

LFE Medieninformatik • Dario Soller

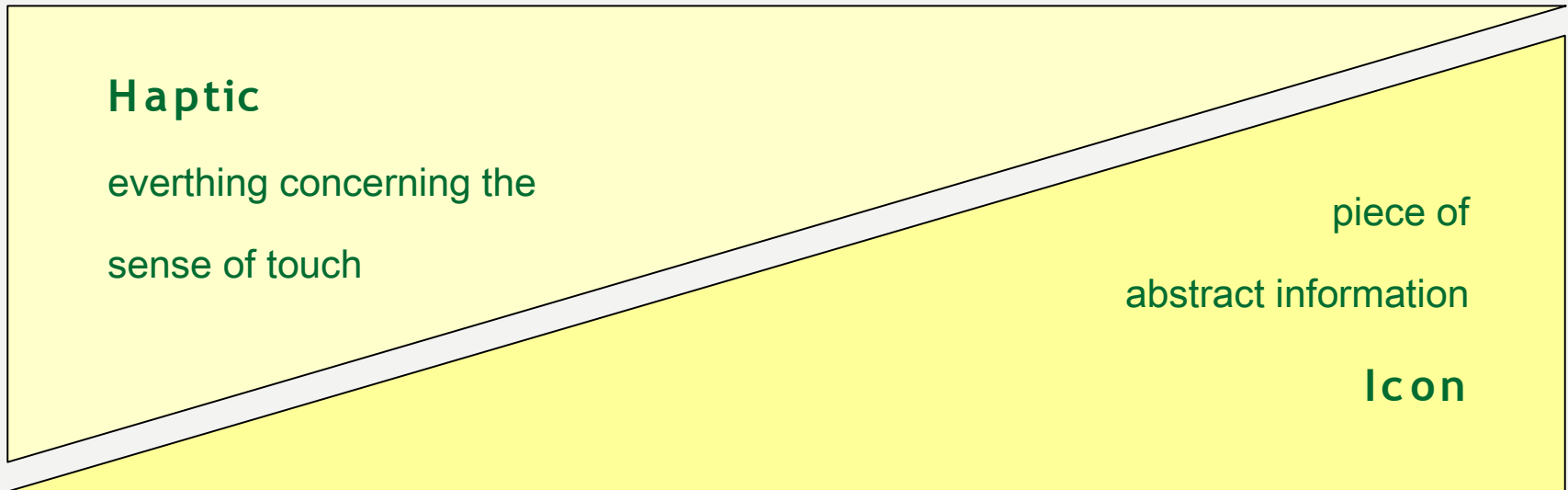
Haptic Icon Prototyping

Medieninformatik Hauptseminar
Wintersemester 2009/2010
„Prototyping“

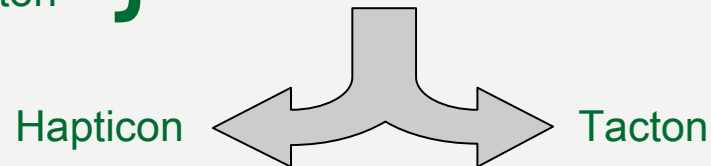




