Interaction Design

Chapter 9 (June 19, 2013, 9am-12pm):
Interaction beyond the desktop

Evaluation and testing

- Multi-touch history
- Novel forms of interaction
- Limits of “Natural UIs”
- Design cycle
- Ethical considerations

Beyond the Desktop PC?

Novel devices

https://en.wikipedia.org/wiki/IPhone

Apple’s iPhone

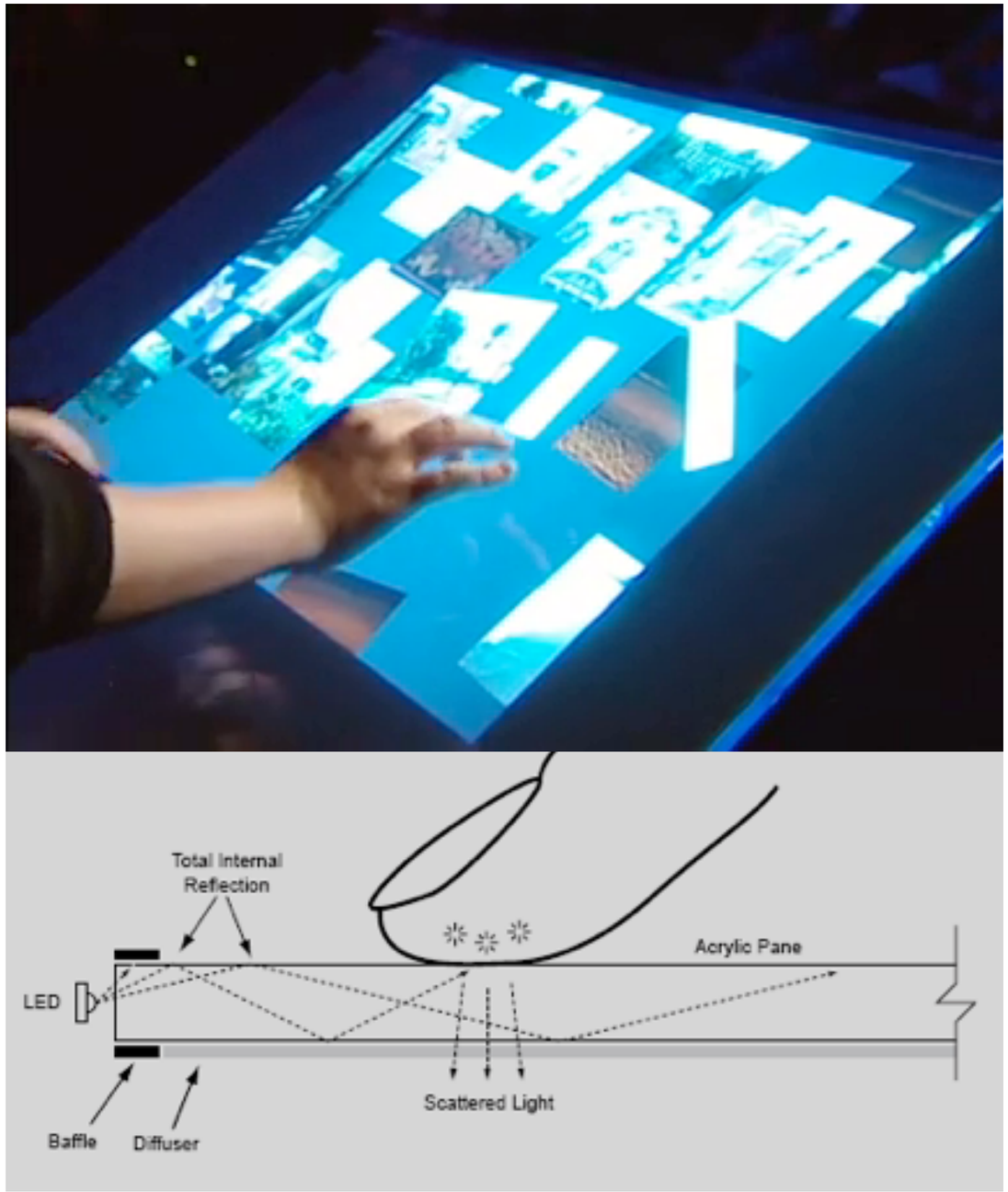
http://www.nintendo.com/

Nintendo’s Wii

http://www.xbox.com/en-US/kinect

Microsoft’s Kinect

The evolution of multi-touch devices



“The future is already here. It is just not uniformly distributed”

—William Gibson

IBM’s Simon phone

https://en.wikipedia.org/wiki/IBM_Simon

1994

- *Phone calls,*
- *Faxes,*
- *E-mails,*
- *Cellular pages,*
- *Applications:*
  - *address book,*
  - *calendar,*
  - *appointment scheduler,*
  - *calculator,*
  - *world time clock,*
  - *electronic note pad,*
  - *handwritten annotations*
  - *standard and predictive touchscreen keyboards.*

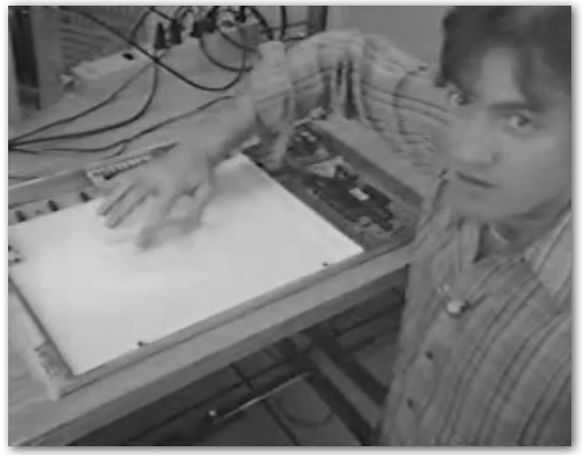
Slide from N. Roussel

The long nose of innovation

1972 : PLATO IV

1979 : Put that there

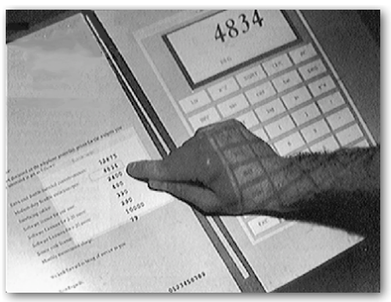
1983 : Videoplace



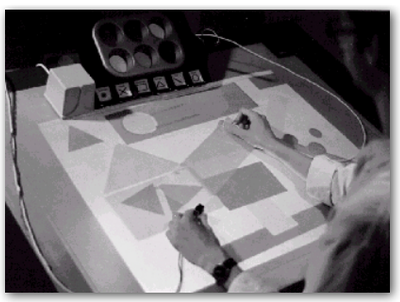
1985 : Multitouch tablet

(...) "new" technologies - like multi-touch - do not grow out of a vacuum. While marketing tends to like the "great invention" story, real innovation rarely works that way.

