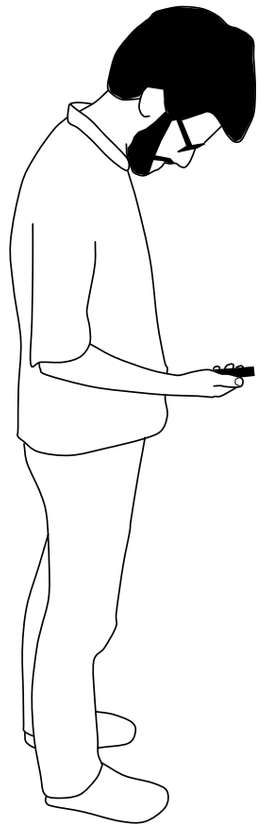
Mensch-Maschine Interaktion 2

Interactive Environments

Mobile Technologies



Desktop Environments

Mensch-Maschine Interaktion 2

Interactive Environments

Mobile Technologies

Desktop

Desktop Environments

- context and task
- challenges
- input technologies
- challenges in interaction design
- output technologies

Mobile

- context and task
- challenges
- input technologies
- challenges in interaction design
- output technologies

Interactive Environments

- context and task
- challenges
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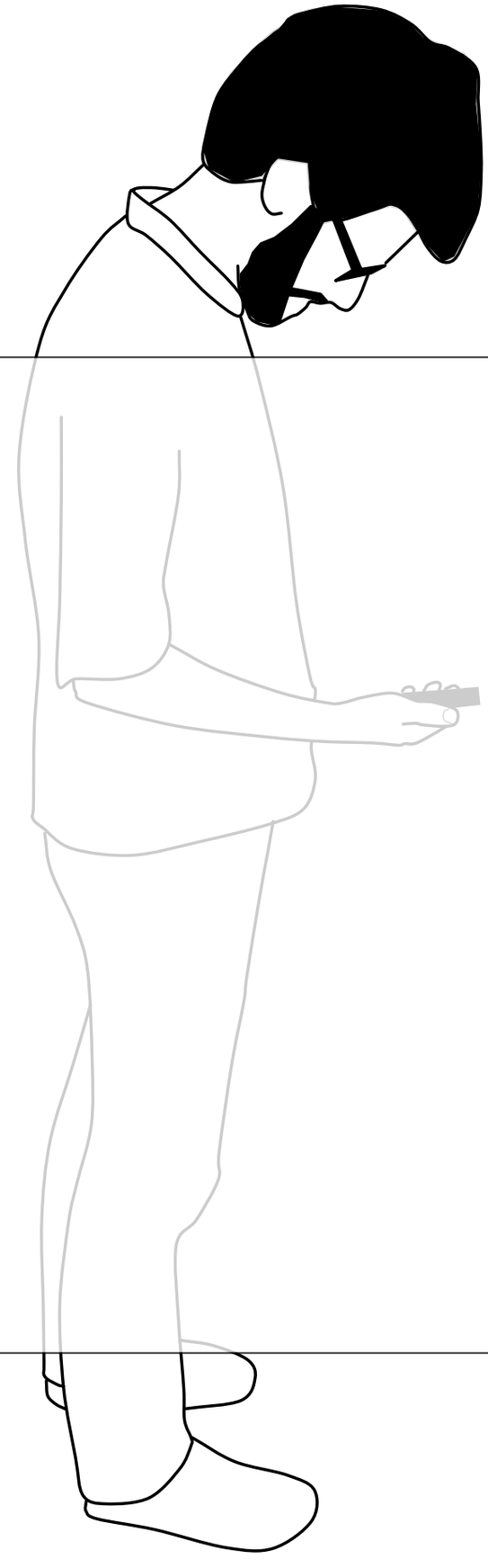
- challenges in interaction design
- output technologies

Mobile Technologies



context and task

challenges

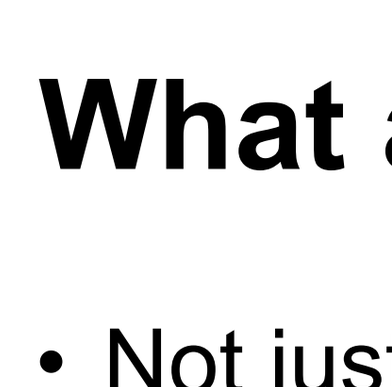
input technologies

challenges in interaction design

output technologies

What are Mobile Technologies?

- Not just phones and tablets...
- Every technology with which
  - input/output is taking place relative to your body
  - while you can move
  - otherwise: just portable, not mobile



http://codezqr.com/blog/wp-content/uploads/2013/04/Phones-and-tablets.jpg

Present example: Smart Watches

- several new models on the market in 2013
- primary use case: smart phone substitute
- enables more peripheral interaction
- social acceptance (discussion?!?)
- watch http://www.uxcite.de for discussion

https://s3.amazonaws.com/ksr/projects/111694/photo-main.jpg?1334081632

- **context and task**
- challenges
- input technologies
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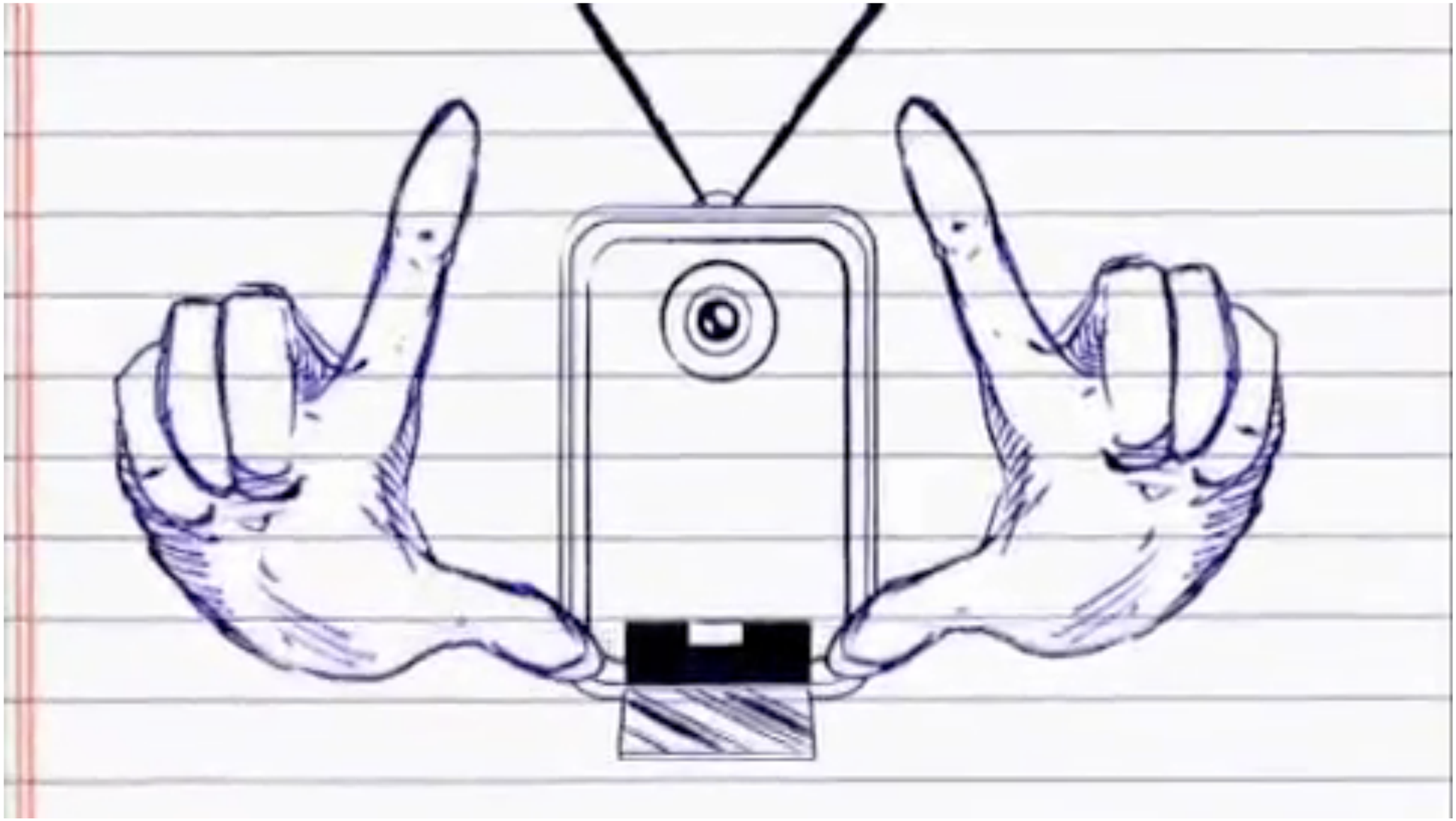
Future Example: 6th sense