Definitions

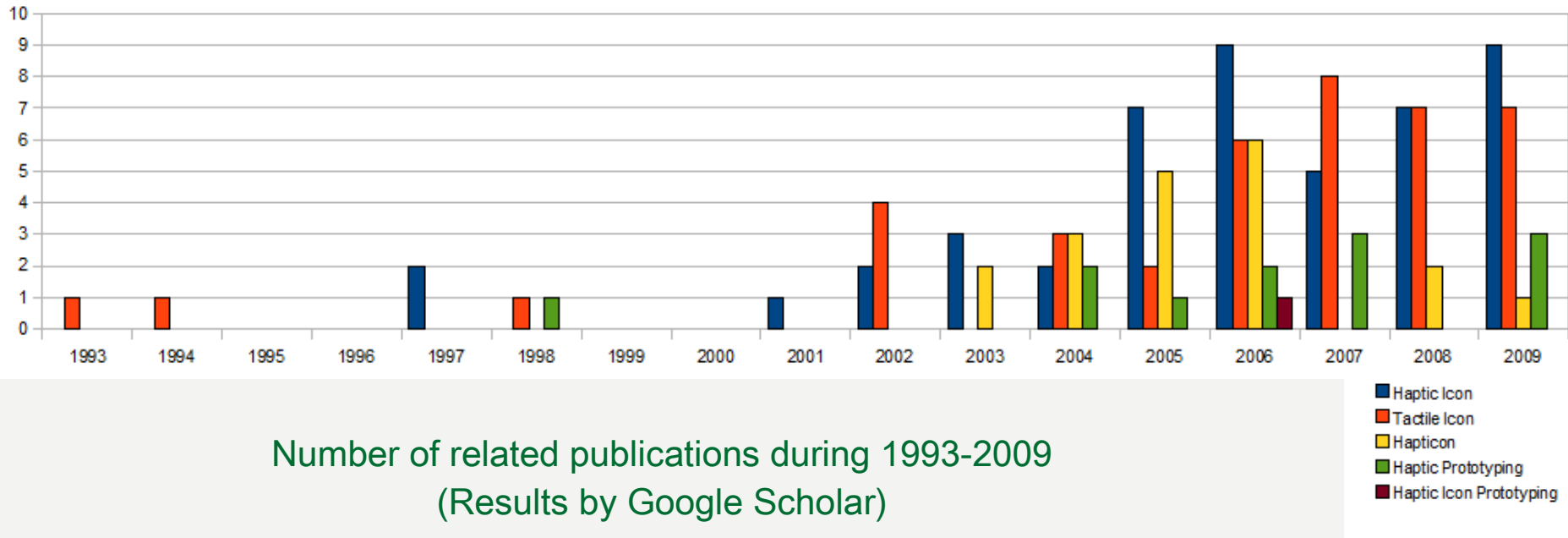


Haptic Icon → Hapticon }
Tactile Icon → Tacton } Hapticon ≐ Tacton



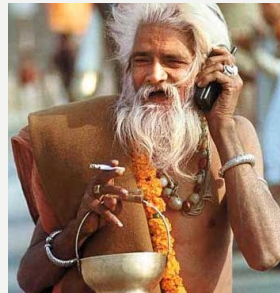
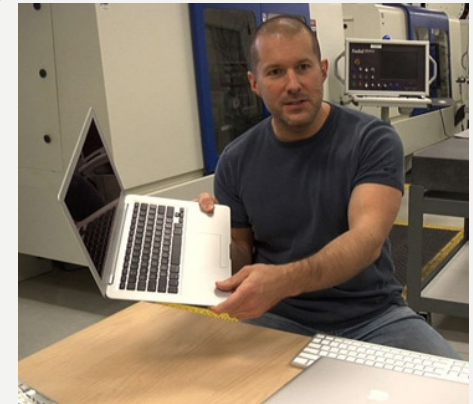
