Current Topics in Media Computing and HCI

L01 Research Contributions in HCI Part 2 & How to Read Papers

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http://hci.rwth-aachen.de/cthci

Literature in this Class

- You will find all Learning Material in our wiki
- Required reading: Examinable, must be read by everyone
  - Until now: Seven Research Contribution Types in Human-Computer Interaction — Jacob Wobbrock, 2016
- Recommended reading: Not examinable
- Other example papers: Not examinable
  - Examples to illustrate the concepts explained in the class

So far: HCI Contributions Types

- ✓ Empirical
- ✓ Artifact

3. Methodological
4. Theoretical
5. Dataset
6. Survey
7. Opinion

3. Methodological Contributions

- Knowledge to improve how we do, discover, measure, analyze or build in research and practice
- Evaluated based on utility, reproducibility, reliability and ability to enhance
- Require repeated validations

Example: Metrics for Text Entry Research

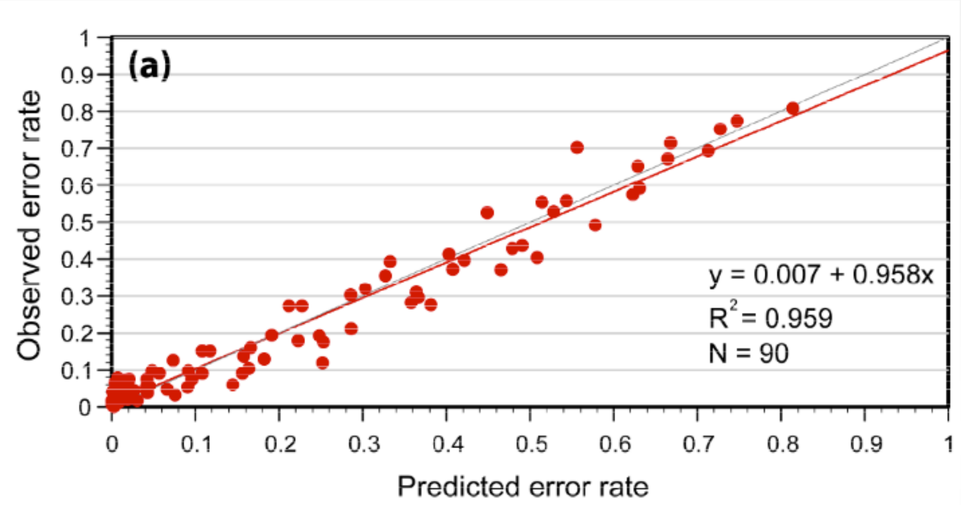
- Soukoreff and MacKenzie, CHI ’03
- Developed a new set of statistics to evaluate input errors in keyboard-based text entry
  - TOTAL ERROR RATE = the corrected error rate (errors committed but corrected) and the not corrected error rate (errors left in the transcribed text)
- **Method**: Empirical experiment to evaluate text entry error rate
- Data was analysed using the new statistics and the old statistics: A similar numerical performance was found

4. Theoretical Contributions

- Knowledge on what and why we do things, and our exceptions
- Have descriptive and/or predictive power
  - Describe what would happen and explain why it occurs
- New concepts, definitions, principles, models, or frameworks
- Must be testable and falsifiable
- Evaluated using empirical methods based on novelty, soundness, power to describe, predict or explain, and ability to generalise