In short, the evolution of multi-touch is a text-book example of what I call "the long-nose of innovation".

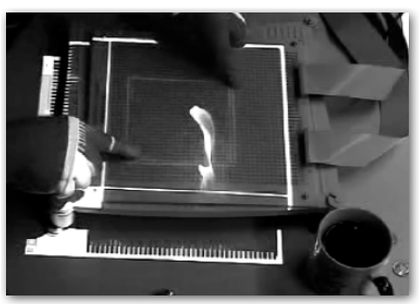


1991: Digital Desk



1991: Bricks

1999 : Augmented surfaces



2001 : DiamondTouch

2004 : DiamondSpin

2006 : DigiTable

Slide from N. Roussel

Why now?

1994 : Disclosure

1995 : Johnny Mnemonic

2002 : Minority report

2005 : The island

2008 : Quantum of solace

2008 : Iron man

Evaluation and testing

- Multi-touch history
- Novel forms of interaction
- Limits of “Natural UIs”
- Design cycle
- Ethical considerations

Beyond mouse and keyboard

- Surface computing
- Mobile
- Wearables
- Augmented reality
- Mixed reality
- Tangibles
- Ambient technologies
- Gestures
- Multimodal interaction

Interactive surfaces

- Shared input/output space
- Shared display
  - Collaboration
  - Space control
  - Input management
- Focus (+ context?)
  - Lack of overview
  - Lack of personal control / privacy.

NYU - Perceptive pixel (FTIR)