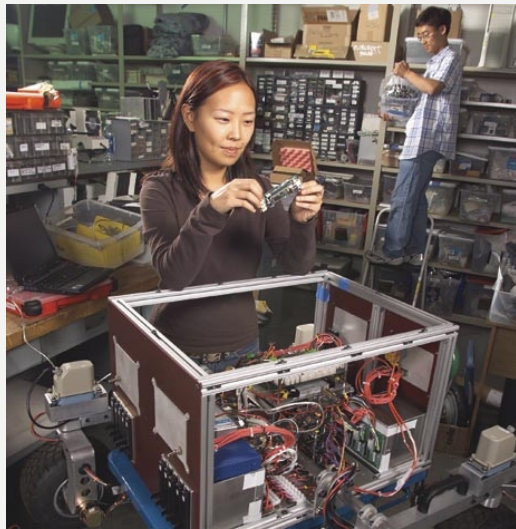
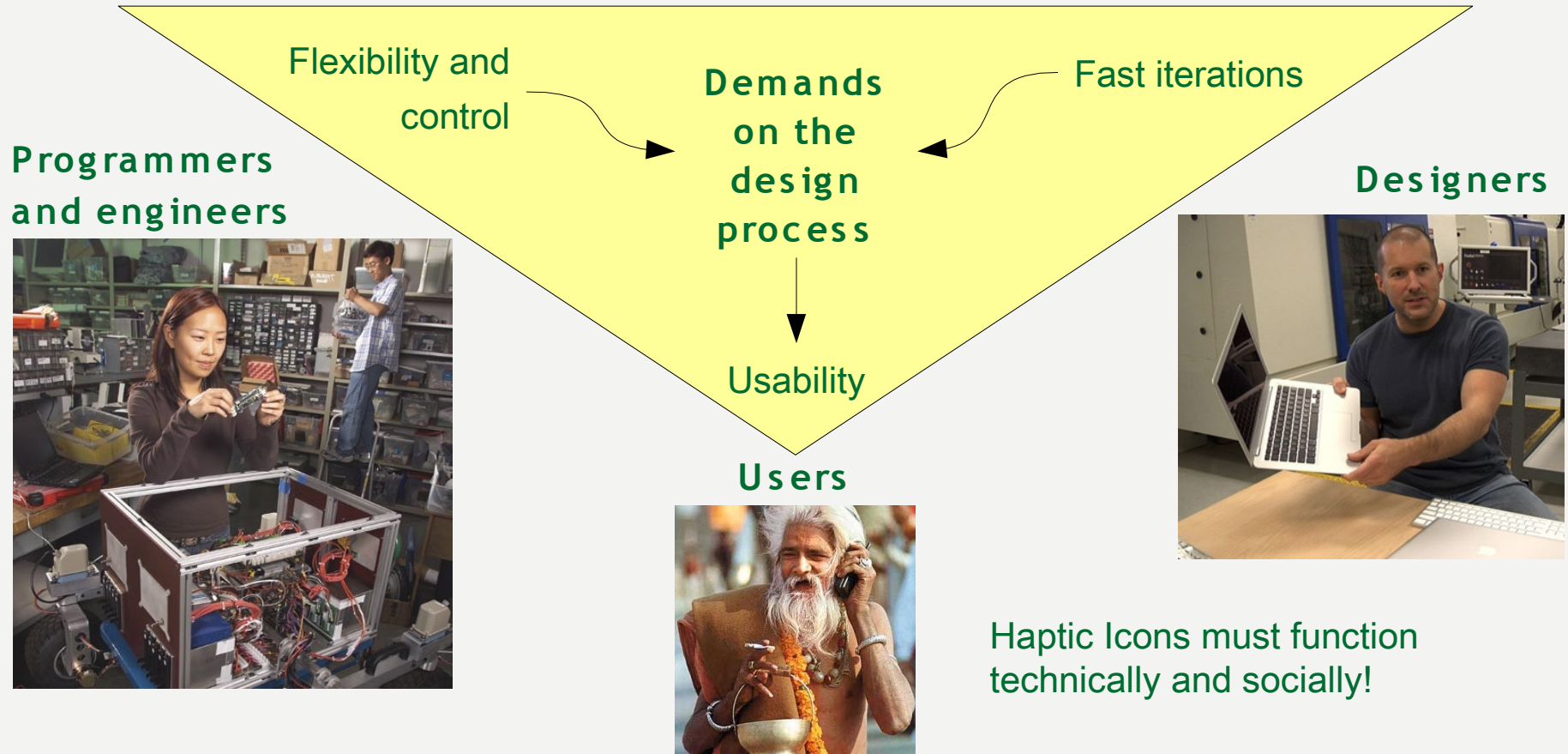


History of HIP





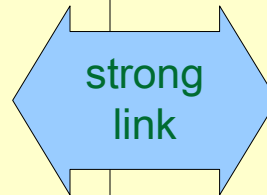
Target Groups for HIP



Haptic Icons must function technically and socially!