- http://www.youtube.com/watch?v=Dxnoib7-vx8

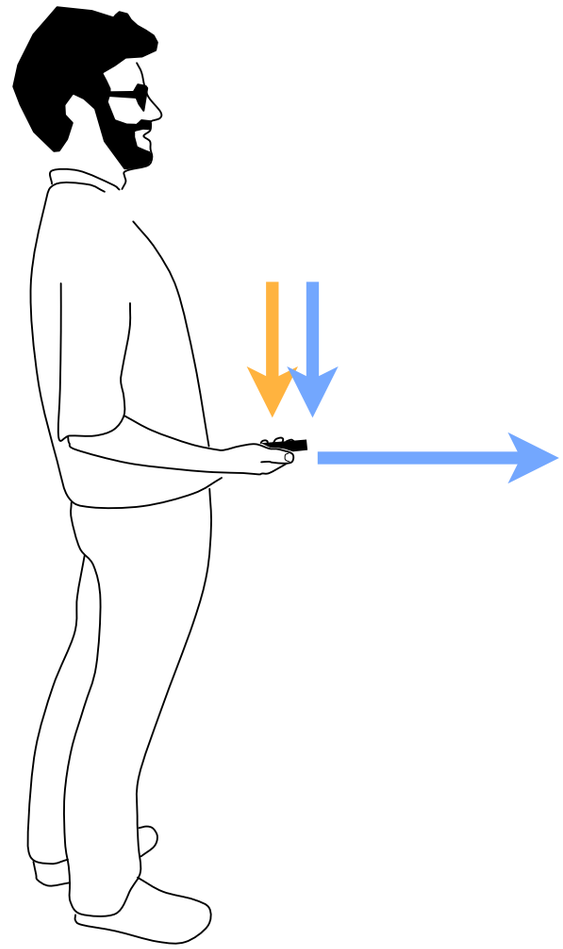


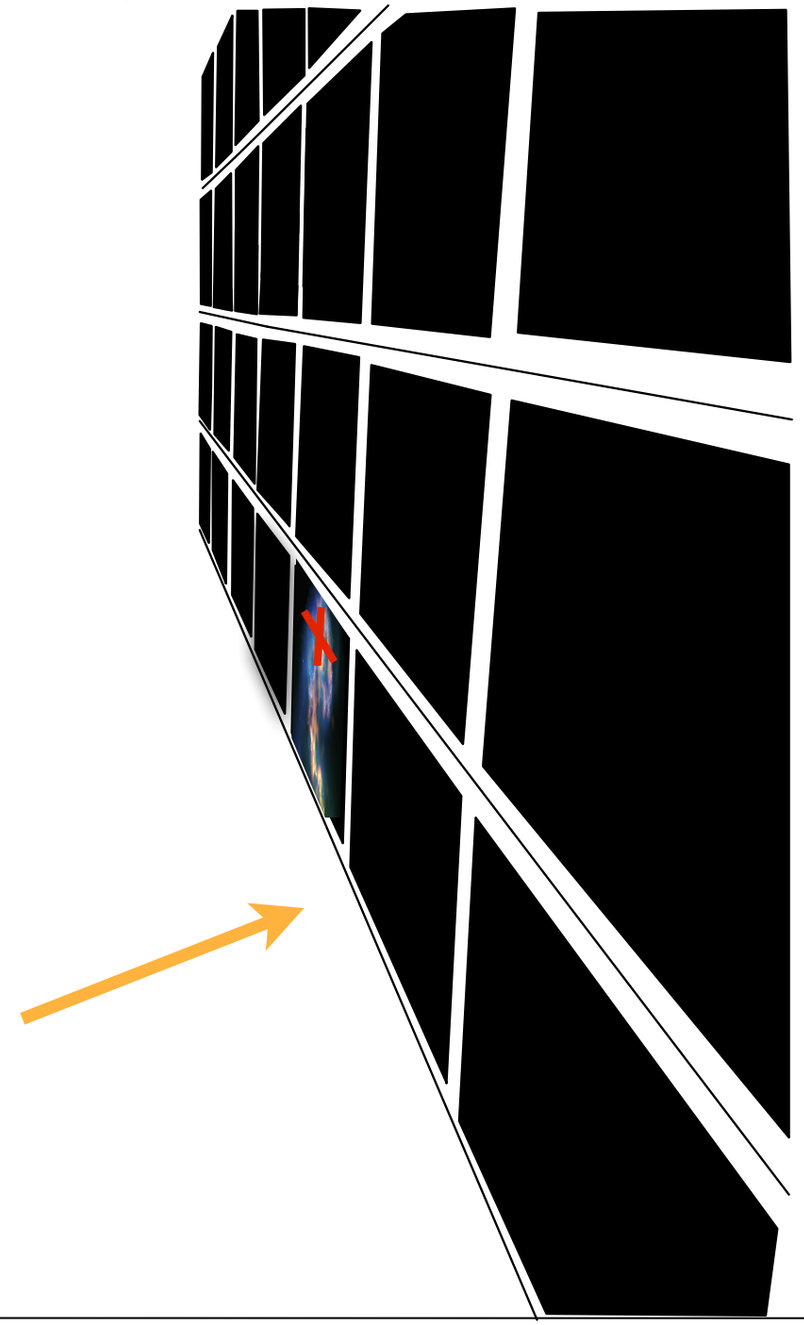
new context of use ... and its issues

- not just stand-alone devices anymore..
- dynamic interactive environment setup.
- interaction across multiple devices - technological challenges.
  - phone = pixel, (chris harrison)
- interaction using larger muscle groups
  - fatigue effects
- using proximity and body language in interfaces.
  - accidental input (e.g., Charade by Baudel et al.)
  - proxemic Interaction (e.g., Nicolai Marquardt 2013)
- new form factors - e.g., cloth, flexible,
- gadget overload? - see the 6th sense video

Question:

- input and output distributed in the environment.
- any ideas for interaction techniques to set up devices or send information to distant displays?





- **context and task**
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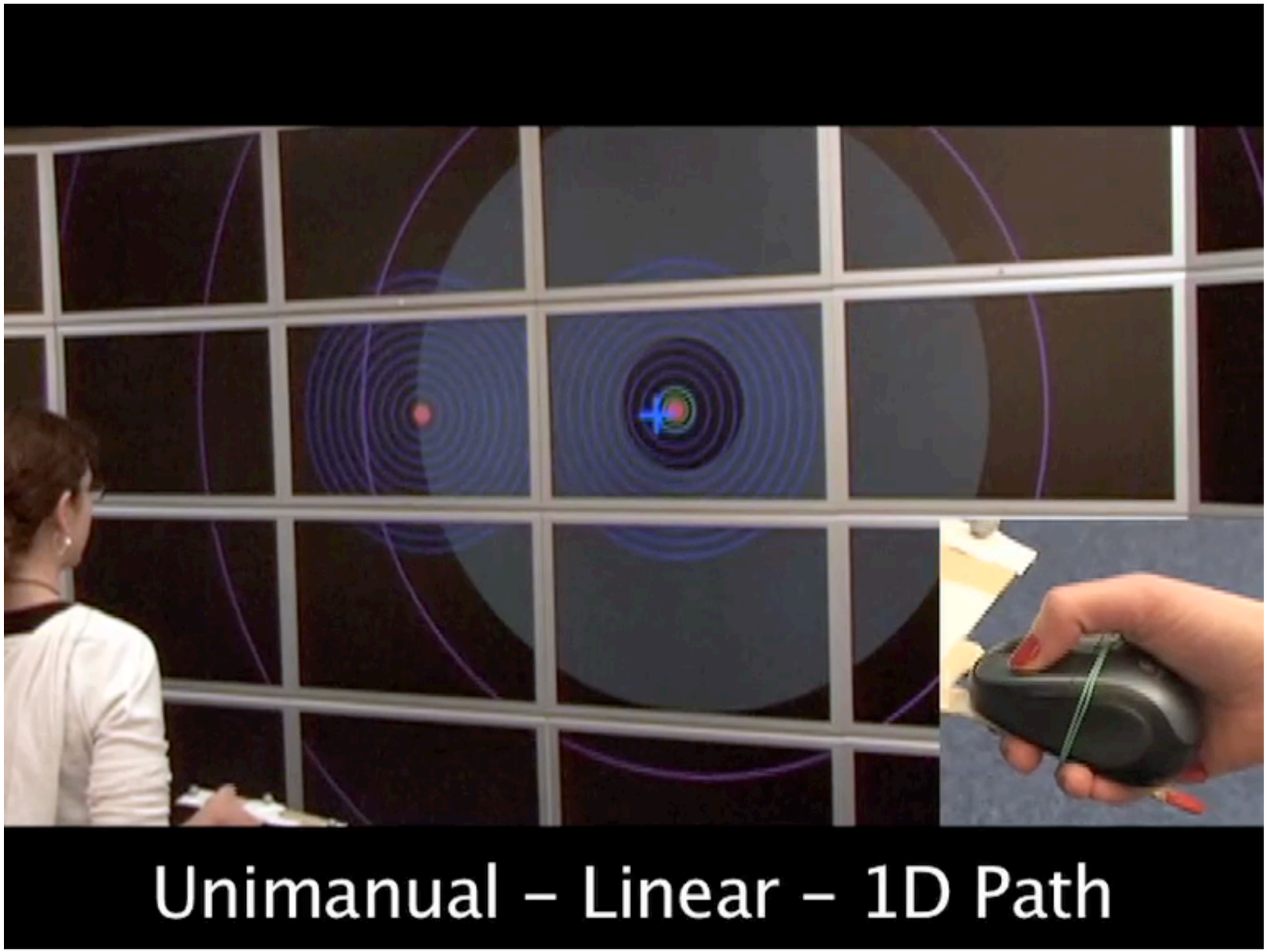
Pan-Zoom on Large Displays