Mobile UI

- Attention
- 1 handed interaction
- Limited space

Designing Interactions

Rob Haitani from Palm

Wearables

- On the body devices
  - Always accessible
  - Glanceable

http://www.flickr.com/photos/vladcampos/1570162428/

http://www.sonymobile.com/us/products/accessories/smartwatch/

- Problems
  - energy
  - attention
  - interaction

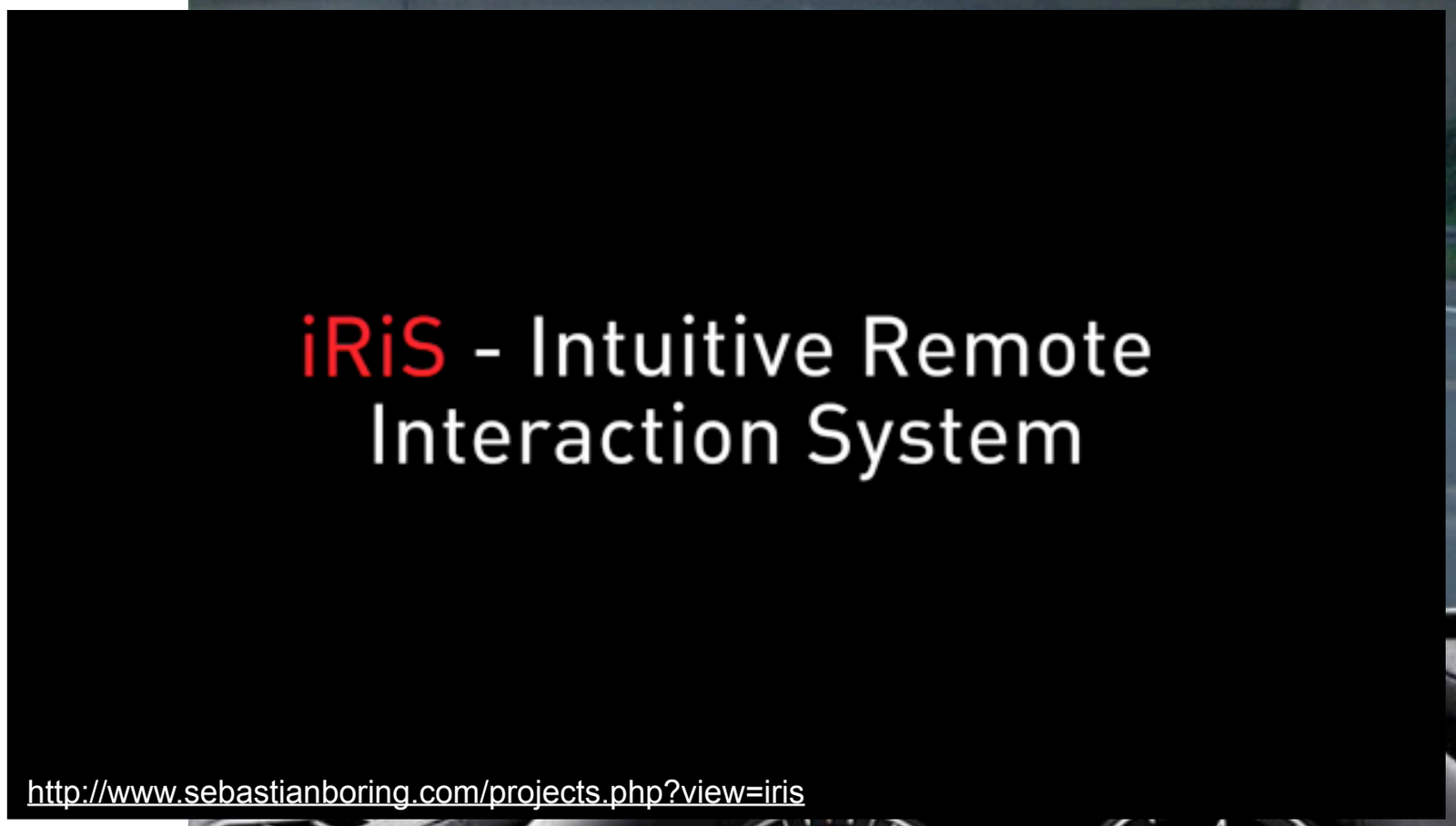
Steve Mann’s experiments

https://en.wikipedia.org/wiki/Steve_Mann

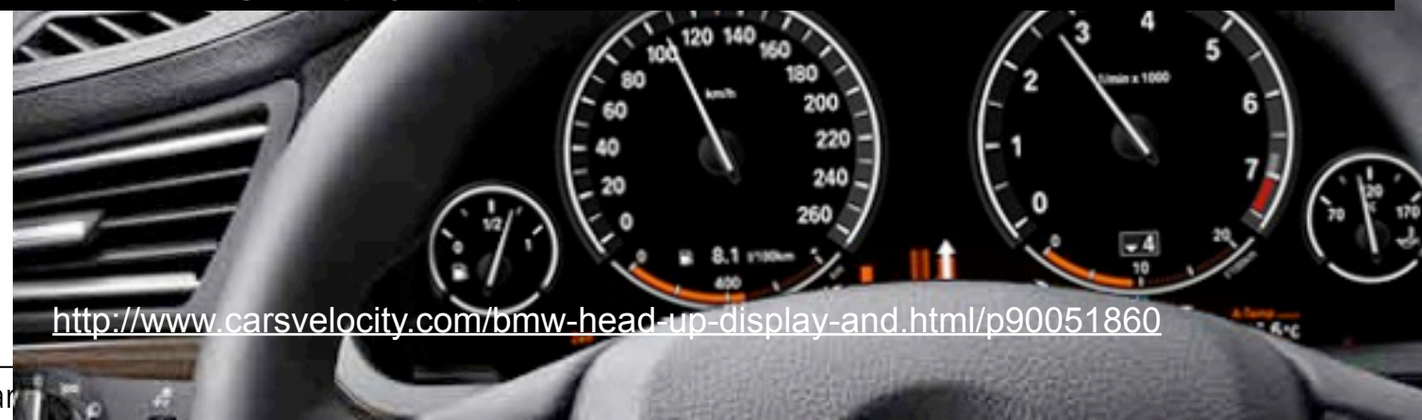
https://plus.google.com/111626127367496192147/about

Augmented reality

- Augmenting our physical environment with digital information



http://www.sebastianboring.com/projects.php?view=iris



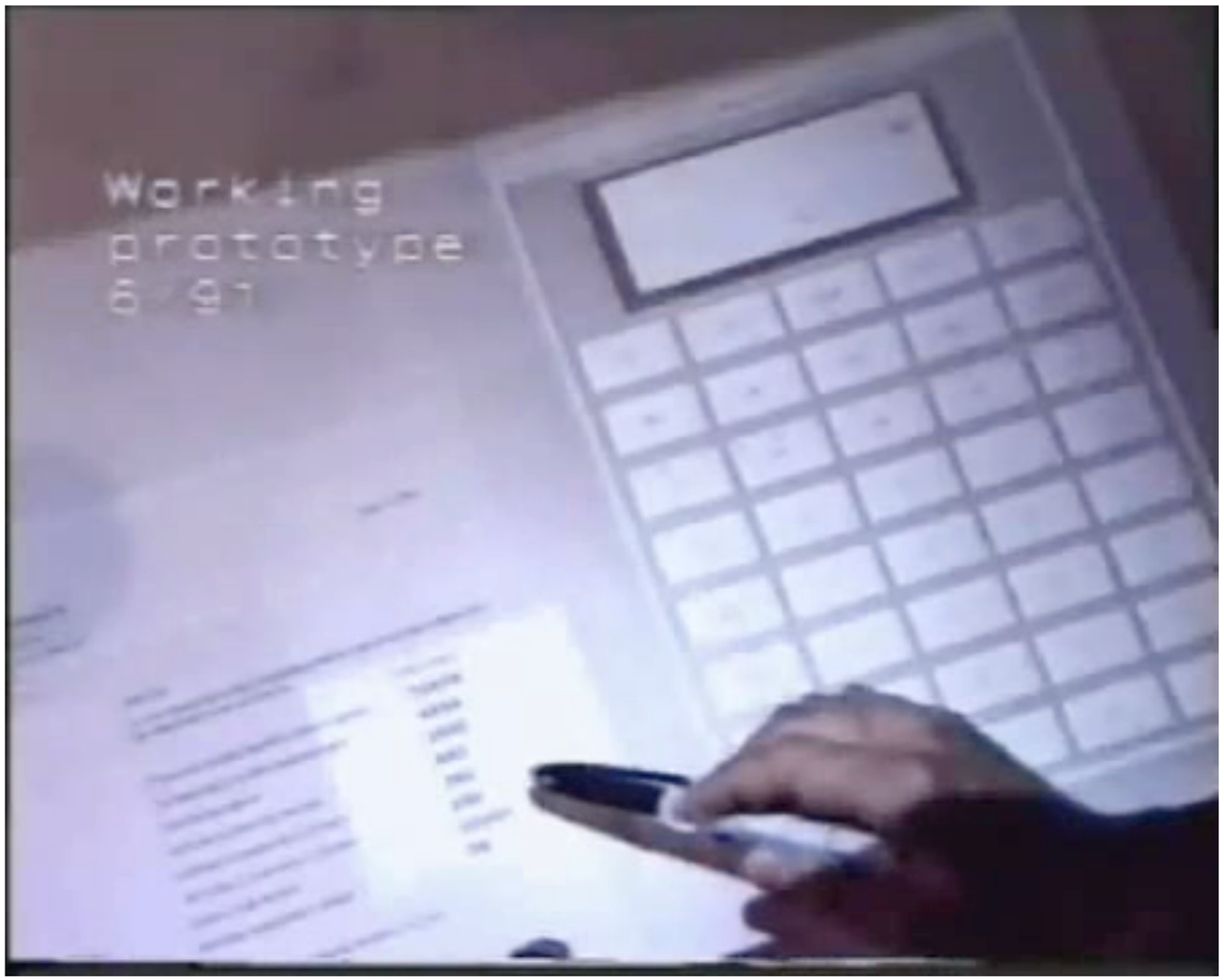
http://www.carsvelocity.com/bmw-head-up-display-and.html/p90051860

Mixed reality

- Back and forth between the physical and the digital.

