Interfaces and Human Computer Interaction 2007*, IADIS Press, Lisbon, Portugal, p. 117-125, 2007.