The Skin's Physiology

Motor-Subsystem
kinesthetic sensations

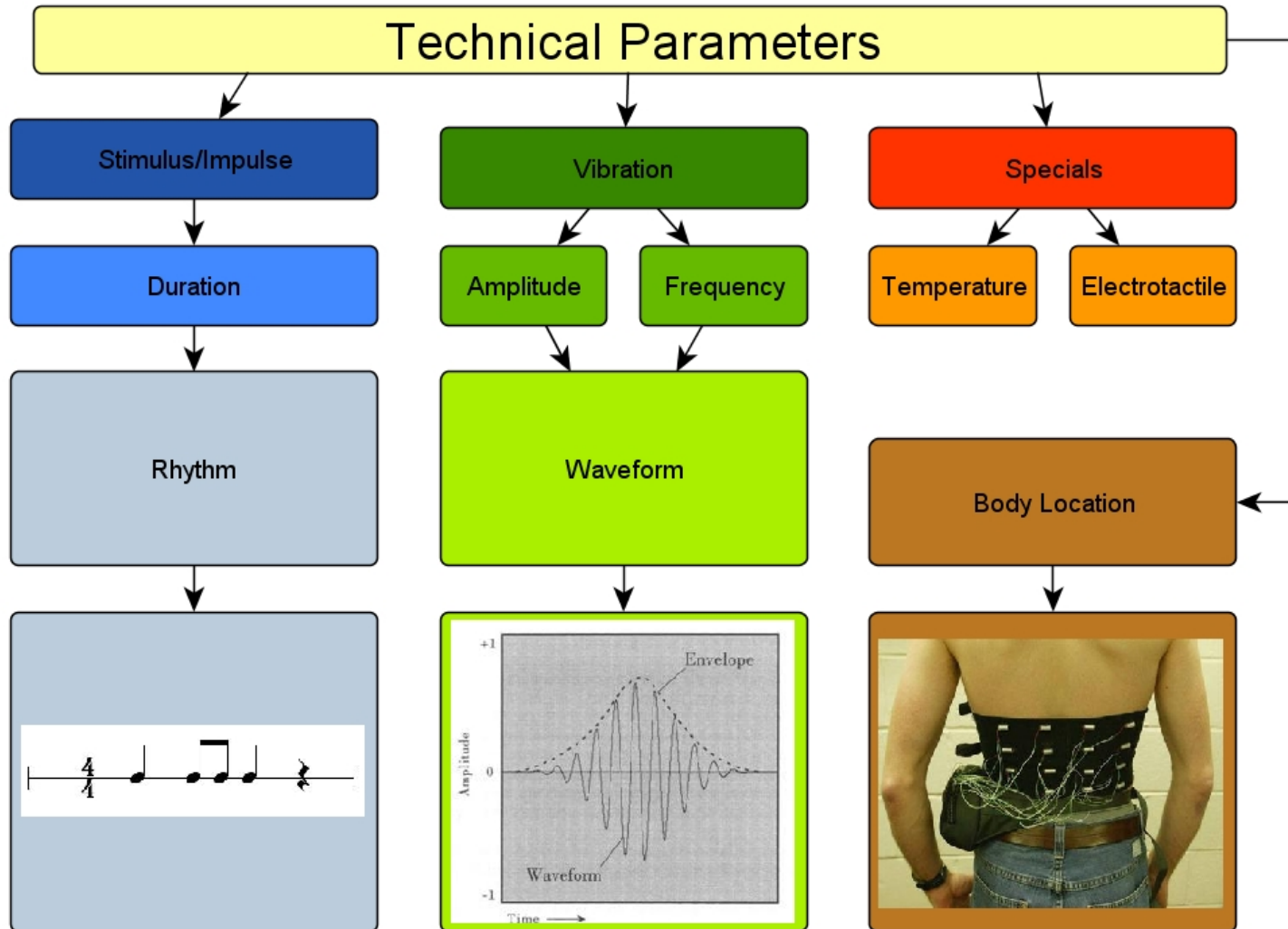


Sensory-Subsystem
tactile sensations



Mechanoreceptors

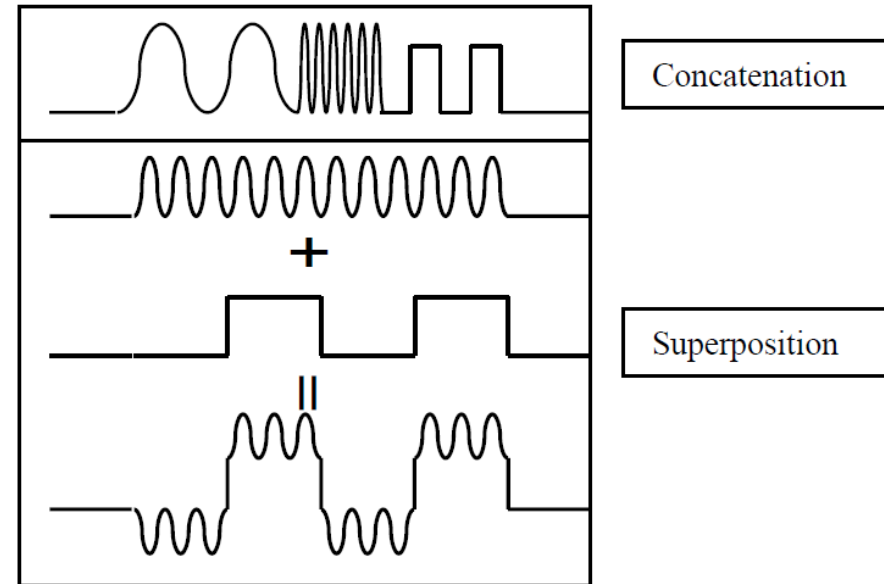
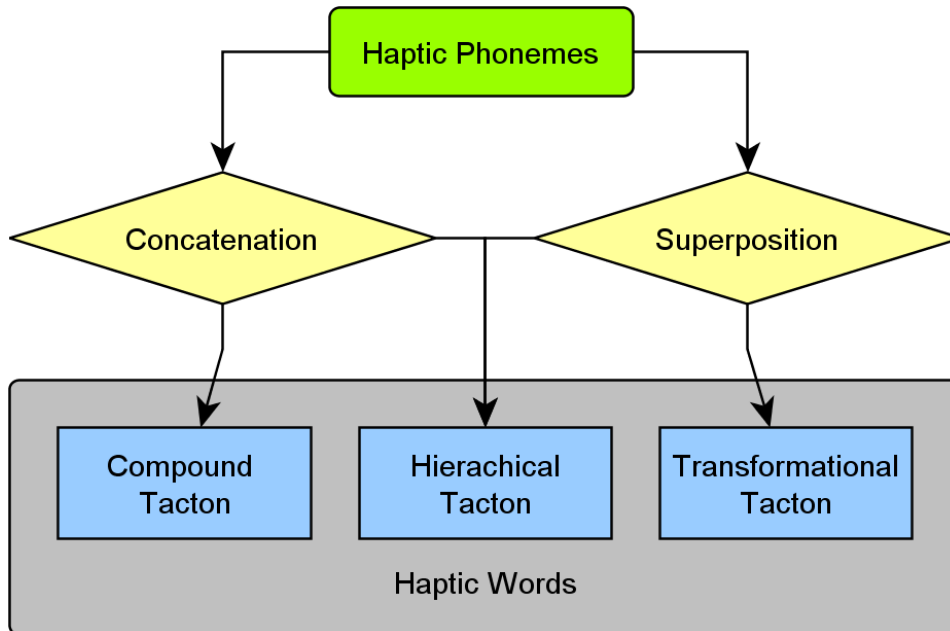
- Meissner's corpuscles
- Pacinian corpuscles
- Ruffini's end organs
- Merkel's discs
- Krause's bulbs
- Free nerve endings



L. M. Brown, S. A. Brewster, and H. C. Purchase. Multidimensional factors for non-visual information presentation in mobile devices. In MobileHCI'06 http://www.audiorakete.de/wp-content/uploads/2008/08/dasgrain_granularsynthese.jpg http://3.bp.blogspot.com/_k_X6e30jnXY/SA_S3wOekqI/AAAAAAAAABGU/lid8C-i4bc0/s1600/handler.jpg



Haptic Icon Design



M. Enriquez, K. MacLean, and C. Chita. Haptic phonemes: basic building blocks of haptic communication. In ICMI '06: Proceedings of the 8th international conference on Multimodal interfaces (2006)

Haptic Devices

Tactaid VBW32



C2 Tactor



Most established haptic prototyping components

Low-fi HIP



What is an effective substitution for paper prototyping in the field of haptics?