Example: Error model based on Fitts' Law

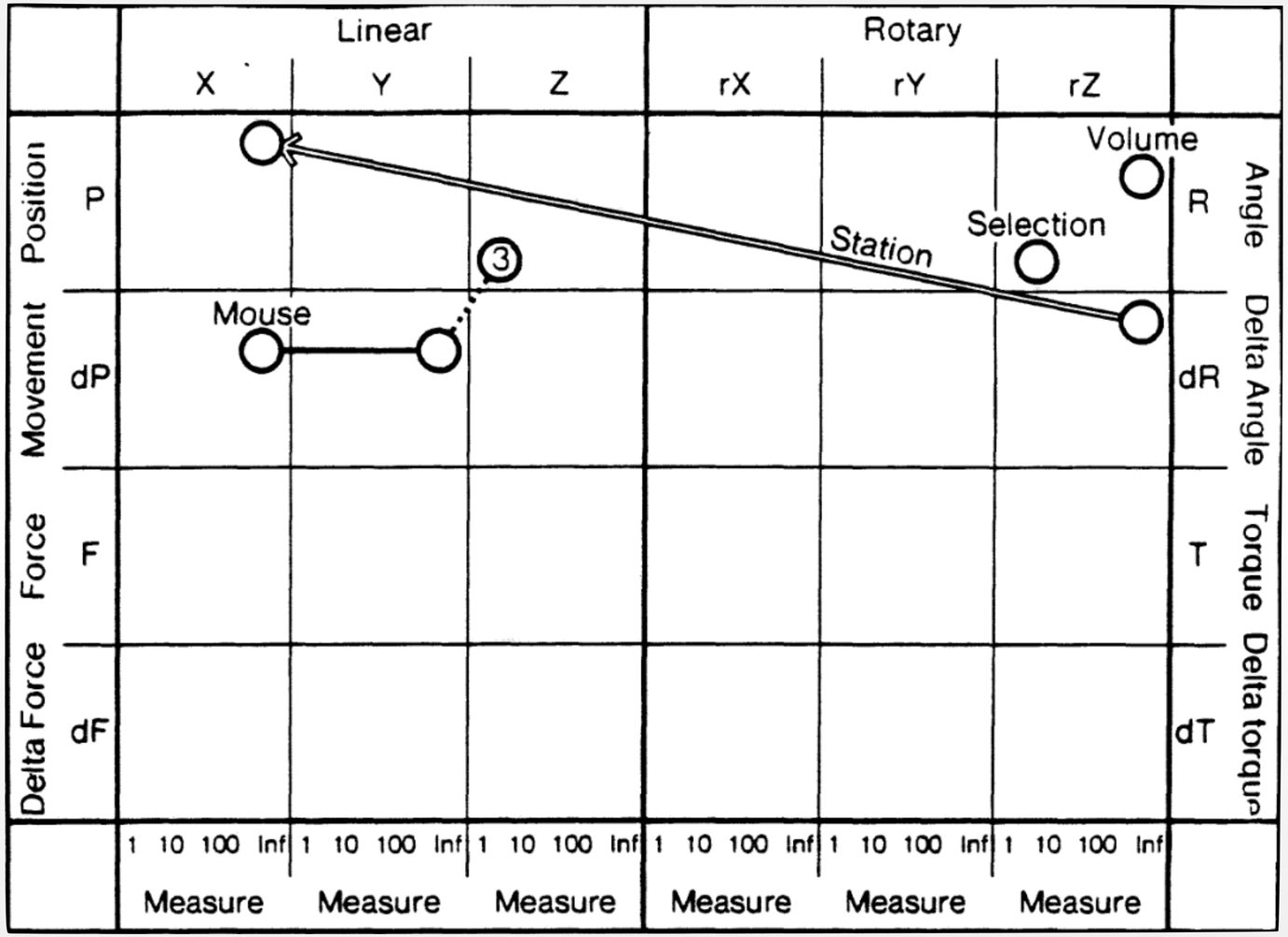
- Wobbrock et al., CHI '08
- Derived a predictive error rate model mathematically from Fitts' law
- Goal: Evaluate the validity of the model



- **Method**: User experiment manipulating Fitts' law parameters
  - Confirmed the results compare to previous research and Fitts' law assumptions hold
  - Compared the results of applying the new prediction model to the observed data
- Results: Predicted and observed error rates showed strong correlations in all conditions