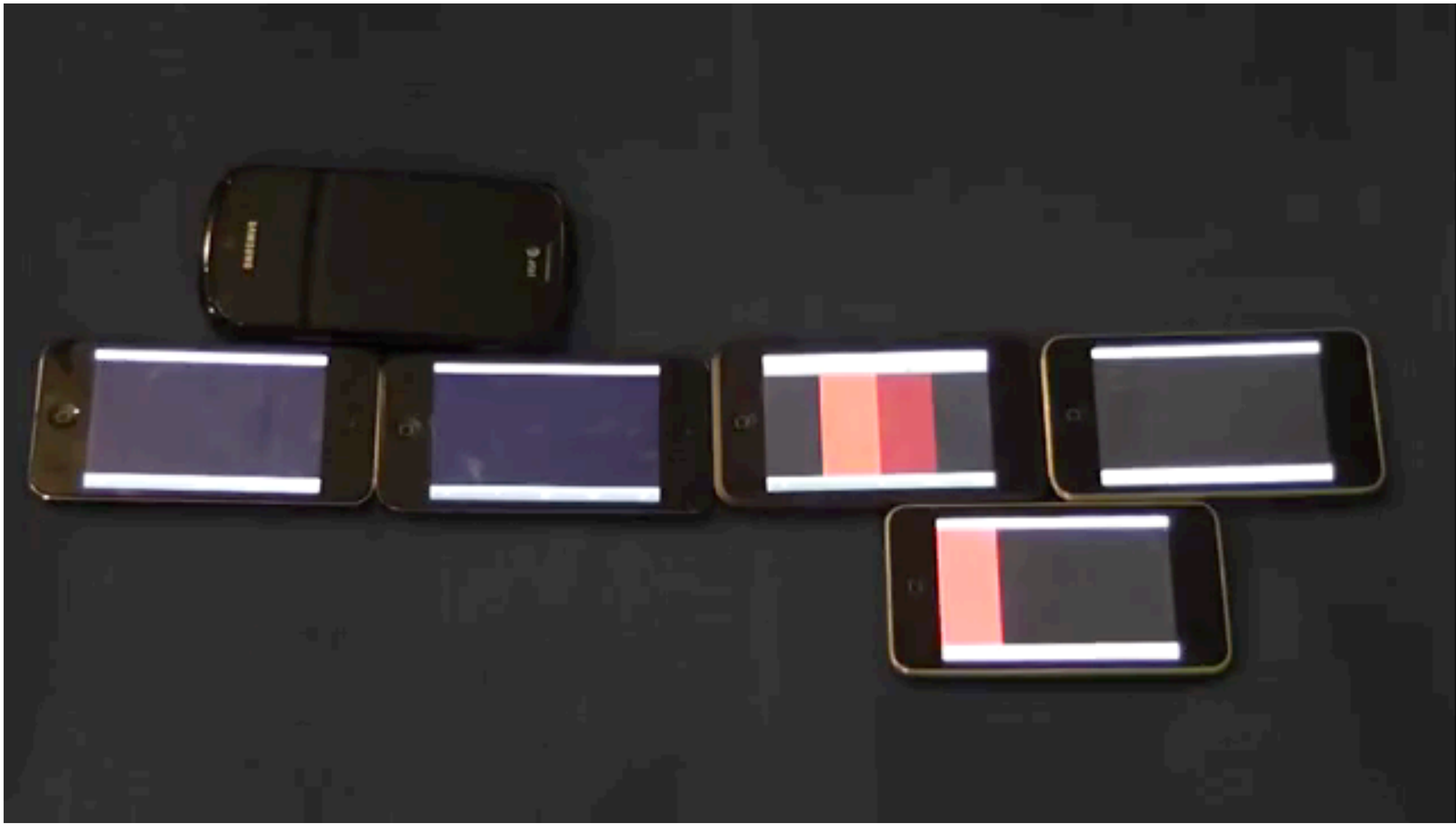
- http://mathieu.nancel.net/videos/CHI_11_CamReady_GoodRes_SD.mov

Pan-Zoom on Large Displays

- fatigue effects when using larger body groups
- guidance of input movements
- interesting physiomotoric interaction effect between pointing and circular zoom gesture

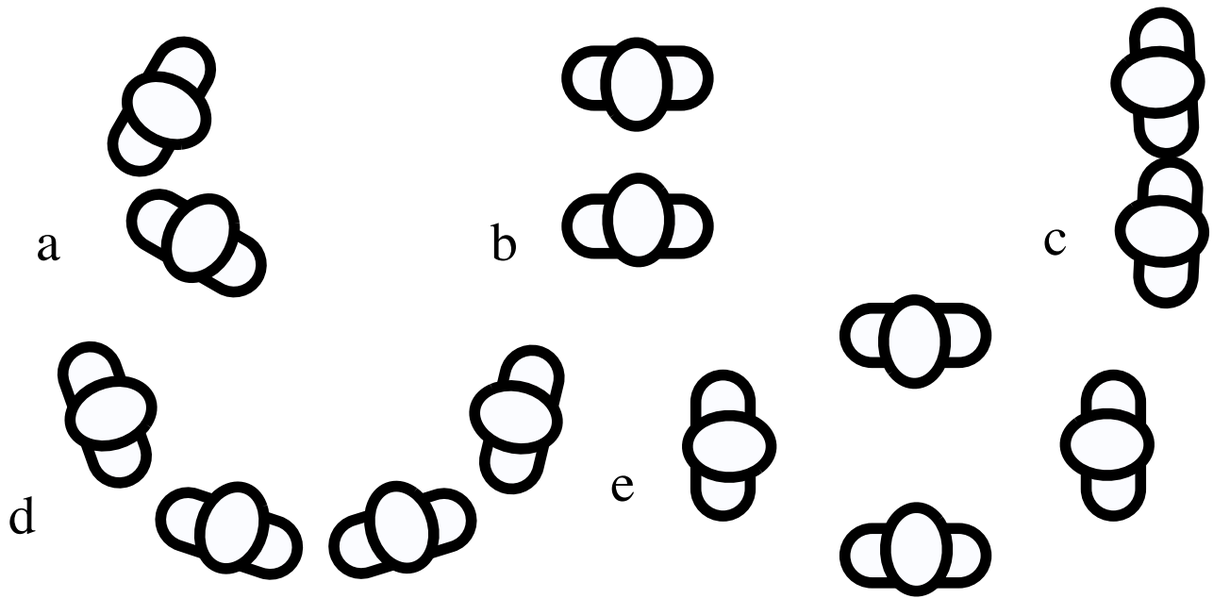
Phone as a pixel

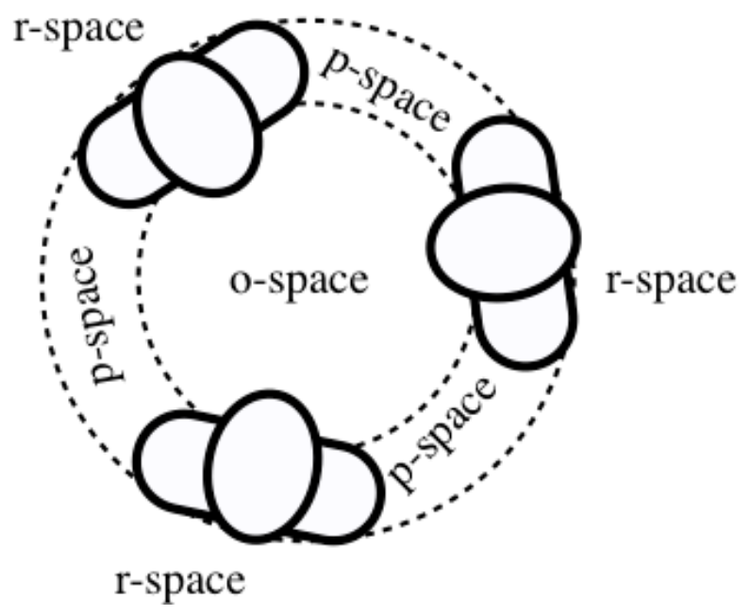
- https://www.youtube.com/watch?v=zuFIUXfS1kU



Using proximity and body language in interfaces

- different spaces. issues with co-workers when designing interfaces using ‘direct touch’
- cultural issues as well
- different formation of people
  - different tasks (teaching, what else???)

