

Human-Computer Interaction

1—Introduction



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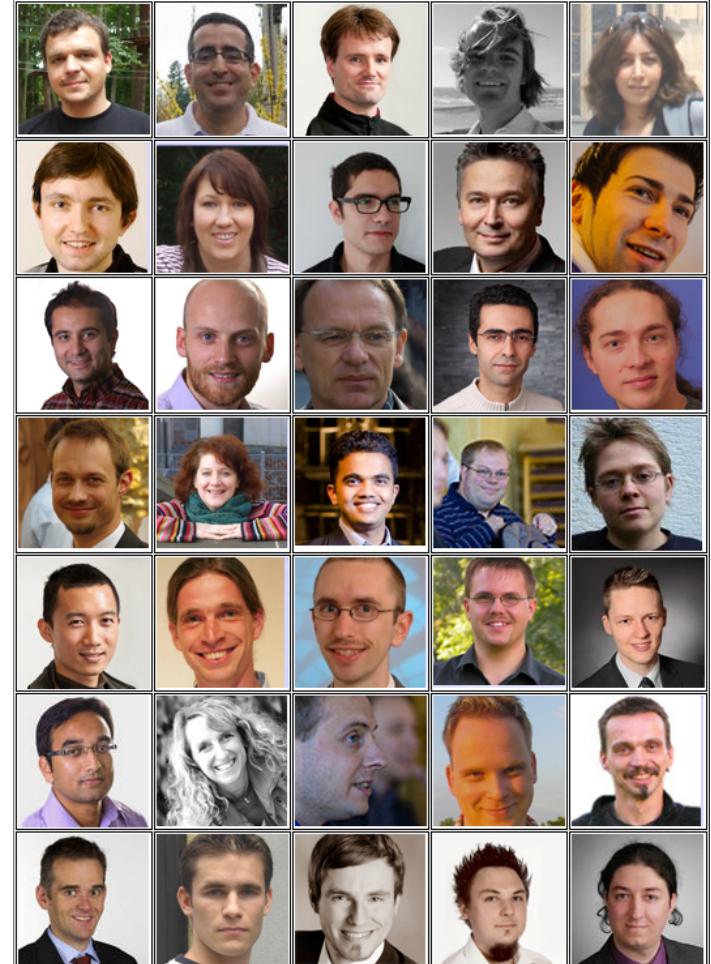
SS 2013

Prof. Dr. Max Mühlhäuser
Dr. Jochen Huber
Mohammadreza Khalilbeigi
Roman Lissermann

Technische Universität Darmstadt
Department of Computer Science
Telecooperation Lab

Telecooperation Lab

- Head: Prof. Dr. Max Mühlhäuser
- Telecooperation = targeted cooperation between and among *networked people, computers and things*
- Research Area: Ubiquitous Computing



Telecooperation Lab: Research Fields

Cooperation

Peer-to-Peer
Networks

Smart Environments

Ambient Learning
Structures

Smart Urban
Networks

Interaction

**Tangible
Interaction**

Smart Interaction

Model Driven
Interaction

Talk'n'Touch
Interaction

Protection

Secure Smart
Infrastructures

Smart Security and
Trust

Tangible Interaction - Our Vision

Make user interfaces and interaction techniques

- more usable
- more joyful
- “invisible”: more seamlessly integrated into the everyday world

→ Integrate user interfaces into objects of the everyday life



Who are we?

- Prof. Dr. Max Mühlhäuser
 - Head Telecooperation Lab
 - Head Rechnerbetriebsgruppe (RBG)
 - Directorate member of CASED
 - Ph.D., Dipl.-Inform.
(TH Karlsruhe)
 - Published more than 300 articles, co-authored and edited books about UbiComp, E-learning, and distributed & multimedia software engineering.



Who are we?

- Dr. Jochen Huber
 - Area Head „Tangible Interaction“
 - Ph.D., Dipl.-Inform., Dipl.-Math. (TU Darmstadt)
 - Research areas:
 - Mobile & Tangible Multimedia
 - Immersive Mixed / Augmented Reality
 - Body-based Interaction



Who are we?