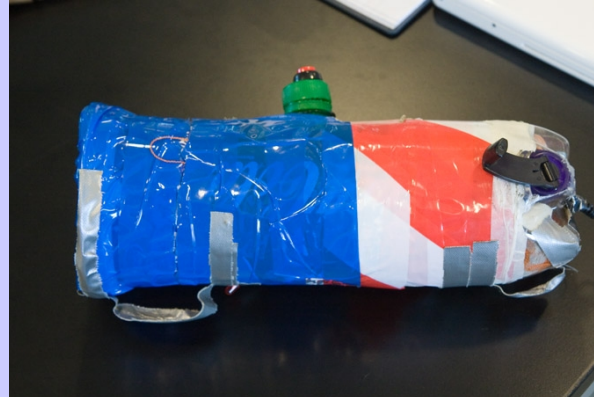
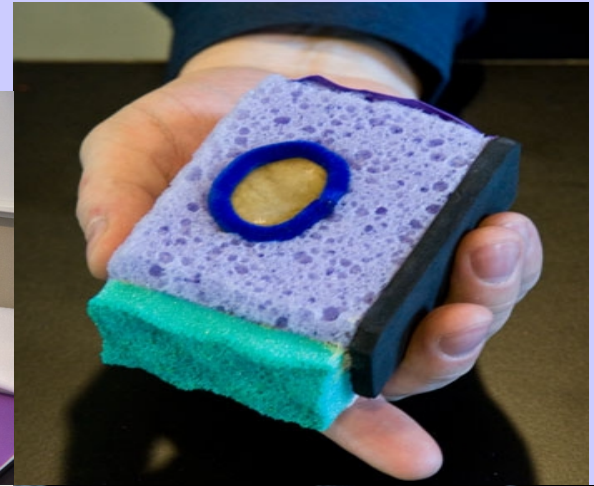
Low-Fi Haptic Icon Prototyping

Definition of
haptic icons

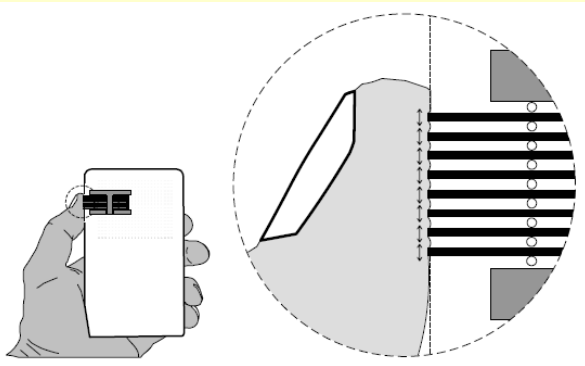
Contradiction!?

Limited expressiveness
of low-fi prototyping
techniques

NordiCHI 2008 Workshop



Hi-Fi Haptic Icon Prototyping



Texture Handheld Miniature Bimodal (THMB)

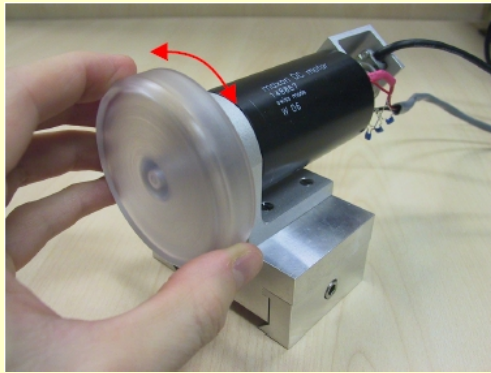
- Array of piezoelectric actuators arouses the thumb tip's skin by bending
- Controlled by a PC host running Linux
- Good for crossmodal tasks