Exercise: Identify Research Contributions

Theoretical Contr.: Input Devices Design Space



Card et al., CH ‘90

Design Meets Science

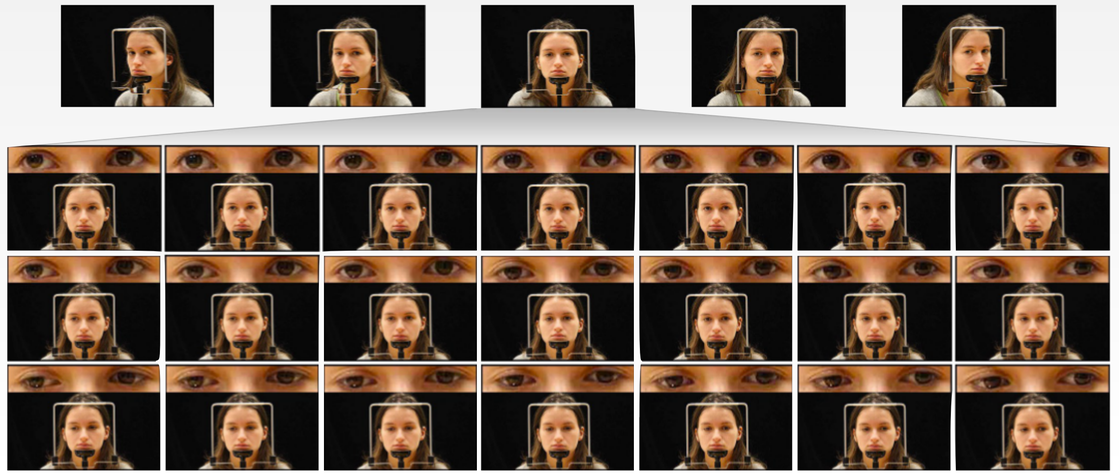
"This was my ideal model of how the supporting science could work. It required good designers to actually do design, but what we could do was help structure the design space so that the movement through that design space was much more rapid. The science didn't design the mouse, but it provided the constraints to do it."

— Stu Card. In Bill Moggridge, **Designing Interactions** (2007)

5. Dataset Contributions

- Corpus of raw data points including an analysis of its characteristics
- Enable comping new algorithms, systems or methods in a standardised way
- Evaluated by the usefulness and representation of the data to the research community
- Usually accompanied by tools that allow viewing the data and applying it

Example: Gaze Locking



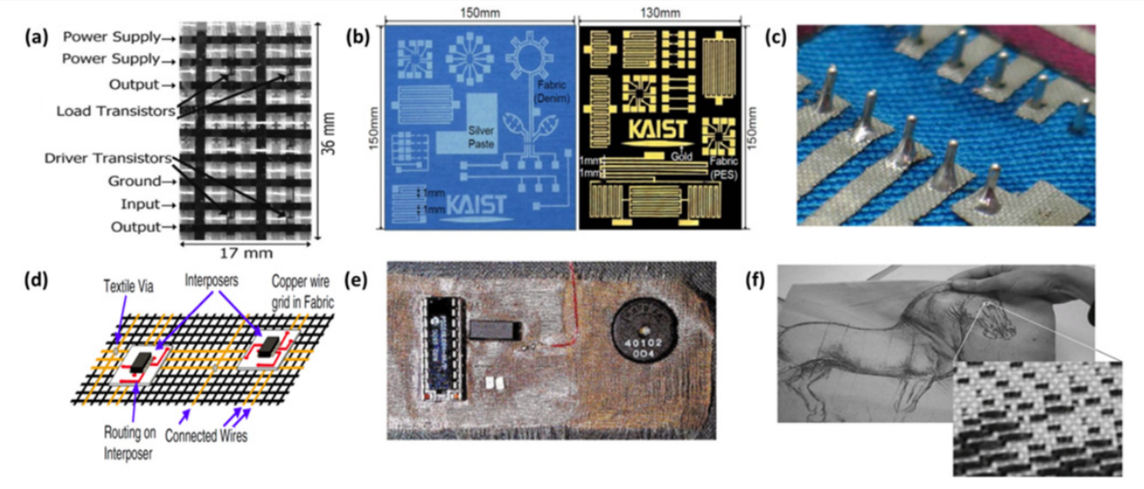
- Smith et al., UIST ‘13
- Gaze data set:
  - 5,880 images of 56 people in 5 head poses & 21 gaze directions per head pose
  - Subjects were ethnically diverse, and 21 wore glasses
  - A public link was provided to access the dataset
- Described and evaluated a method to analyze the data
- Provided example applications to demonstrate the use of gaze locking for HCI

6. Survey Contributions

- A meta-analysis or synthesis of exiting research in order to detect trends and gaps
- Evaluated based on completeness, depth, maturity, and organisation and the opportunities they reveal for further research
  - Not a mere list of related work

Example: Smart Fabrics & E-textiles

- Castano et al., SMS ’14
- Defined different types of smart textiles
- Identified the main research questions in this domain
- Organised and compared conductive threads, fabrication techniques, insulating techniques, etc.
- Highlighted interesting finings and gaps
- Suggested a future direction to the field