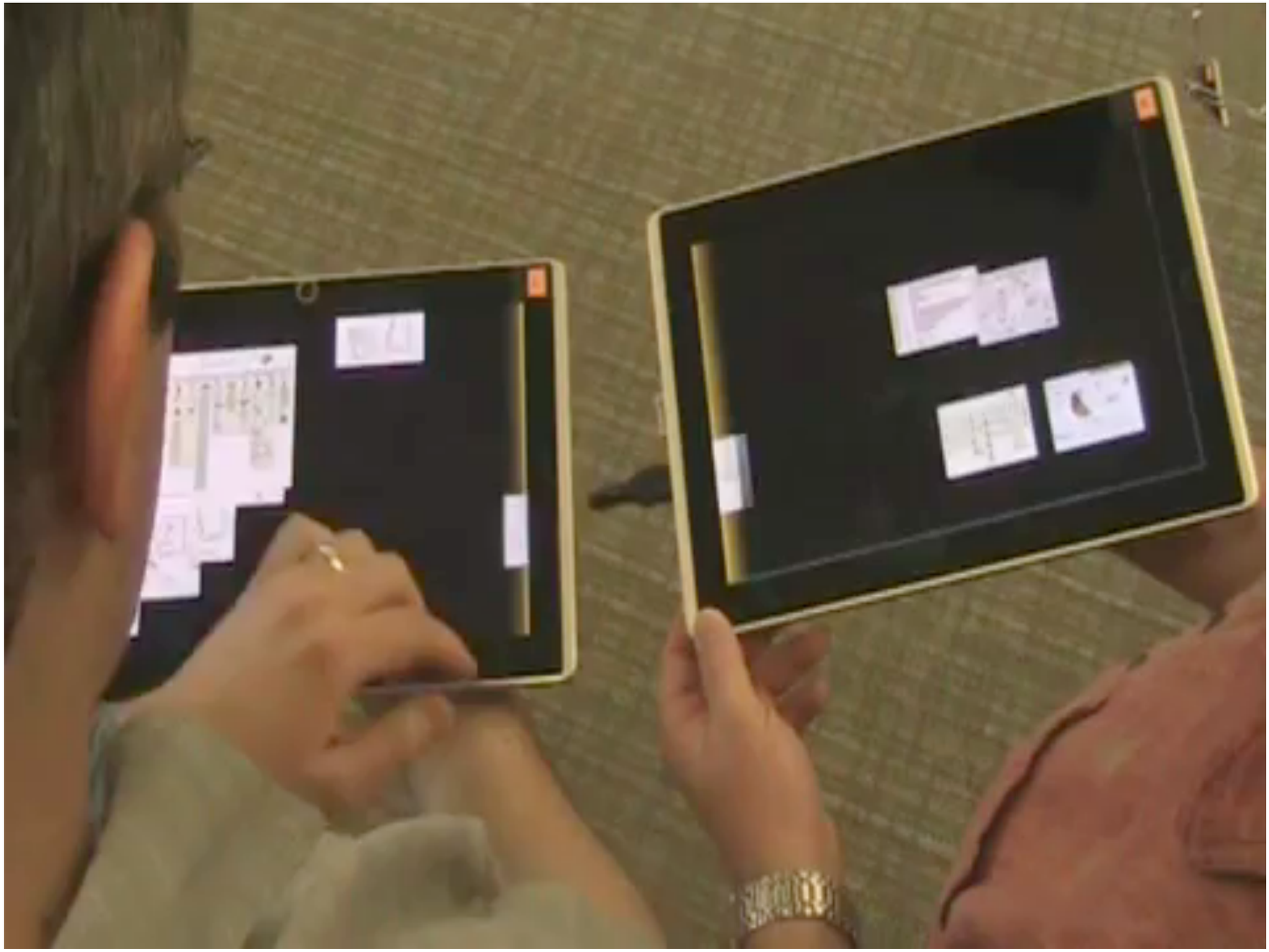




Literature: Marshall, P. et al. “Using F-formations to Analyse Spatial Patterns of Interaction in Physical Environments”. CSCW 2011

Proxemics for cross-device interaction

- https://www.youtube.com/watch?v=HYt0qAJ4y9c



Proxemic Interactions to mediate interaction

- https://www.youtube.com/watch?v=OHm9teVoNE8

Mobile phones: social issues

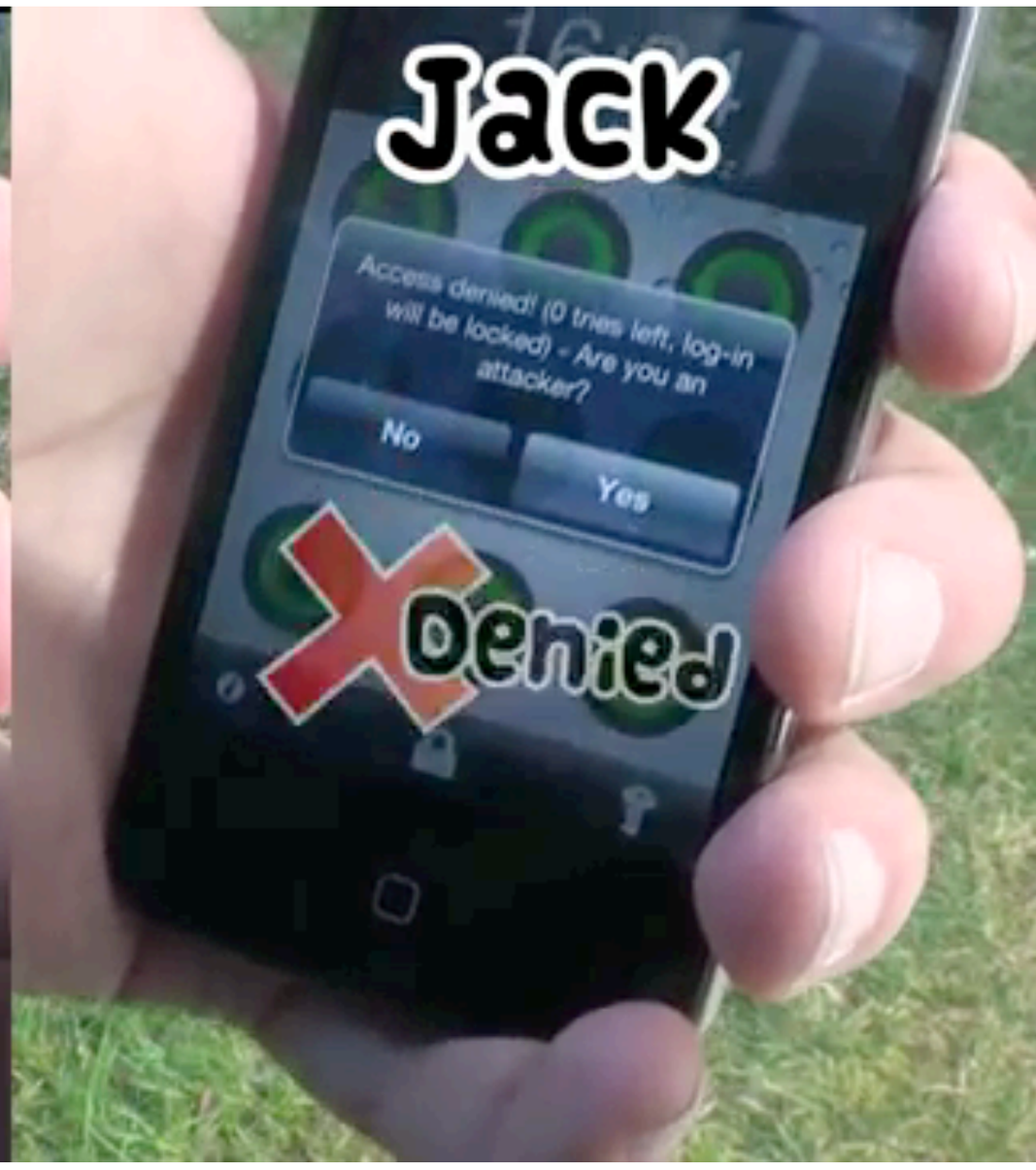
- https://www.youtube.com/watch?v=OINa46HeWg8

Let‘s discuss these issues:

- (un)divided attention
- not living in the moment, instead trying to capture the moment
- hyper-multi-tasking?

- privacy issues
  - e.g., current research of Alina Hang and Emanuel von Zezschwitz
  - e.g., http://pleaserobme.com/why
- ethical issues of designing technology,
  - how do you want your future to be???
  - what does society accept?

Example: biometric unlock pattern



Example: fake cursors

- **context and task**
- challenges
- input technologies
- challenges in interaction design
- output technologies

Interaction in cars

http://www.autocarbike.com/ford-focus-rs-will-get-350-horsepower/ford-focus-st/

- **context and task**
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A specific multi display environment