- New but re-use of familiar elements.

- Problems:
  - capture/tracking
  - consistency



Wellner's Digital Desk

Tangible interaction

- Everyday objects
- Embodied
- Actuated
- Ambient

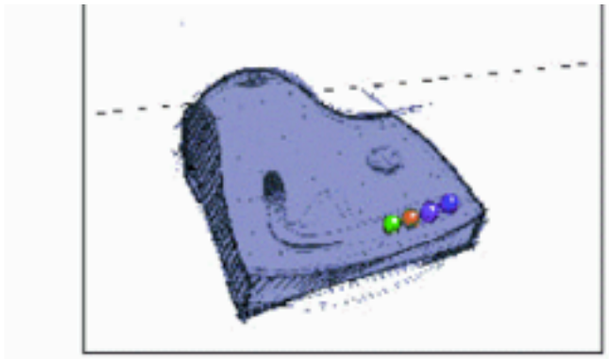
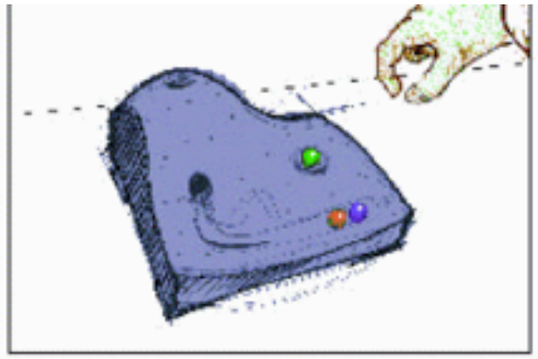


Figure 6.i Incoming messages await...



The user listens to a message... Figure 6.ii

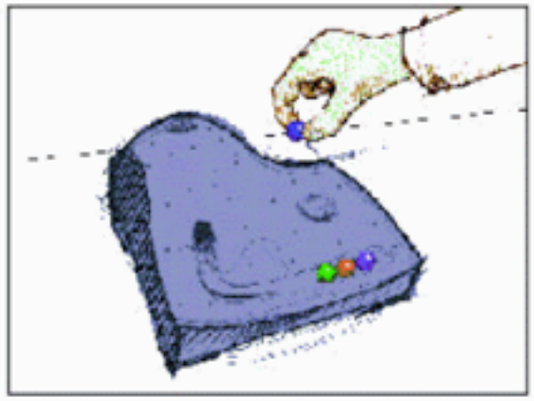
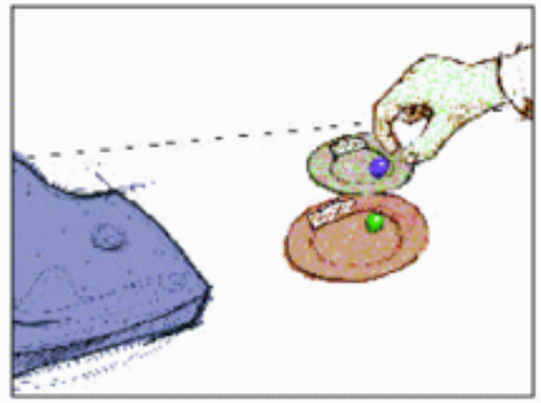


Figure 6.iii ...the user moves the message



...to each roommate's in-tray. Figure 6.iv

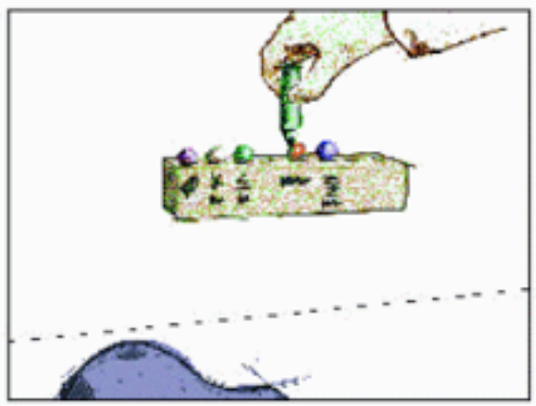
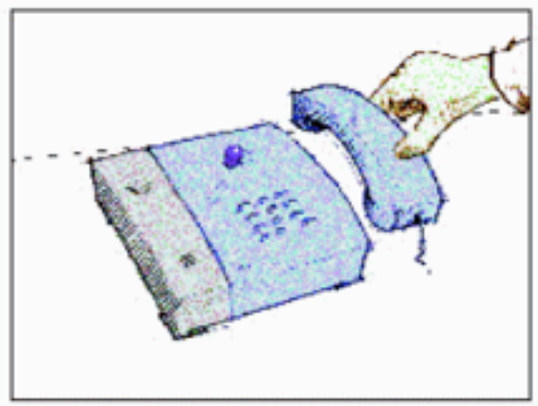


Figure 6.v Here the user stores an incoming message



Moving the marble to the phone dials the number stored in the message that the marble 'contains' Figure 6.vi

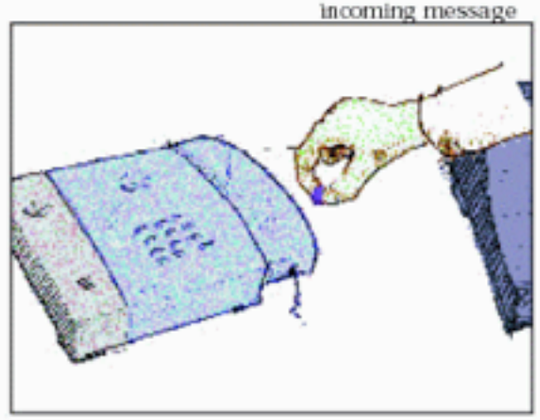


Figure 6.vii The marble is returned to the answer machine to be 'recycled'

