

LFE Medieninformatik • Maurice Sanner

Entrance Presentation

# Meanings and Metaphors of Grasp Interaction

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Responsible  
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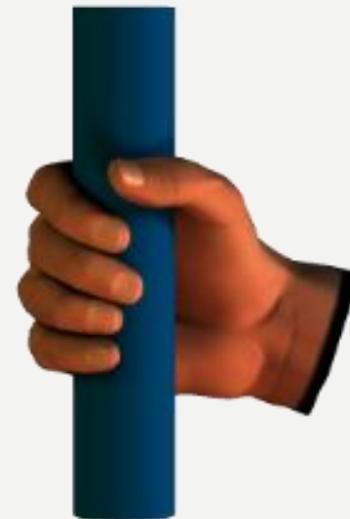
**Prof. Dr.  
Heinrich Hußmann**





## Topics

- Meaning of Grasp
- Related work
- Research questions
- Preliminary studies
- 2D study
- First glance at the evaluation of the 2D study
- Next steps



[1]

## Parameters of Grasping

- Goal
- Relationship
- Anatomy
- Setting
- Properties

What we won't take into consideration:  
Prehension, Reaching, Neuro-Psychology,  
Dynamic Grasping, ...





## Related Work

- J. R. Napier (The prehensile movements of the human hand [1])
- Christine MacKenzie (The Grasping Hand [2],...)
- Hiroshi Ishii (Tangible User Interfaces[3],...)
- Brandon Taylor (The Bar of Soap [4],...)
- Grasp Taxonomy (<http://web.student.tuwien.ac.at/~e0227312/>)
- Lots in robotics and neurophysiology

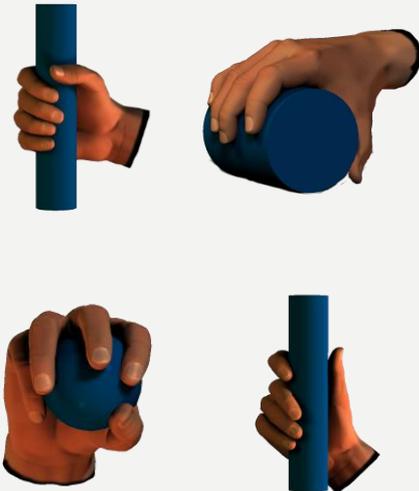


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## Related Work: A small view into Taxonomies

### Power Grips



### Precision Grips



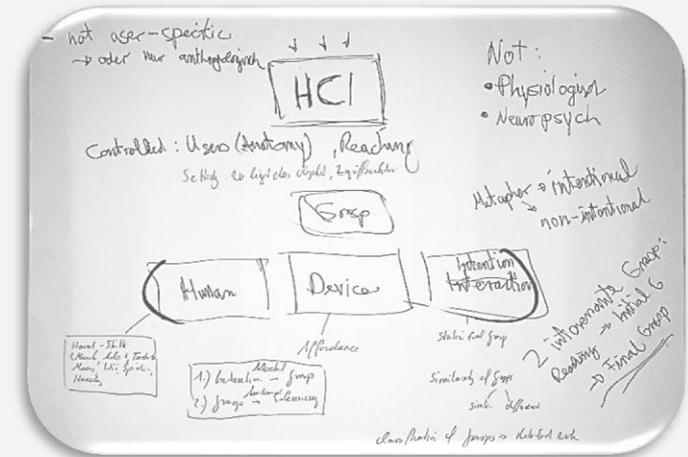
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# Research questions

## How can grasp sensing enhance interaction with tangible user interfaces?

- Taxonomy of Grasp – but no taxonomy of users
- Do people really grasp the same way?
- How would people grasp given a choice?
- Are there underlying metaphors in interaction?





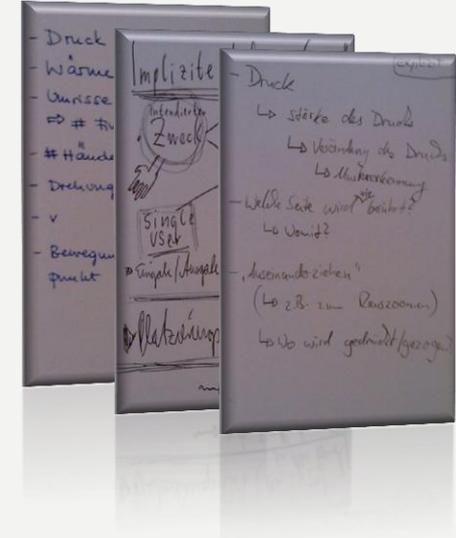
# Timeline

Month	March					April					May					June				July			August				
Week	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
Related Work	█	█	█	█	█	█																					
Focus Group							█																				
Preliminary Studies								█																			
Brainstorming									█																		
2D Experiment Design										█	█	█	█	█													
2D Experiment															█	█											
Writing Program for Evaluating 2D Experiment															█	█											
2D Experiment Evaluation																	█	█									
Starting Presentation																	█										
Extended Experiment Design																		█	█	█							
Extended Experiment																				█	█						
Extended Experiment Evaluation																						█					
Elaboration															█	█	█	█	█	█	█	█	█	█	█	█	█
Buffer																								█	█	█	█