Types of tasks

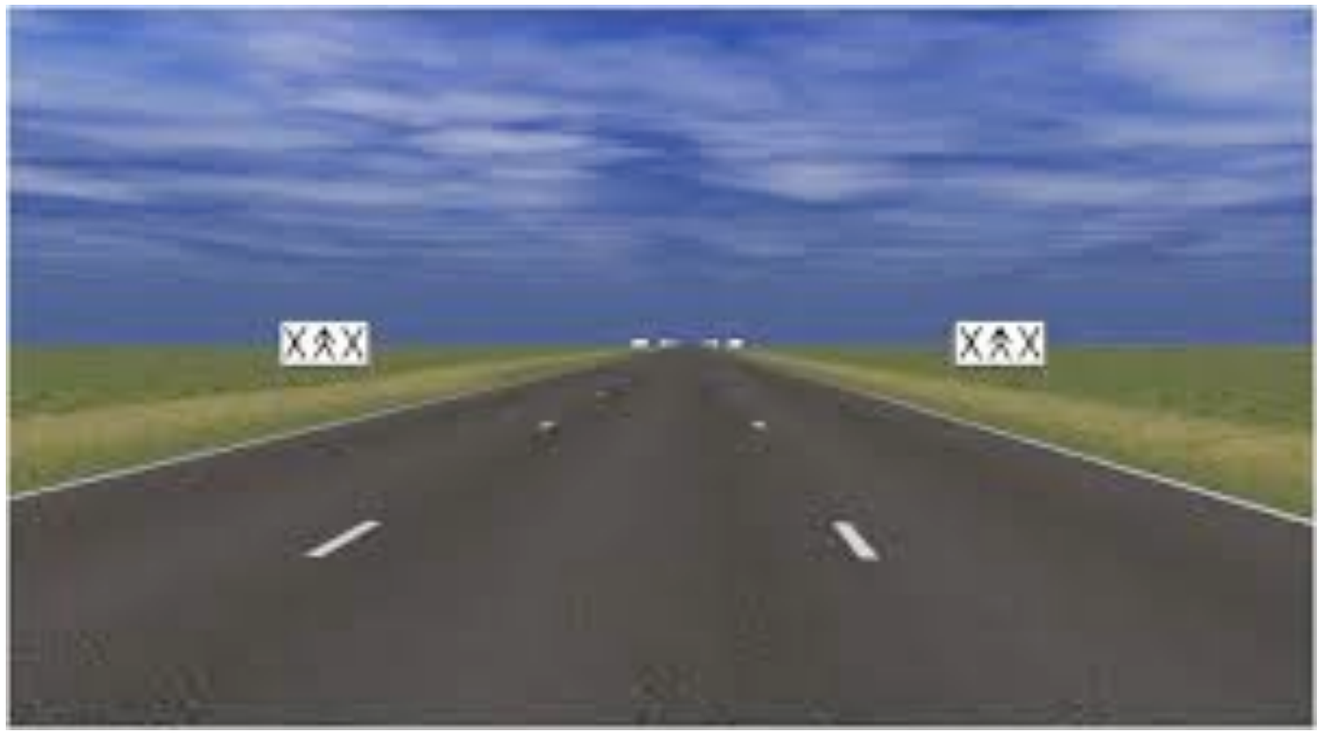
- primary task: driving (stabilizing, collision avoidance)
- secondary tasks: e.g., navigation, signalling, ...
- tertiary tasks: entertainment, communication, ...

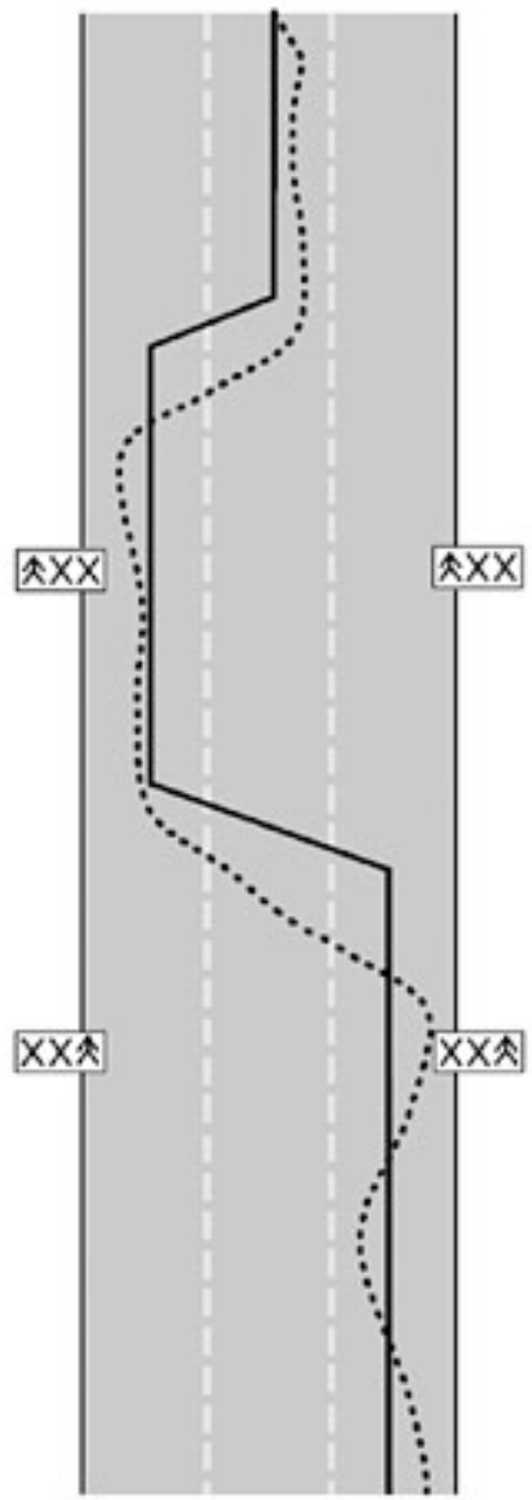
Some legal requirements

- Eye gaze
  - should ideally be on the road all the time
  - aversions should not be too long or frequent
  - how about HUD???
  - i.e. all tasks must be interruptible
- hands on the wheel!

- No animations allowed
  - are assumed to distract
  - certainly valid for primitive blinking etc.
  - also valid for smooth transitions?
  - might avoid change blindness

A specific test: the lane change task



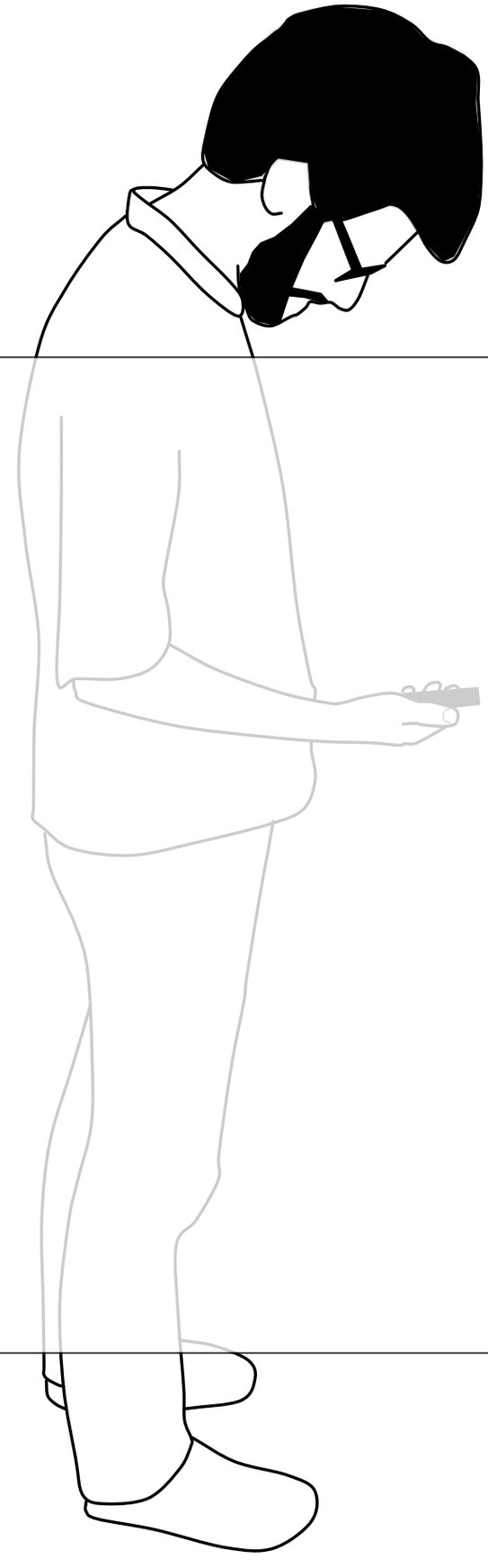


- follow a 3 lane highway for a while
- change lanes according to signs
  - first without sec. task (baseline)
  - then with secondary task
- compute area between ideal and actual path
- larger area means more distraction!

New Body configurations

- standing
  - device held in hand, i.e. no fixed support
  - will desktop models still work???
- walking
  - everything is in motion (precision??)
  - „secondary“ task of not running into things
- lying on the sofa...