The Marble Answering Machine
Durrell Bishop, 1992

Stills from Director animation

Tangible interaction

Nabaztag

https://www.sifteo.com/

eLabBench

Augmented racks

Tangible bookmarks

Tangible interaction

- Physical Interaction lecture in 2 weeks by Martin Kaltenbrunner

Ambient technologies

- Moving between:
  - background and,
  - foreground of attention

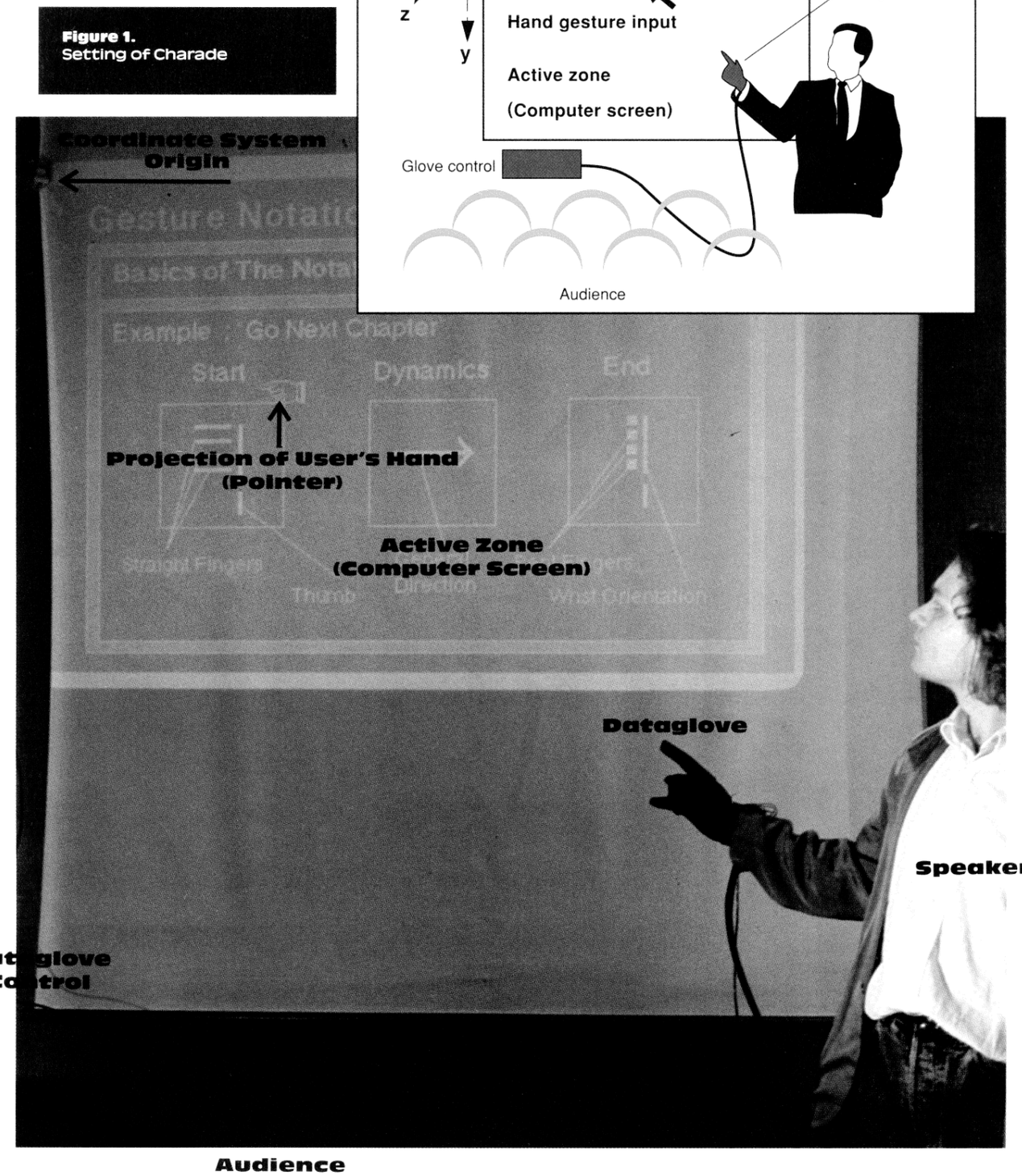
http://goodnightlamp.com/

Gestures

http://interaction.lille.inria.fr/~roussel/digital-library/media/2002-minority-report/

Gesture based interaction

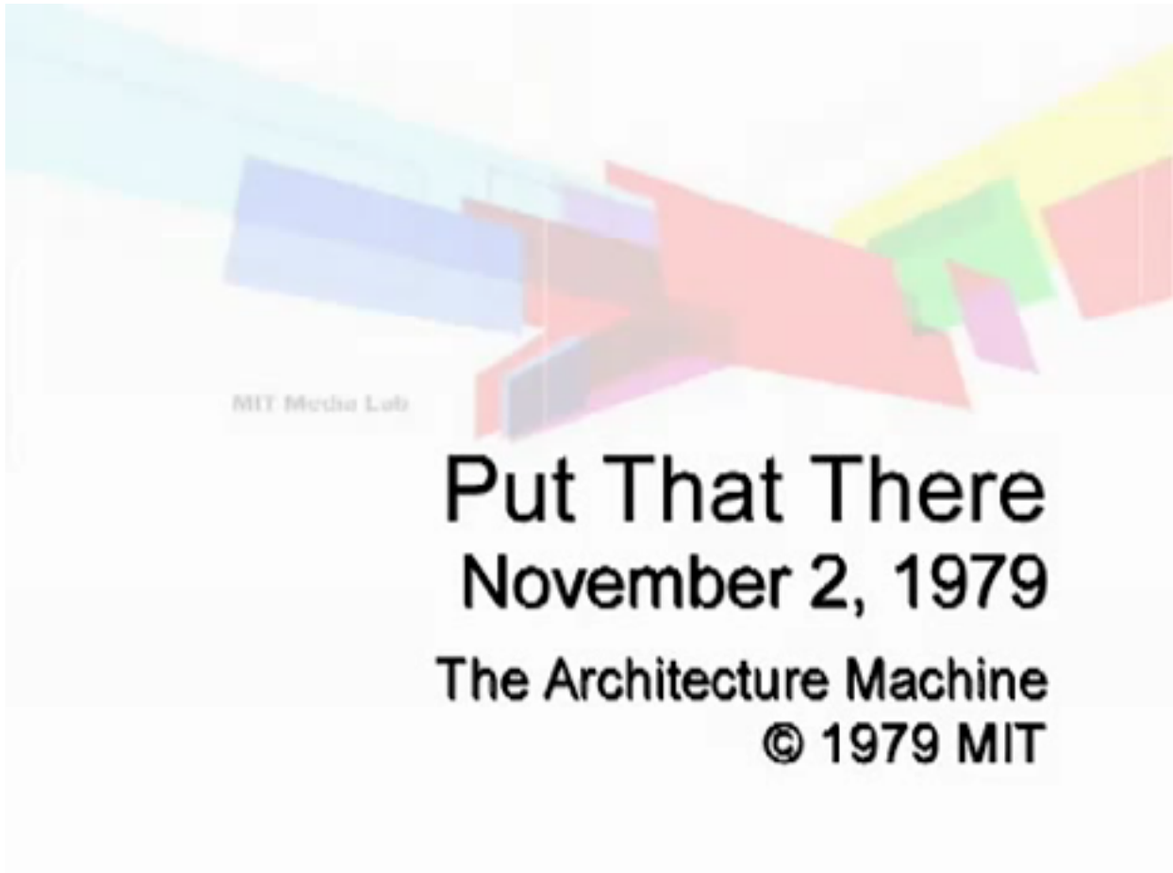
- Benefits:
  - Re-use a form of communication easy to learn.
  - Terse and powerful interaction
  - Direct interaction
- Problems:
  - Fatigue
  - Non self-revealing
  - Immersion syndrome
  - Segmentation of gestures
- Today: Wii, Kinect, Leap...