- Mohammadreza Khalilbeigi, M.Sc.
 - B.Sc. Intl. University of Kish
 - M.Sc. RWTH Aachen
 - Doctoral Candidate TU Darmstadt
 - Research areas:
 - Interactive Surfaces
 - Flexible Displays



Who are we?

- Roman Lissermann, M.Sc.
 - B.Sc. & M.Sc. TU Darmstadt
 - Doctoral Candidate TU Darmstadt
 - Research areas:
 - Interactive Surfaces & Multimedia
 - Paper-like Displays
 - Body-based Interaction



Who are we?

- Jan Riemann, B.Sc.
 - B.Sc. TU Darmstadt
 - Doctoral Candidate TU Darmstadt
 - Research areas:
 - Interactive Surfaces



And you?



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???

Organisation (1)

- V2 Lecture, 2 SWS, 3 CPs
- No assignments (but in-class exercises!)
- Final exam
 - written or oral (depending on number of participants)
 - in German language
 - End of July 2013
- Registration via TUCaN is mandatory
- Optional: practical lab course (vertiefendes Praktikum)
 - ***Come see us, talk to us!***

Organisation (2)

- Course webpage

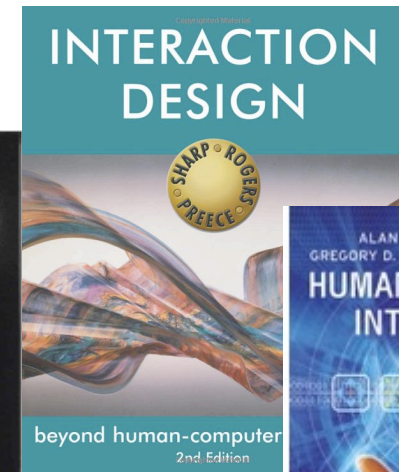
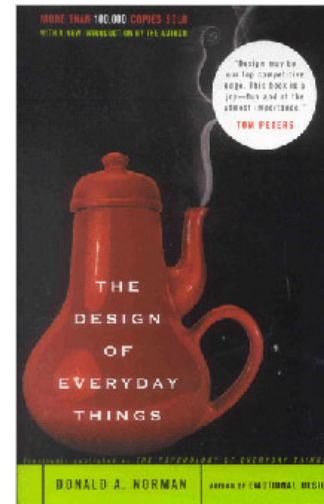
- www.tk.informatik.tu-darmstadt.de → Teaching → SS 2013 → HCI
- Username: student
- Password: hcistd2013

Literature



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- *Donald Norman:*
The Design of Everyday Things (DOET)
- *Yvonne Rogers, Helen Sharp and Jenny Preece:*
Interaction Design: Beyond Human-Computer Interaction
- *Alan Dix et al.:*
Human-Computer Interaction



- **Approaching Human-Computer Interaction:
Example videos**
- Definition of HCI, Course Topics
- What is good/poor design?
- Design goals: Usability and User Experience

Human-Computer Interaction: Example Videos



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- [BumpTop](#) 3D Desktop (U Toronto)
- [Inflatable Mouse](#) (KAIST)
- [Microsoft Pixelsense](#) (Microsoft)
- [Permulin](#) (TU Darmstadt)
- [PalmRC](#) (TU Darmstadt)

Human-Computer Interaction: Example Videos (2)



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- [Put That There](#) (MIT Media Lab)
- [Beamatron](#) (Microsoft Research)
- [LightBeam](#) (TU Darmstadt)
- [Youm Flexible OLED](#) (Samsung)
- [FoldMe](#) (TU Darmstadt)
- [Flexpad](#) (MIT Media Lab)
- [IllumiRoom](#) (Microsoft Research)

Human-Computer Interaction: Vision Videos



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- [Project Glass](#) (Google)
- [Productivity Future Vision](#) (Microsoft)
- [Sight](#) (May-raz & Lazo)