Mobile Technologies



context and task

challenges

input technologies

challenges in interaction design

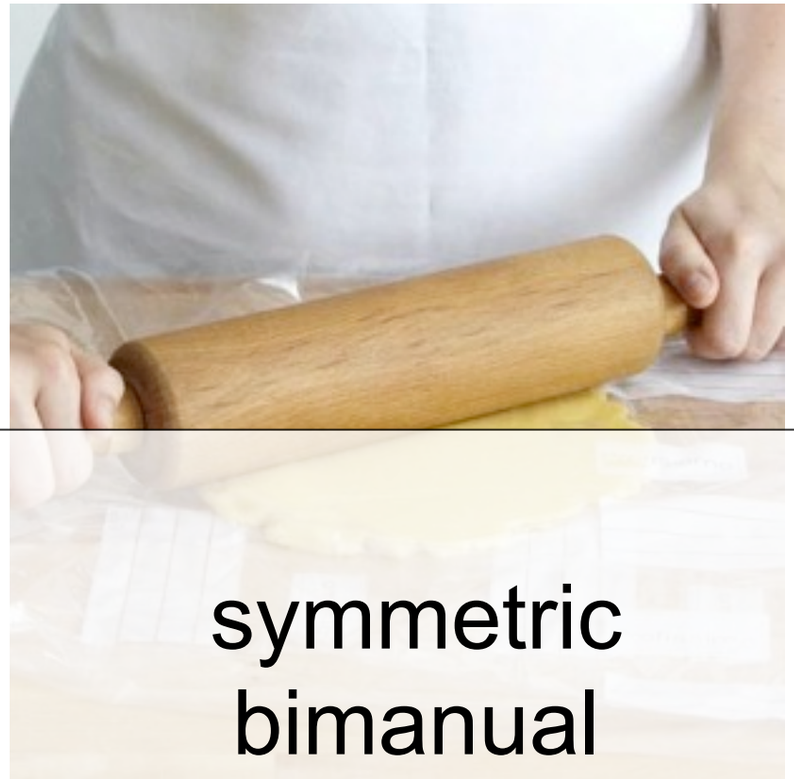
output technologies

Theories and Models

- descriptive power:
  - complex multi-limb coordination
    - bimanual interaction: Guiard's kinematic chain theory
      - was briefly mentioned in MMI 1 lecture last SS
    - spatial relationship between device and body matters
      - BiTouch Design Space, extension of Guiard's theory
      - http://hal.archives-ouvertes.fr/docs/00/66/39/72/PDF/bipadA.pdf
    - multi-touch interaction
      - proton++ formal language to describe multi-touch gestures
  - direct manipulation
    - cognitive aspect: buxton's chunking and phrasing, miller?
    - instrumental interaction as extension
- predictive power:
  - FFitts' law: modeling touch with fitts law
- generative power: body-centric design space (maybe in next section)

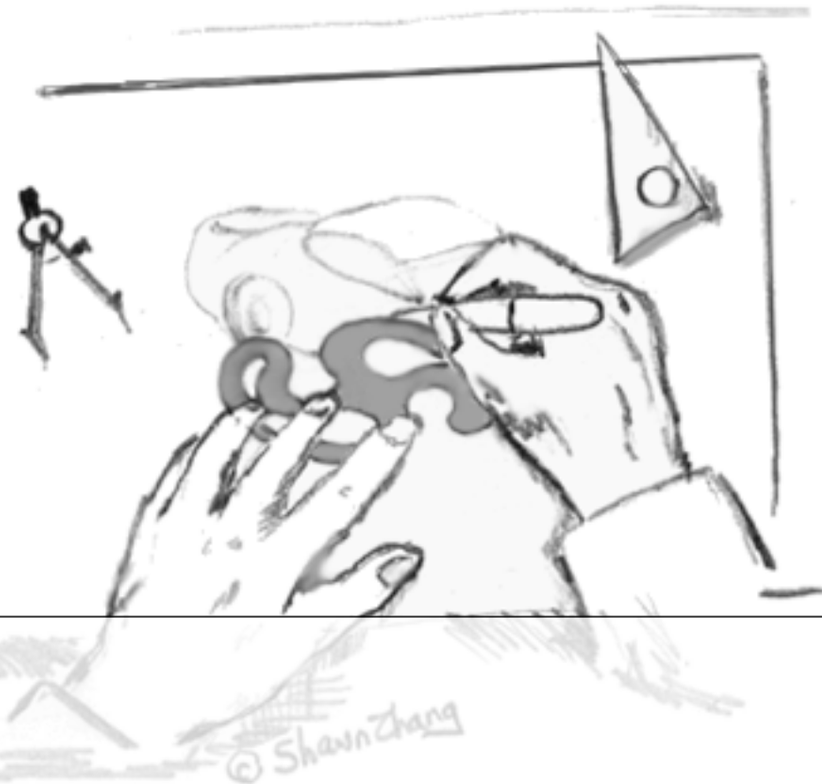
Complex Multi-limb Coordination

- Bimanual interaction
  - is not the sum of two uni-manual actions
  - remember sketchpad!
- Whole body interact



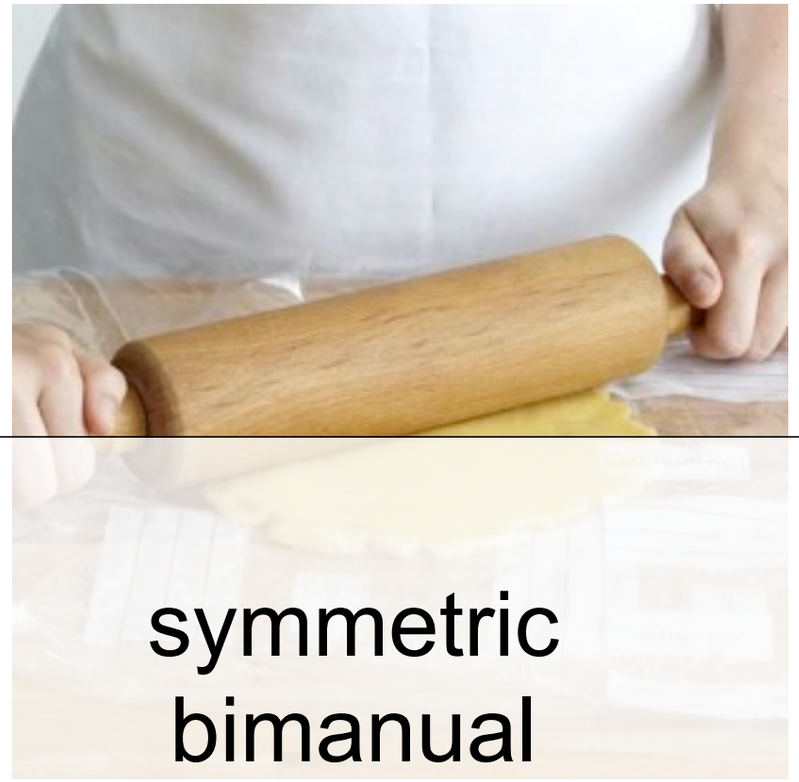
symmetric bimanual action

http://www.lecker.de/media/artikelbilder/konventionell/leckerde/backen_1/weihnachten_10/plaetzchenbacken/hbv_1382/muerbeteig-ausrollen_img_308x0.jpg



asymmetric bimanual action

bimanual interaction



symmetric bimanual action

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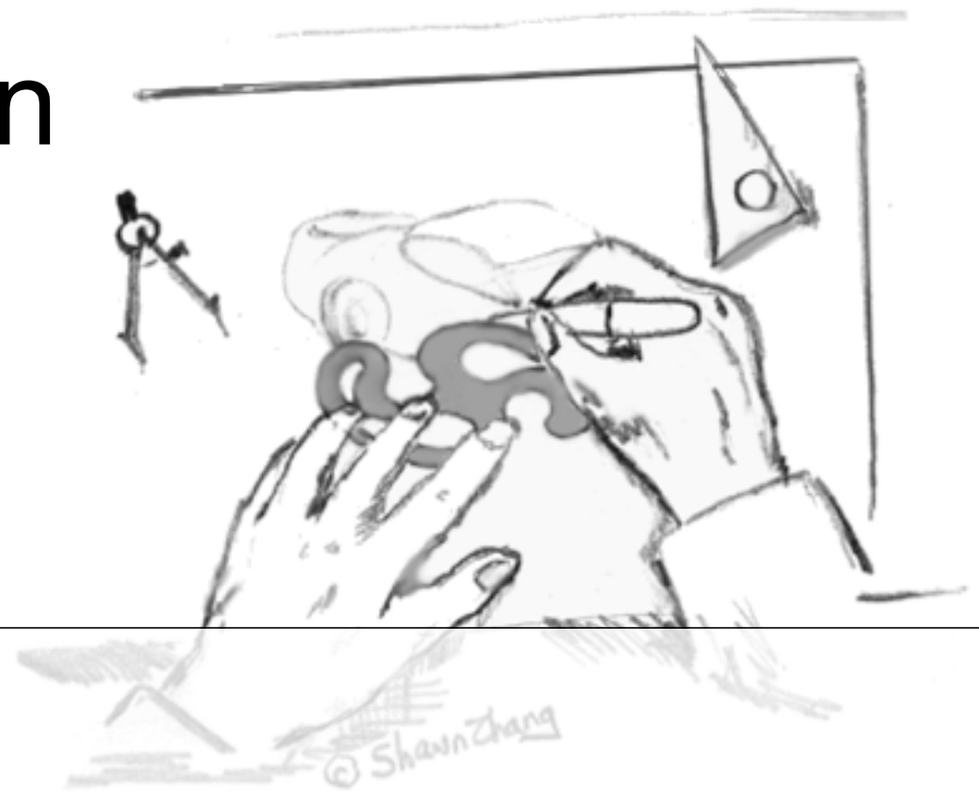


asymmetric bimanual action

- symmetric bimanual action: the two hands have the same role
- asymmetric bimanual action: the two hands have different roles