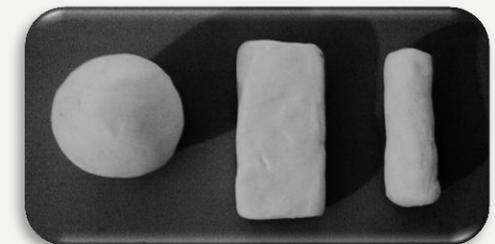
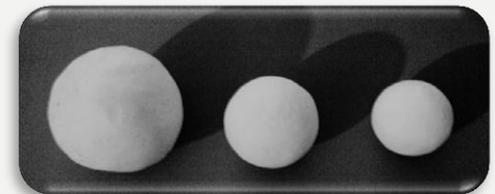
## Preliminary Studies

- Brainstorming
  - What information can a grasp yield?
  - Implicit vs. Explicit interaction
- Focus Groups
  - What interactions make sense with graspables?
  - 2D vs. 3D vs. Mobile environments
- Mock-up Graspables
  - Which size is preferred? Which color?
  - Which form inspires the most possibilities?



## Preliminary Studies II

- Brainstorming Results
  - Grasp can yield finger count, heat, pressure, multi-hand multi-user interaction, acceleration, pulse, ...
  - Interactions include pushing away as standby, encasing to mute, pressure as volume control, ...
  - Escape actions like shaking, hitting, turning, ...
- Mock-up Graspables
  - If presented with different sizes (8cm, 6cm, 4cm), the medium size was preferred.
  - From the colors red, blue, black, brown and white the users preferred white.
  - As form users preferred the cylinder above ball and rectangle.



## 2D Study

- Question  
How similar are grasps performed by one user and different users?
- Setup  
Two prisms of different size (5cm and 6cm) are placed on an easy to reach platform.
- Execution  
18 persons were asked to repeatedly pick up each prism to get a data set of grasps (128 grasps per person)
- Measurement  
The angle between thumb and fingers is measured to keep the data relational for each hand.