Sharade: Baudel & Beaudouin Lafon 1993

Multimodality

- Definitions:
  - Multimedia generally refers to an interface that produces output in two or more modes.
  - Multimodal generally refers to an interface that can accept input from two or more combined modes.



Modalities

- Input:
  - mouse
  - pen
  - speech
  - audio (non-speech)
  - tangible object manipulation
  - gaze, posture, body-tracking
- Output
  - Visual displays
  - Haptics: Force Feedback
  - Audio
  - Smell
  - Taste

Motivations

- Hands busy / eyes busy
- Mutual disambiguation
- Faster input
- More “natural”

Evaluation and testing

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- Novel forms of interaction
- Limits of “Natural UIs”
- Design cycle
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What is intuitive or natural?

Natural User Interfaces?

Static	Responsive	Evocative
Disconnected	Indirect	Unmediated
Directed	Exploratory	Contextual
Recall	Recognition	Intuition

Text

Graphics

Objects

On intuitive and natural

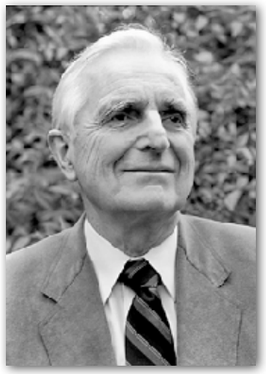
Jef Raskin in *The humane interface* (p. 150)

Many interface requirements specify that the resulting product be intuitive, or natural. However, there is no human faculty of intuition, as the word is ordinarily meant; that is, knowledge acquired without prior exposure to the concept, without having to go through a learning process, and without having to use rational thought*. When an expert uses what we commonly call his intuition to make a judgement, with a speed and accuracy that most people would find beyond them, we find that he has based his judgement on his experience and knowledge. Often, experts have learned to use methods and techniques that nonexperts do not know. Task experts often use cues of which others are not aware or that they do not understand. Expertise, unlike intuition, is real.*

When users say that an interface is intuitive, they mean that it operates just like some other software or method with which they are familiar. *Sometimes, the word is used to mean habitual, as in "The editing tools become increasingly intuitive over time." Or, it can mean already learned, as was said of a new aircraft navigation device: "Like anything, it can be learned, but it would take a lot of experience to do it intuitively" (Collins 1994).*

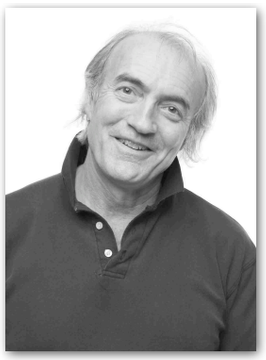
Another word that I try to avoid in discussing interfaces is natural. Like intuitive, it is usually not defined. An interface feature is natural, in common parlance, if it operates in such a way that a human needs no instruction. This typically means that there is some common human activity that is similar to the way the feature works. However, it is difficult to pin down what is meant by similar. *Similarities or analogies can occur in many ways. Certainly, that the cursor moves left when a mouse is pushed to the left and right when the mouse is pushed to the right is natural. Here, the term natural equates to very easily learned. Although it may be impossible to quantify naturalness, it is not too difficult to quantify the learning time.*

On learning



Douglas Engelbart in Thierry Bardini's *Bootstrapping* (p. 28)

When interactive computing in the early 1970s was starting to get popular, and they [researchers from the AI community] start writing proposals to NSF and to DARPA, ***they said*** *well, what we assume is that* ***the computer ought to adapt to the human*** *[…]* ***and not require the human to change or learn anything. And that was just so just soantithetical to me. It's sort of like making everything to look like a clay tablet so you don't have to learn to use paper.***



Bill Buxton on the *power law of practice*

Don't waste people skills. They're really expensive to acquire and we're already too busy. (...) ***One of the key things is whenever possible to not force you to learn something new but to do the design in a way that exploits the skills you already have****. (...)* ***Now there are some places*** *(...)* ***where if the value is there, it's worth learning something new.***

http://www.jnd.org/dn.mss/natural_user_interfa.html

Don Norman on natural interfaces

“Control of our systems through interactions that bypass the conventional mechanical switches, keyboards, and mice is a welcome addition to our arsenal. Whether it is **speech, gesture, or the tapping of the body's electrical signals for "thought control," all have great potential for enhancing our interactions**, *especially where the traditional methods are inappropriate or inconvenient. But they are not a panacea.* **They come with new problems, new challenges, and the potential for massive mistakes and confusion** *even as they also come with great virtue and potential.*

All new technologies have their proper place. All new technologies will take a while for us to figure out the best manner of interaction as well as the standardization that removes one source of potential confusion. **None of these systems is inherently more natural than the others. The mouse and keyboard are not natural. Speech utterances will have to be learned and gestures carefully developed and standardized through time.** *The standards don't have to be the best of all possibilities. The keyboard has standardized upon variations of qwerty and azerty throughout the world even though neither is optimal--standards are more important than optimization.*

Are natural user interfaces natural? No. But they will be useful.”