- Be sure to check our YouTube channel 😊

<http://www.youtube.com/user/TKLabs>

Agenda



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- Approaching Human-Computer Interaction:
Example videos
- **Definition of HCI, Course Topics**
- What is good/poor design?
- Design goals: Usability and User experience

■ Human-Computer interaction is

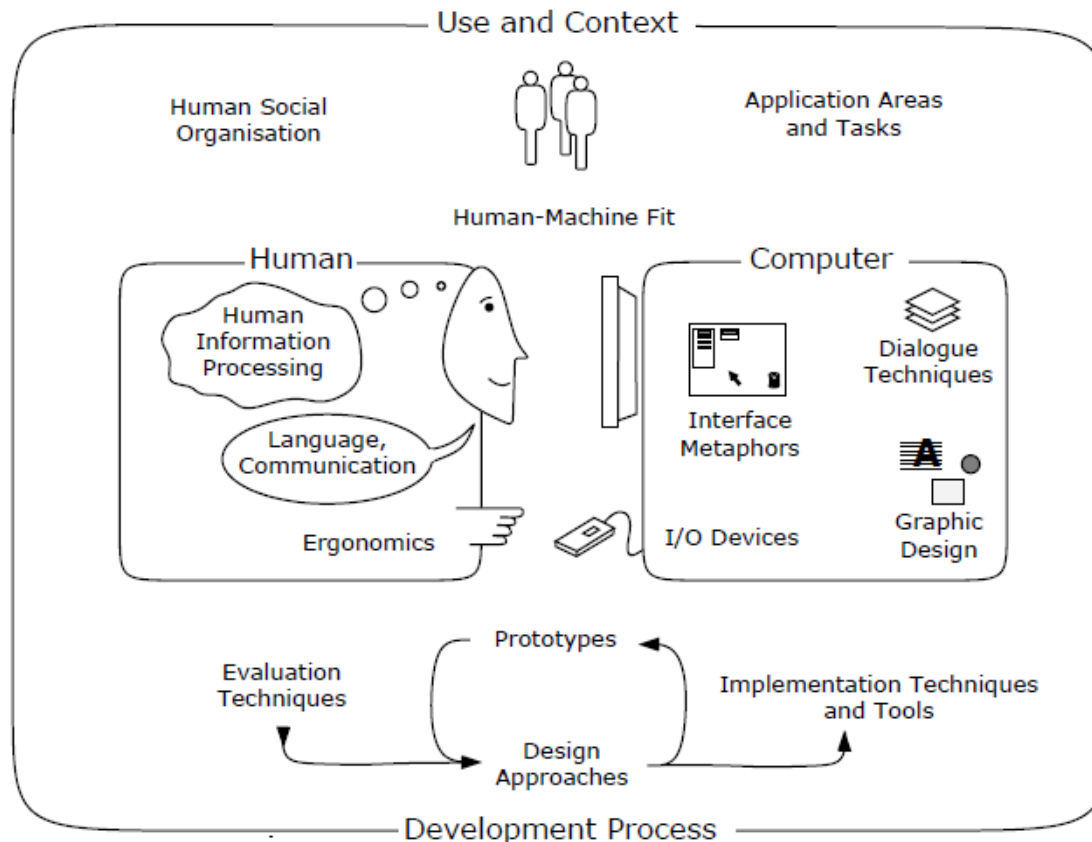
“[...] concerned with the design, evaluation, and implementation of interactive computing systems for human use and with the study of major phenomena surrounding them.”

- ACM SIGCHI (1992)

Human-Computer Interaction (2)



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Adapted from the ACM SIGCHI Curriculum for HCI (Hewett et al., 2002)

Involved Disciplines



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Academic Disciplines

- Computer Science
- Informatics
- Psychology
- Social Sciences
- Engineering
- Ergonomics

Design Practices

- Graphic design
- Product design
- Media design
- Industrial design

- HCI consultancies emerge, e.g.