BubbleWrap - textile-based electromagnetic haptic display

- Matrix of electromagnetic actuators, enclosed in fabric
- Individually controllable cells that expand or contract
- Active and passive haptic feedback

Hi-Fi Haptic Icon Prototyping



Haptic Knob with the haptic icon editor software

- Editor software with tile concept
- Designing Haptic Icons via drag&drop
- Mathematical equations for tacton representation
- Haptic Knob controlled by a Linux PC connected to an I/O-Board



NADA Sketchstools Network Analog and Digital Adapter

- Open source hardware and software tool kit
- Big collection of sensors and actuators
- Connected to an iPhone/iPod simply by the headphone jack



Open Questions

How do simultaneously presented tactons effect each other or work together ?

HIP

What other techniques rather than crescendos can be used from the field music?

Which shared data structures are useful to incorporate it with other modalities?



Conclusion

1 • User Studies

„Currently, the best approach for haptic prototype design is to perform perceptual user studies to compare several designed haptic behaviors after they have been developed.“

Way to go!

2 • New Toolkits

„We'll continue to strive to create tools that make sketching in hardware as simple as putting pen to paper.“



References

L. M. Brown, S. A. Brewster, and H. C. Purchase.

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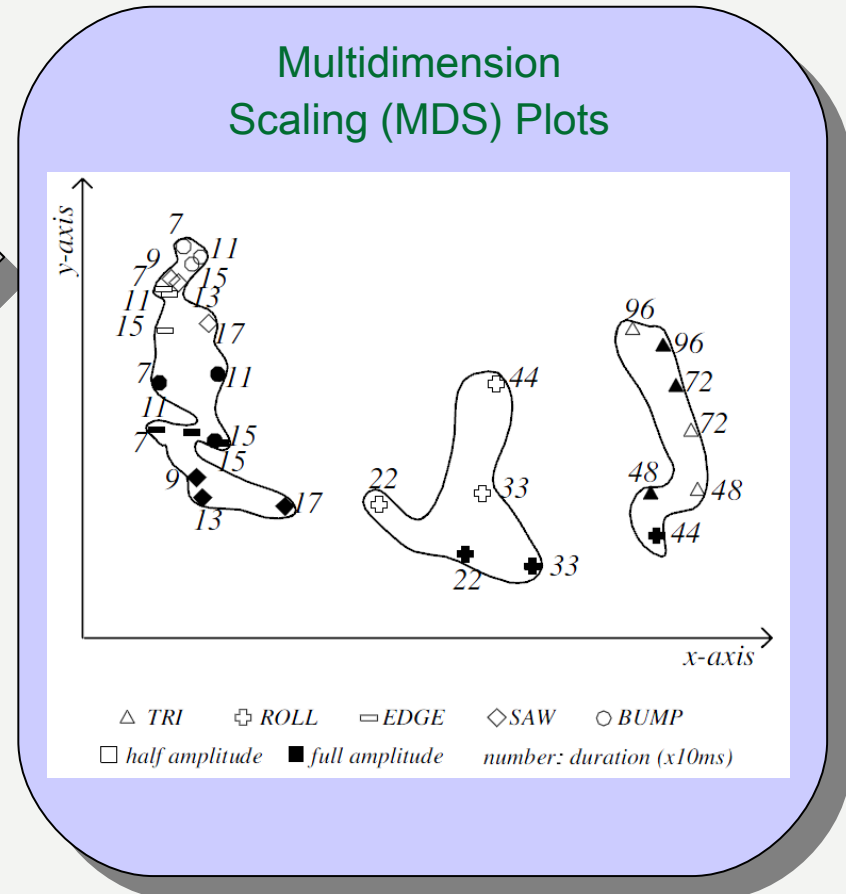
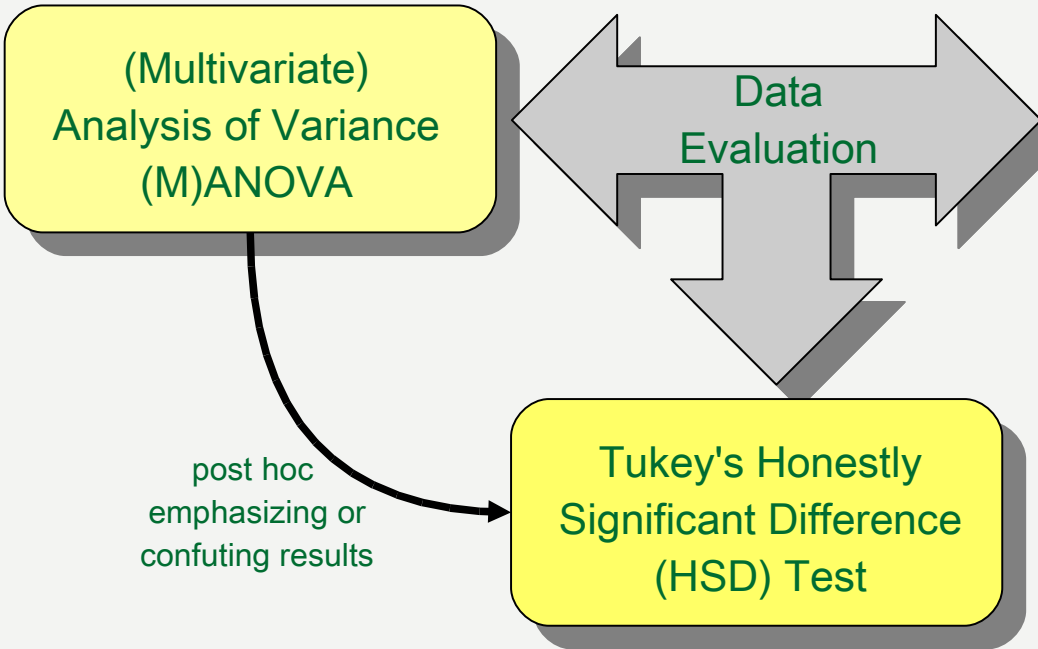
Exploring melodic variance in rhythmic haptic stimulus design. In GI '09: Proceedings of Graphics Interface 2009