John Underkoffler

http://oblong.com/article/085zBpRSY9JeLv2z.html

You adapt the gestural language from the Luminous Room work. ***You train the actors to use this language.*** *They become adept, even though it is partly an exercise in mime.* ***The production will shoot the actors performing gestural tasks in front of an enormous transparent screen, but the screen will be blank, a prop****. Graphics will be composited onto the screen in post-production. You understand that for a sense of causality to emerge the actors must be able to clearly visualize the effects of their gestural work. You assemble a training video showing this.*

When the time comes to shoot, the director explains what sequence of analysis should occur in each scene. You translate this into the gestural language. You explain what graphical elements the actors would be seeing on different parts of the screen, how they are manipulating those elements. You make sure that a detailed account of all this is subsequently available to the editor and the visual effects people. Continuity of the original intent is critical. The cameras roll.

The movie appears in 2002. ***The scenes of gestural computation show something apparently real.***

Gesture language in Sharade:

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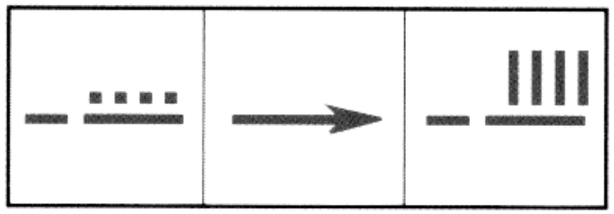

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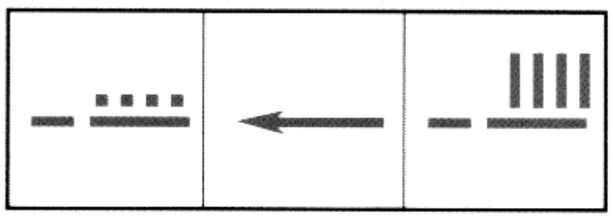

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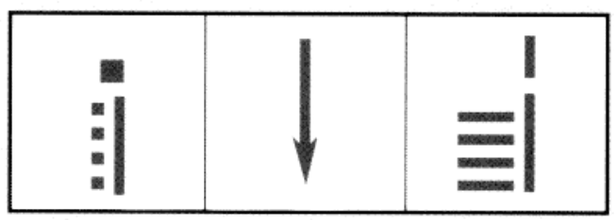

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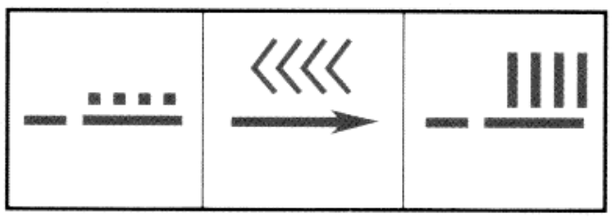

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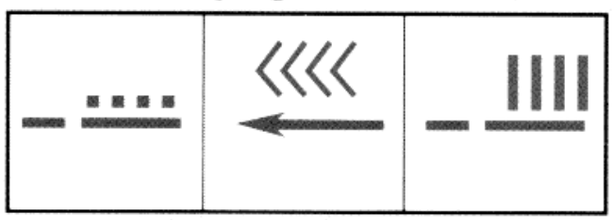

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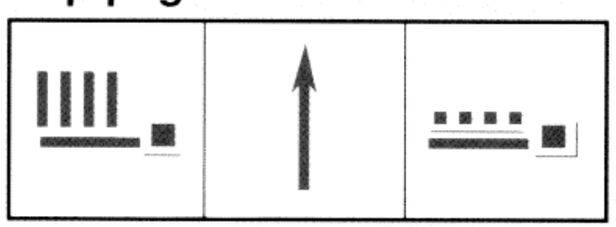

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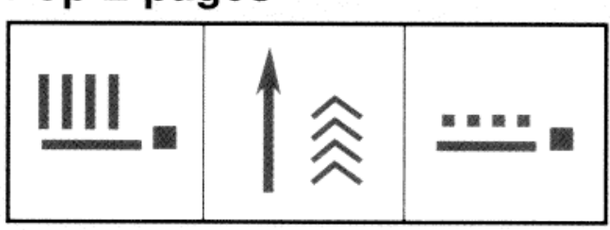

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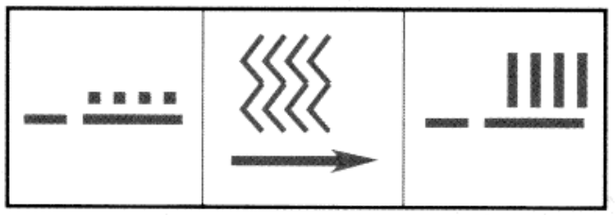

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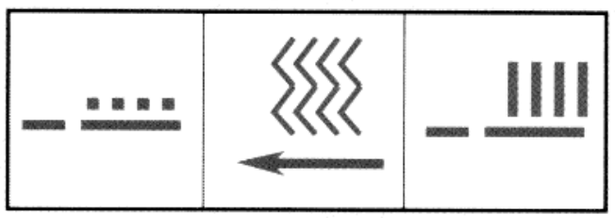

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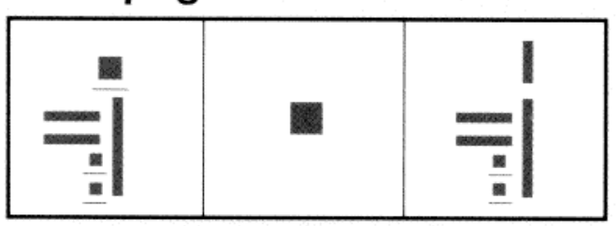

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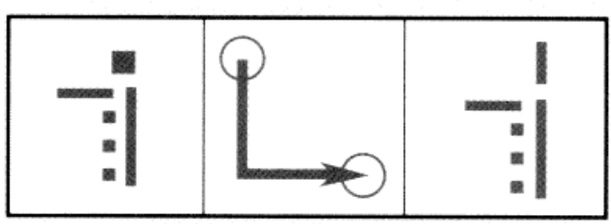