- Nielsen Norman Group

“The philosophy of the Nielsen Norman Group is simple: To help companies enter the age of the consumer, designing human-centered products and services.”, nngroup.com



- Cooper

“We ‘ll help you define, design and deliver digital products and services that inspire your team, your customers and your bottom line.”, cooper.com



- Digital District,

“Wir unterstützen unsere Kunden dabei, effektiver und effizienter zu kommunizieren.”, digitaldistrict.de



Overview of Course Topics



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- Understanding „human factors“:
Fundamentals from psychology and
cognitive science
 - Human Perception
 - Cognitive Models and Theories
 - Models of Interaction
- Being creative:
User-centered design process
 - Rules and principles
 - Design process
 - Prototyping
- Types of user interfaces and
technologies
 - Command-line interfaces, Graphical user
interfaces, e.g. Mac OS und Windows
 - Post-desktop user interfaces: Interactive
Surfaces, Mobile user interfaces, Pen-based
user interfaces, Tangible user interfaces,
Speech-based user interfaces
- Assessing and measuring user
interface characteristics:
Evaluation and user studies
 - Methods
 - Data gathering
 - Empirical data analysis

Agenda

- Approaching Human-Computer Interaction:
Example videos
- Definition of HCI, Course Topics
- **What is good/poor design?**
- Design goals: Usability and User experience

Activity

- How many interactive computing systems do you use frequently?
- How usable are they?
- Why?



→ Interactive computing systems which are easy to use – from the users' perspective

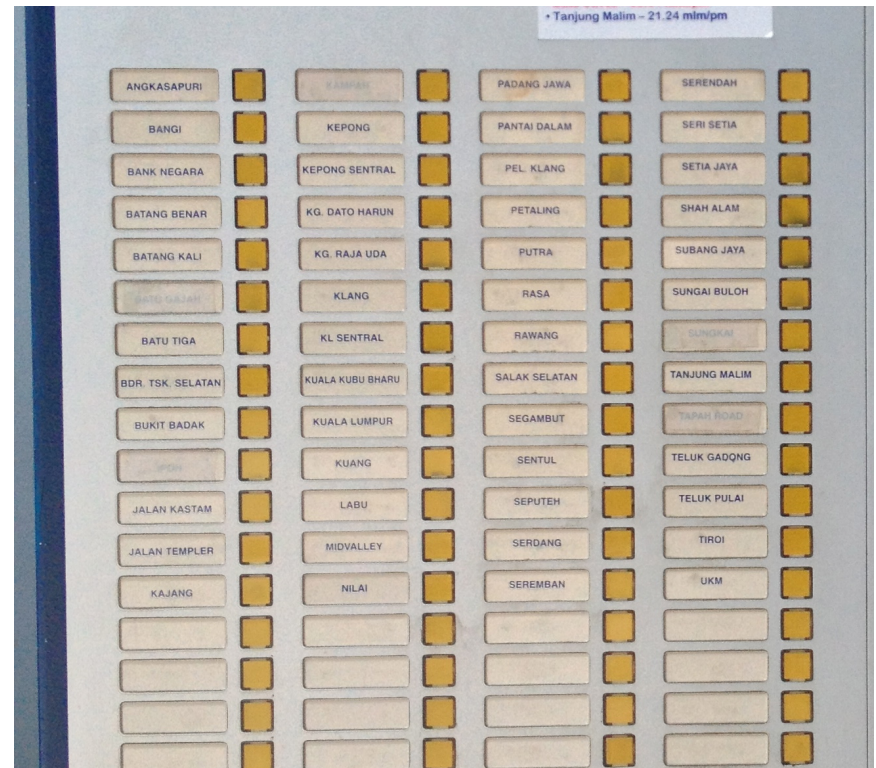
Good and Poor Design (1)



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Good and Poor Design (2)



Good and Poor Design (3)