Types of fabric circuits

7. Opinion Contributions

- Aim to change the opinion of read through persuasion (they do not inform)
- Goal is to compel reflection, discussion and debate
- Build upon the other contribution types to make their case
- Evaluated based on the strength of the arguments, supporting evidence, consideration of the opposing perspectives
- Often by established researchers and for a broader audience
- Example: Usability Evaluation Considered Harmful (some of the time) (Greenberg and Buxton, CHI ’08)

Exercise: Identify Research Contributions

How to Read A Scientific Paper

- How to Read a Scientific Article – Purugganan & Hewitt
- Read the title, determine your interest
- Skim the paper and identify the structure
  - Abstract, Introduction, Methods (Arifcat + User Studies/Evaluation), Results, and Discussion
- Read abstract: motivation, research problem, methodology, some results & conclusion
- Jump to figures: identify experiments and results
- At this point you decide whether to continue, store it for later, or discard it

How to Read A Scientific Paper

- Introduction
  - Purpose: create interest, clarify the domain
  - Common knowledge statement (broad)
  - What is known about the topic
  - What is not known
  - What question the authors asked and answered (specific)
- Related work
  - Similar work and base knowledge

How to Read A Scientific Paper

- Methods (more on that next week)
  - What experiments were done
  - What variables were considered
- Results (objective)
  - Statements of what was found (from observation & data analysis), and reference to the data in figures and tables
- Discussion
  - Show how results (don't) answer your question
  - Identify unexpected findings

Comprehension Questions

- What specific problem does this research address? Why is it important?
- Is the method used a good one? The best one?
- What are the specific findings? Am I able to summarize them in one or two sentences?
- Are the findings supported by persuasive evidence?
- Is there an alternative interpretation of the data that the author did not address?
- How are the findings unique/new/unusual or supportive of other work in the field?
- How do these results relate to the work I'm interested in?
- What are some of the specific applications of the ideas presented here?

Always take Notes!

Reading Exercise

- Read and annotate this abstract

Improving command selection with CommandMaps

Joey Scarr, Andy Cockburn, Carl Gutwin, and Andrea Bunt. CHI 2012.

Designers of GUI applications typically arrange commands in hierarchical structures, such as menus, due to screen space limitations. However, hierarchical organisations are known to slow down expert users. This paper proposes the use of spatial memory in combination with hierarchy flattening as a means of improving GUI performance. We demonstrate these concepts through the design of a command selection interface, called CommandMaps, and analyse its theoretical performance characteristics. We then describe two studies evaluating CommandMaps against menus and Microsoft's Ribbon interface for both novice and experienced users. Results show that for novice users, there is no significant performance difference between CommandMaps and traditional interfaces -- but for experienced users, CommandMaps are significantly faster than both menus and the Ribbon.

Example: CommandMaps 

- Scarr et al., Best paper CHI ’12
- Improve toolbar (specifically Microsoft’s Ribbon interface)
- In-class exercise:
  - Contributions?
  - Benefits?

Improving Command Selection with CommandMaps

Joey Scarr[†], Andy Cockburn[†], Carl Gutwin[‡], Andrea Bunt[*]

[†] Computer Science, University of Canterbury, New Zealand

[‡] Computer Science, University of Saskatchewan, Canada

[*] Computer Science, University of Manitoba, Canada

Source

☐ How? ← ☐ speed, ☐ accuracy, ☐ satisfaction

task

System name

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Domain overview

Designers of GUI applications typically arrange commands in hierarchical structures, such as menus, due to screen space limitations. However, hierarchical organisations are known to slow down expert users. This paper proposes the use of spatial memory in combination with hierarchy flattening as a means of improving GUI performance. We demonstrate these concepts through the design of a command selection interface, called CommandMaps, and analyse its theoretical performance characteristics. We then describe two studies evaluating CommandMaps against menus and Microsoft's Ribbon interface for both novice and experienced users. Results show that for novice users, there is no significant performance difference between CommandMaps and traditional interfaces -- but for experienced users, CommandMaps are significantly faster than both menus and the Ribbon.

artifact "make"

empirical

☐ How did the theoretical perf. derived?

Problem in the domain

proposed solution (in principle)

evidence to support the proposed principle

What they did.

What they found.

Comparison ⇒ experimental

☐ What performance?

	novice	experienced
Command Maps		
Menu		
Ribbon