Execution



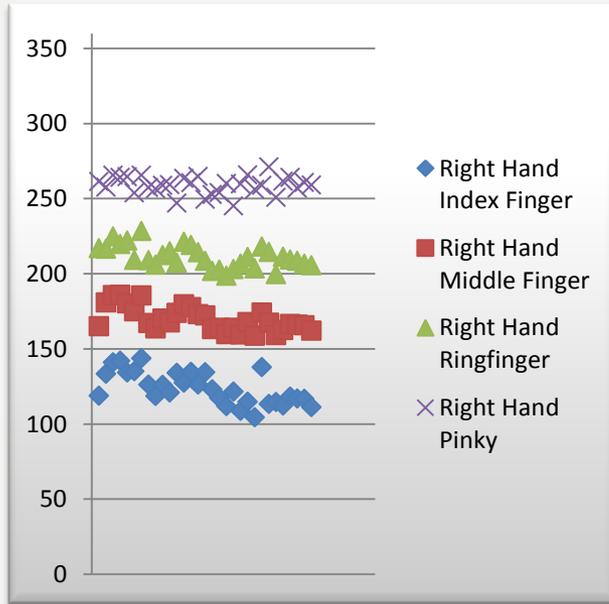
Setup



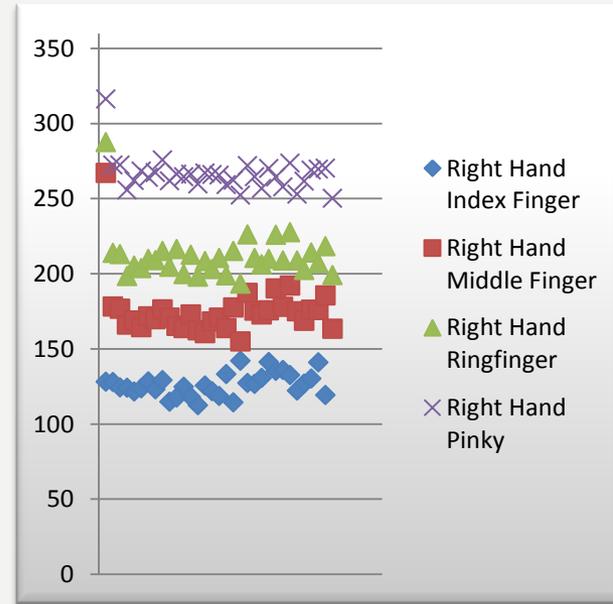
Measurement



## First glance at the evaluation of the 2D study



Hand size: 16cm base to tip middle finger, 8cm width

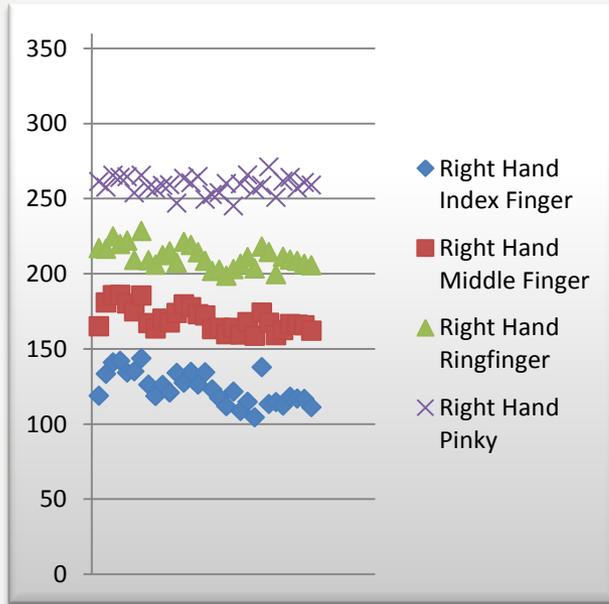


Hand size: 19,5cm base to tip middle finger, 9,5cm width

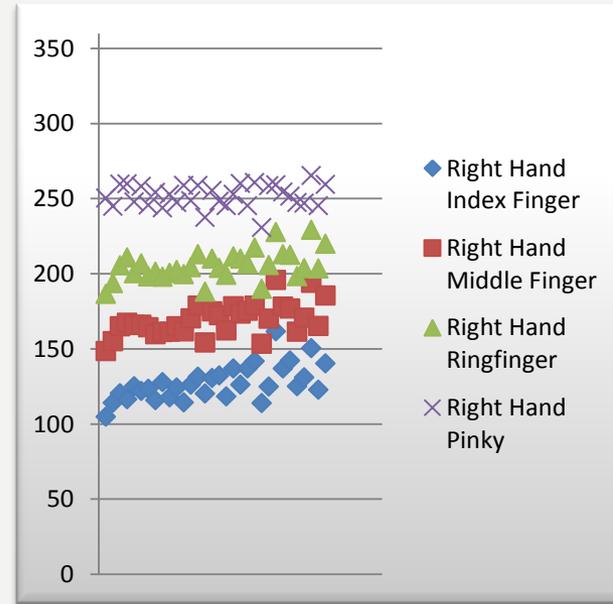
Evaluation of two users comparing right hands with the large prism size



## First glance at the evaluation of the 2D study



Prism size: Large (6cm)



Prism size: Small (5cm)

Evaluation of one user comparing both prism sizes

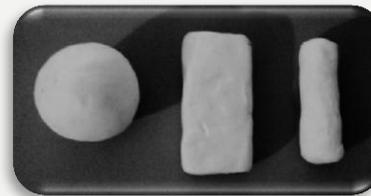
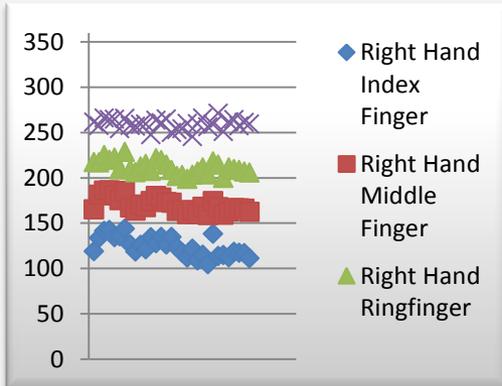
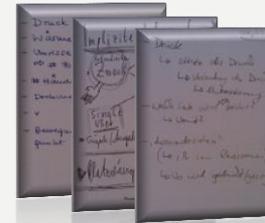
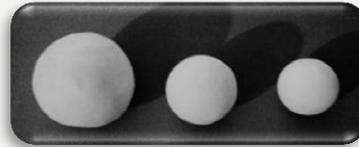


## Next Steps

- Continuing evaluation of the 2D study
- Search for patterns in and in between users
- Creating a study to take it to 3D
- Performing and evaluating the 3D study
- Creating a study to research metaphors
- Performing and evaluating the metaphor study
- Definition of metaphors or even a formula?



# Questions?





# Ressources

- [1] J. R. Napier (1956). The prehensile movements of the human hand. The Journal of bone and joint surgery. British volume 38-B(4):902-913.
- [2] MacKenzie CL, Iberall T. The Grasping Hand. North-Holland; 1994.
- [3] Ishii H. The tangible user interface and its evolution. Communications of the ACM. 2008;51(6):32.
- [4] Taylor BT, Bove VM. The Bar of Soap: A Grasp Recognition System Implemented in a Multi-Functional Handheld Device. Computer. 2008;3459-3464.

Images:

- [1] <http://web.student.tuwien.ac.at/~e0227312/>