Mobile

context and task

challenges

Predictive Models

Systematic Exploration

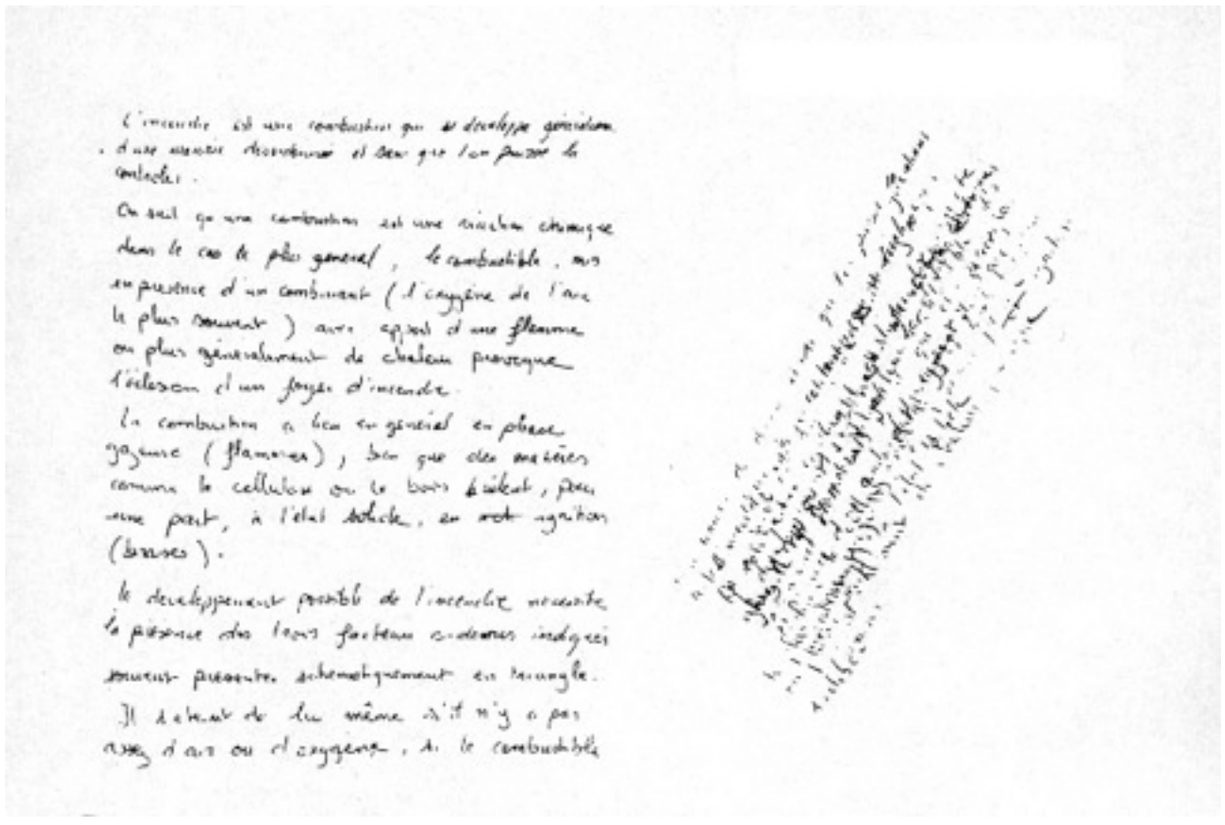
input technologies

challenges in interaction design

output technologies

Guiard's Kinematic Chain

"Under standard conditions, the spontaneous writing speed of adults is **reduced** by some **20%** when instructions **prevent the non-preferred hand** from manipulating the page"



Literature: Yves Guirad (1987). Asymmetric Division of Labor in Human Skilled Bimanual Action: The Kinematic Chain as a Model

Mobile

- context and task
- challenges
  - Predictive Models
  - **Systematic Exploration**
- input technologies
- challenges in interaction design
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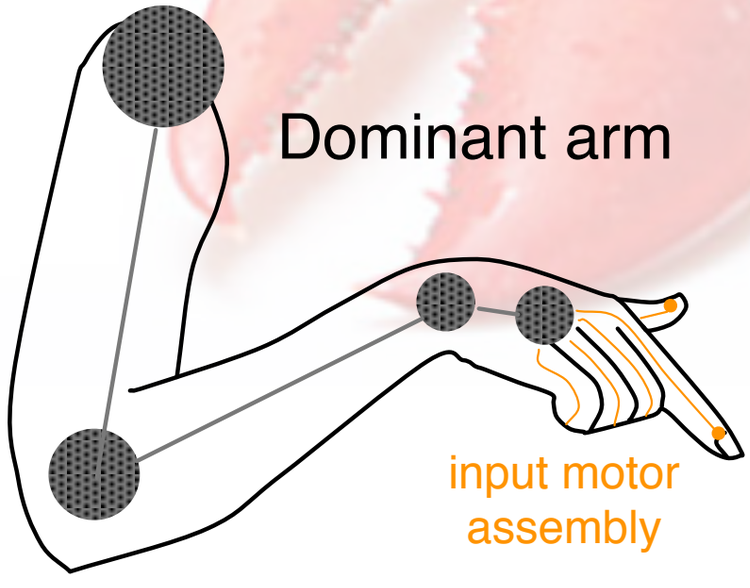
http://www.lobshots.com/wp-content/uploads/2011/08/lobster_560x375.jpg

- Guiard's principles
  - *Right-to-left spatial* reference
    - The non-dominant hand sets the frame of reference for the dominant hand
  - Left-right contrast in the spatial-temporal scale of motion
    - Non-dominant hand operates at a coarse temporal and spatial scale
  - *Left hand precedence* in action
- Kinematic chain
  - each limb a motor if it contributes to the overall input motion.
- Kinematic chain theory
  - although separated, the two hands behave like being linked within the kinematic chain.



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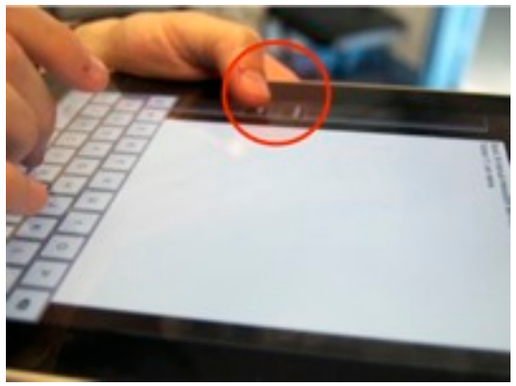
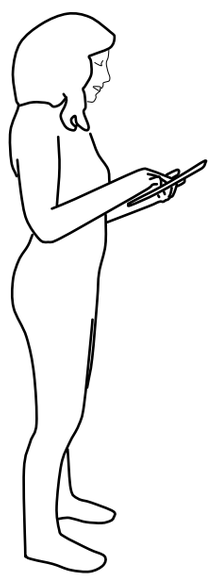



How do people naturally hold tablets?