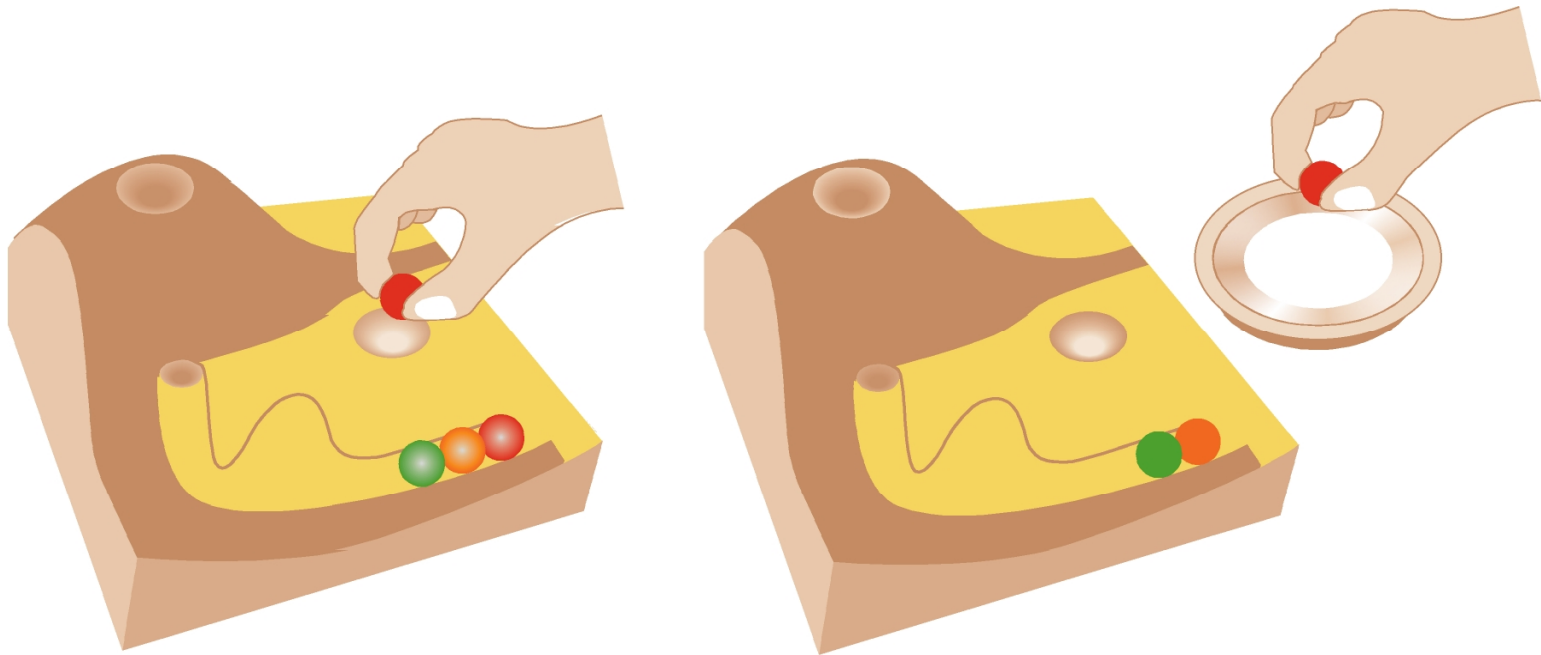


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Good and Poor Design (4)

- The marble answering machine, Bishop 1995



Good and Poor Design (5)