**Thanks for
your attention !**



Data Analysis

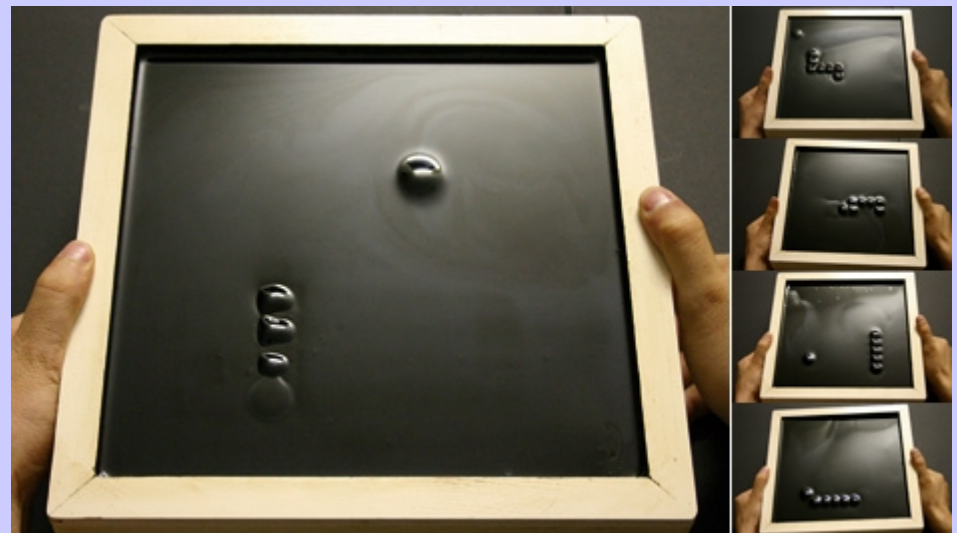


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Future Prospects



Multitouch Display



Haptic Ferrofluid Display

The dream of direct intuitive haptic interaction
on large multimodal user interfaces