Mobile

- context and task
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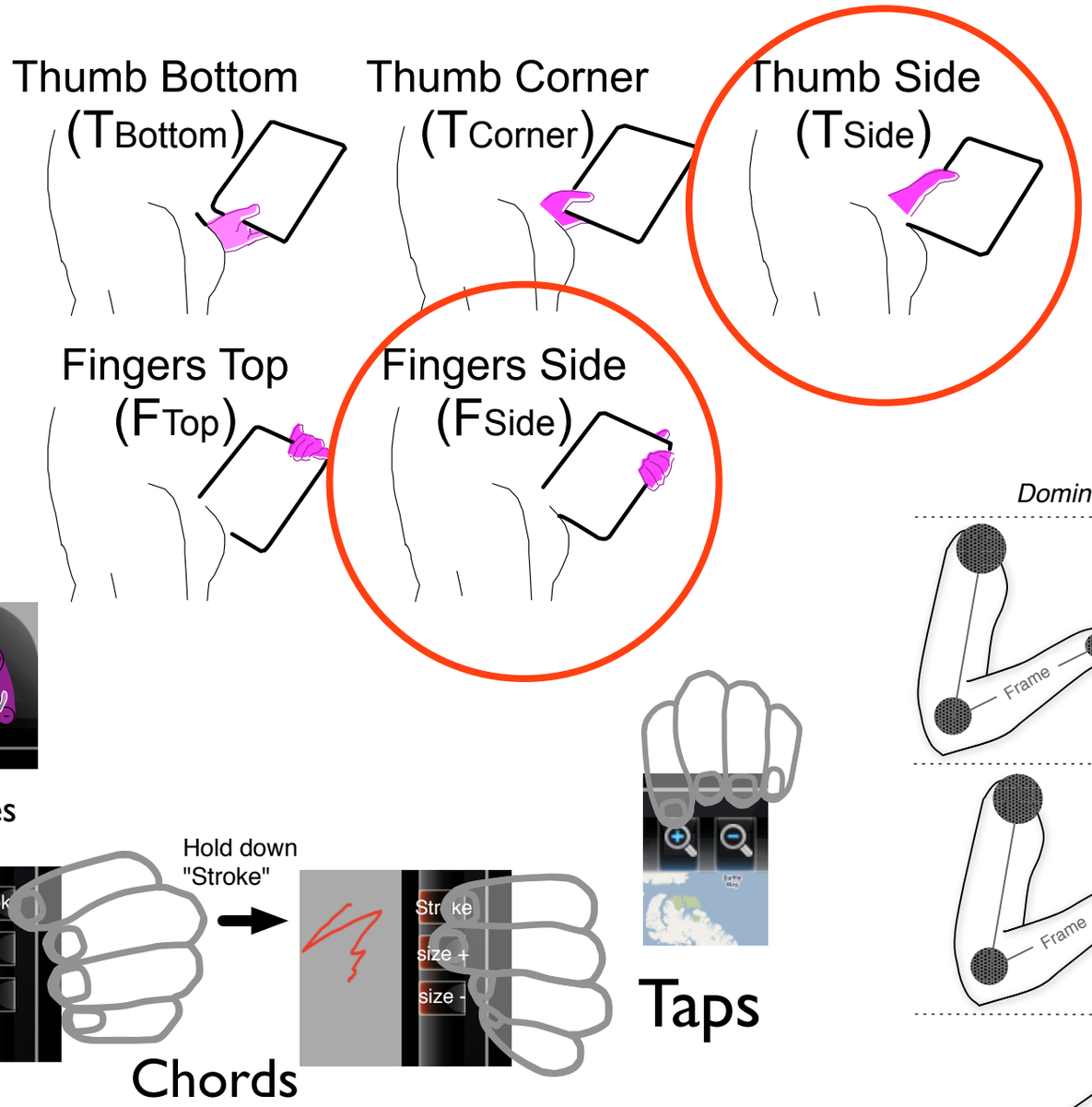
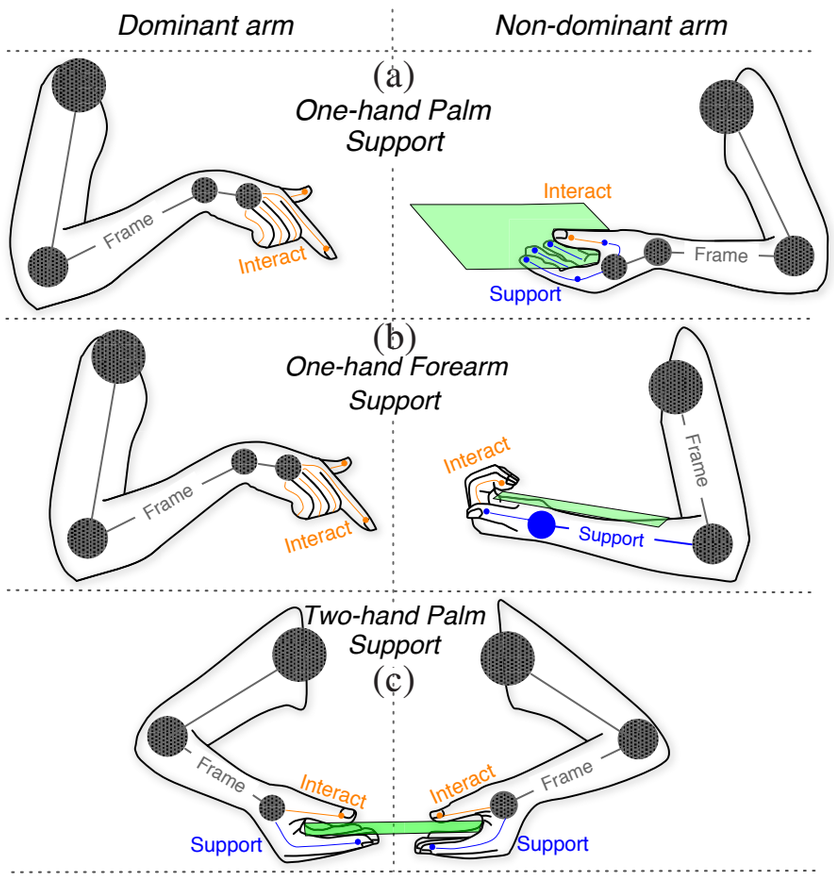
The Role of Support





J. Wagner, S. Huot, W. E. Mackay. **BiTouch and BiPad: Designing Bimanual Interaction for Hand-held Tablets**. In *CHI'12: Proceedings of the 30th International Conference on Human Factors in Computing Systems*, ACM, May 2012.

Mobile

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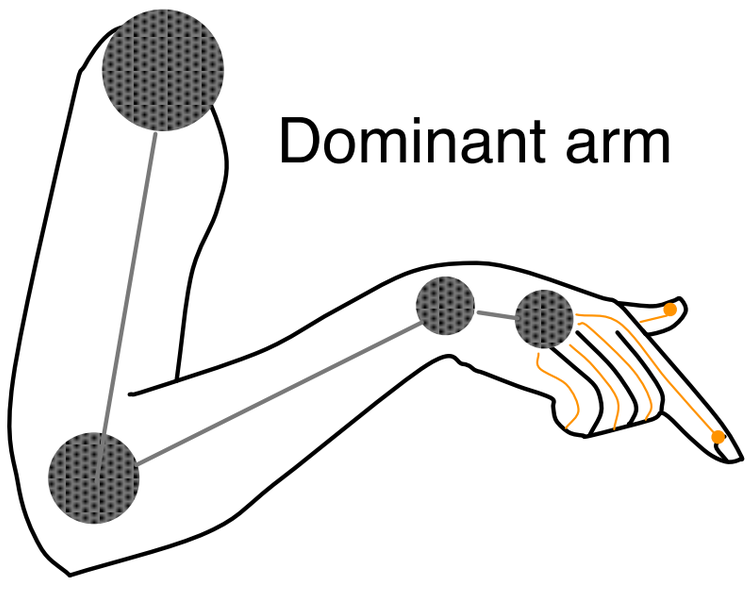
frame interaction



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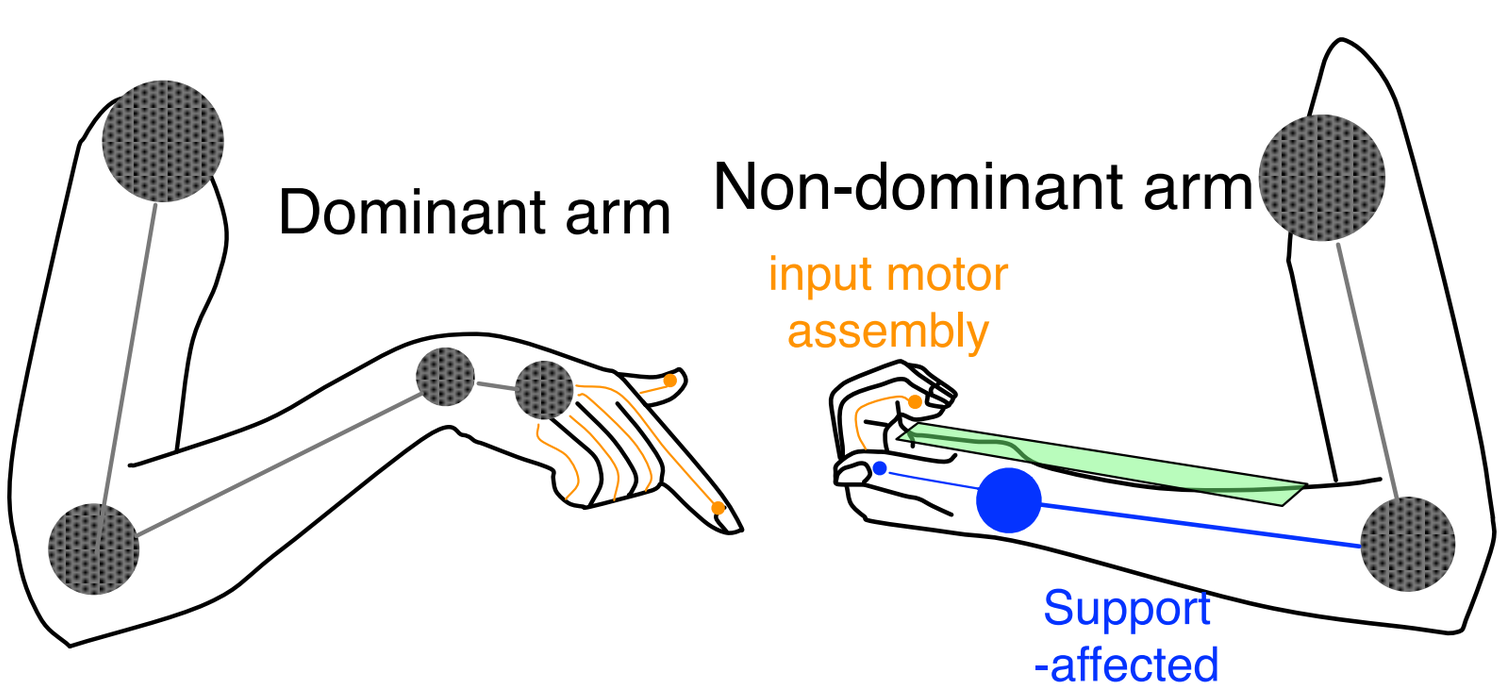
frame support interaction



Frame, Support, Interaction

Framing	
Location:	proximal link in the kinematic chain
Distribution:	1 – n body parts
Support	
Location:	none or middle link in the kinematic chain
Distribution:	0 – n body parts
Independence:	0% – 100% body support
Interaction	
Location:	distal link in the kinematic chain
Distribution:	1 – n body parts
Degrees of freedom:	0% – 100% body movement
Technique:	touch, deformation,...

Describing Gesture Interfaces

- http://vis.berkeley.edu/papers/protonPlusPlus/

Proton++ Touch Event Symbol

$$E\ A_1{:}A_2{:}\ldots{:}A_n\ T_{ID}$$

$$E \in \{D, M, U\}$$