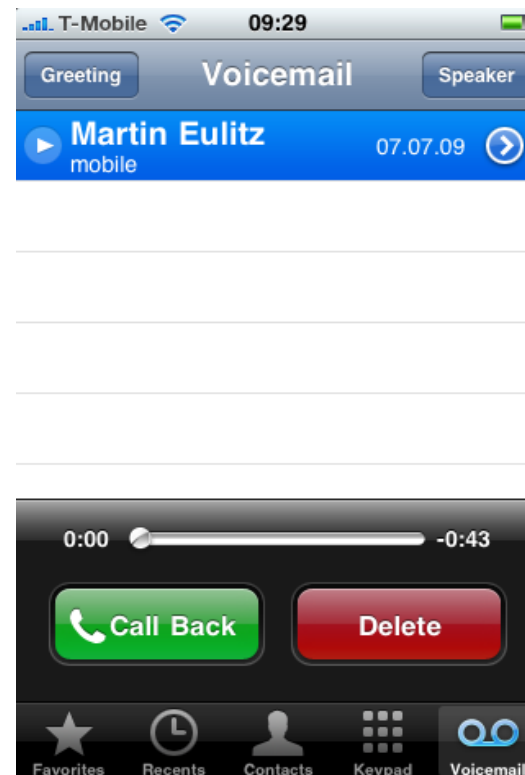


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- Differences to traditional mailbox interfaces?
 - Haptic/tangible instead of audio
 - Familiar physical objects utilized to represent the messages
 - Amount of messages obvious
 - Requires only one-step actions
 - Simple but elegant design
- Drawbacks: robustness
 - *Where* will the product be deployed, *who* will be the users and *how* will it be used?

Good and Poor Design (6)

- Today 's more advanced “marble” answering machine? 😊





- How does making a phone call differ when using
 - a public phone box or
 - a cell phone?
- How have these devices been designed to take into account
 - the *kind of users*,
 - the *type of activity* being supported, and
 - the *context* of use?

Process of Interaction Design

- Identifying needs and establishing requirements
- Developing alternative designs to meet these
- Building interactive prototypes that can be communicated and assessed
- Evaluating what is being built throughout the process

Agenda

- Approaching Human-Computer Interaction:
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- What is good/poor design?
- **Design goals: Usability and User experience**

Usability Goals (1)



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- **Effectiveness**

“Is the product capable of allowing users to perform tasks accurately and completely?”
(doing “right” things, good quality results)

- **Efficiency**

“Once users have learned how to use a product to carry out their tasks, can they sustain a high level of productivity?”
(doing things in the most economical way)

- **Safety**

“What is the range of errors that are possible using the product and what measures are there to permit users to recover easily?”

Usability Goals (2)

- **Utility**

“Does the product provide an appropriate set of functions that will enable users to carry out all their tasks in the way they want to do them?”

- **Learnability**

“Is it possible for the user to work out how to use the product by exploring the interface and trying out certain actions?”

- **Memorability**

“What kinds of interface support have been provided to help users remember how to carry out tasks?”

- Emerging usability criteria provide *objective, quantitative indicators* (e.g. with respect to time)

Usability Metrics

- Standardized, DIN EN ISO 9241-110
 - Effectivity
 - Efficiency
 - User satisfaction
- Mix of both, objective and subjective goals

Usability and User Experience

- Historically HCI focused on usability goals
- Currently a paradigm shift is going on:
user experience is recognized as a key aspect in HCI
(But of course: Usability remains highly important)

User Experience (UX)



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- Behaviour of product, how it is being used
- How people feel about a product
- Design *for* a user experience, not the UX itself

“[...] every product that is used by someone has a user experience: newspapers, ketchup bottles, reclining armchairs, cardigan sweaters.”

- Jesse Garrett (2003)

Activity



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- Apple's iPods are a phenomenal success.
- Why?



Activity



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- Maybe another reason? 😊



User Experience: Example



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- Remote sketching and gesturing
(by Marc Hassenzahl and Kathrin Völker)



User Experience Goals

- satisfying
- enjoyable
- engaging
- exciting
- aesthetically pleasing
- supportive of creativity
- fun
- ...
- boring
- frustrating
- annoying
- ...

→ Subjective *qualities*

What to Take Home

- Human Computer Interaction focuses on the human use of interactive computer system
- Usability and user experience goals are key factors for the design of good interactive products
- Remember interdependent factors like cultural differences, user groups, or context of use
- Suggestion: read chapters 1-3 from „Design of Everyday Things“ until April 30