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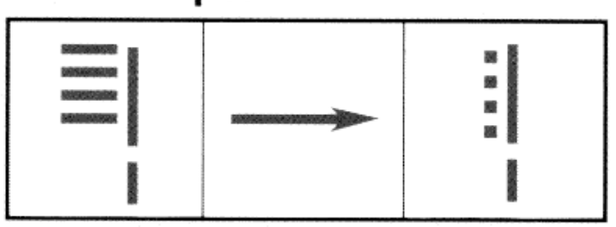

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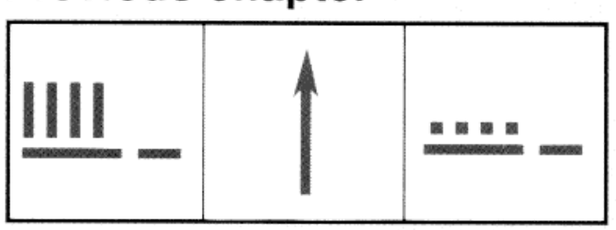
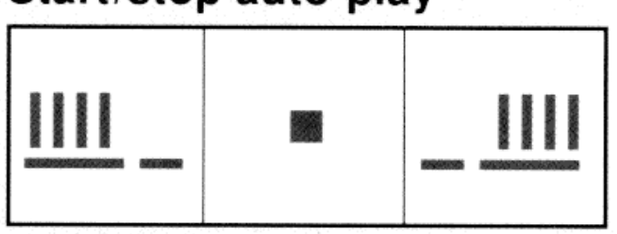


Start/stop auto-play



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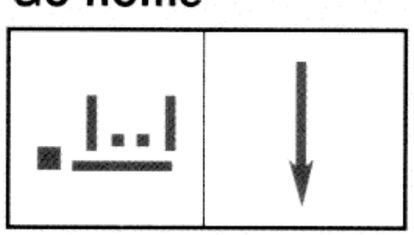

How to make sense of sensing systems?

Questions to keep as design guidelines:

- When I address a system, how does it know I am addressing it?
- When I ask a system to do something how do I know it is attending?
- When I issue a command (such as save, execute or delete), how does the system know what it relates to?
- How do I know the system understands my command and is correctly executing my intended action?
- How do I recover from mistakes?

see Bellotti et al., CHI 2002

Evaluation and testing

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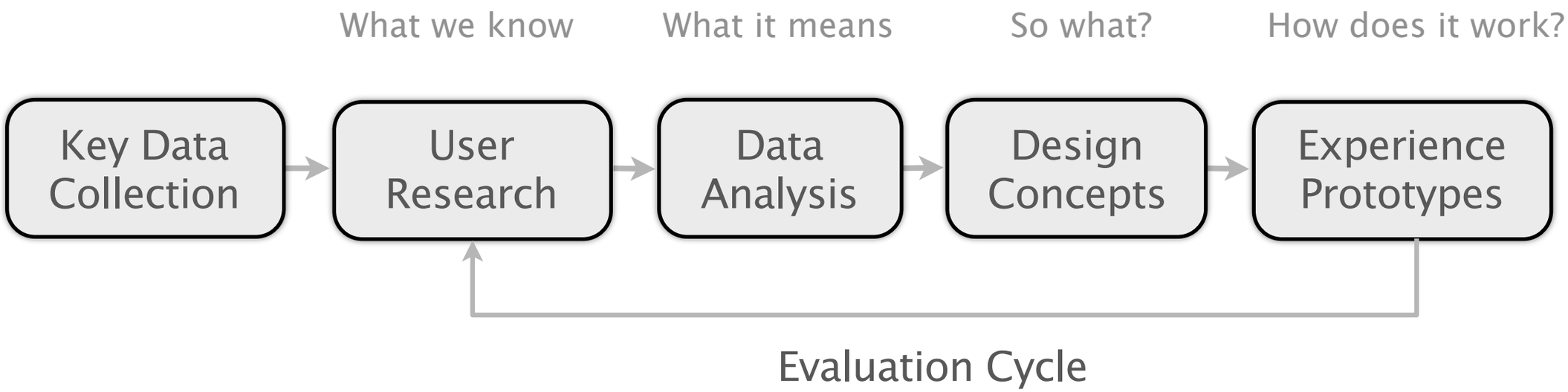
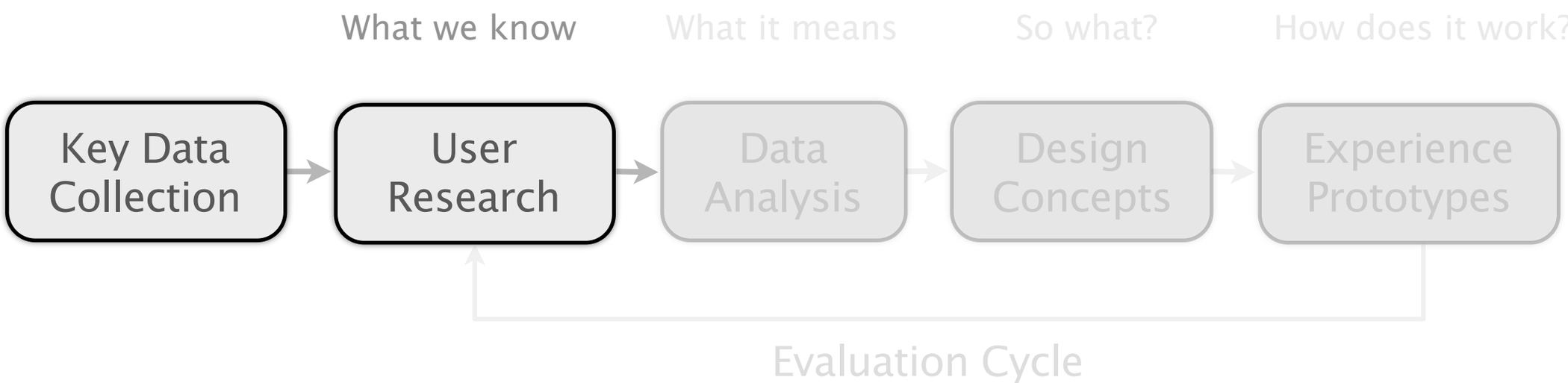
- Novel forms of interaction
- Limits of “Natural UIs”
- Design cycle
- Ethical considerations

Design Cycle



Design Cycle



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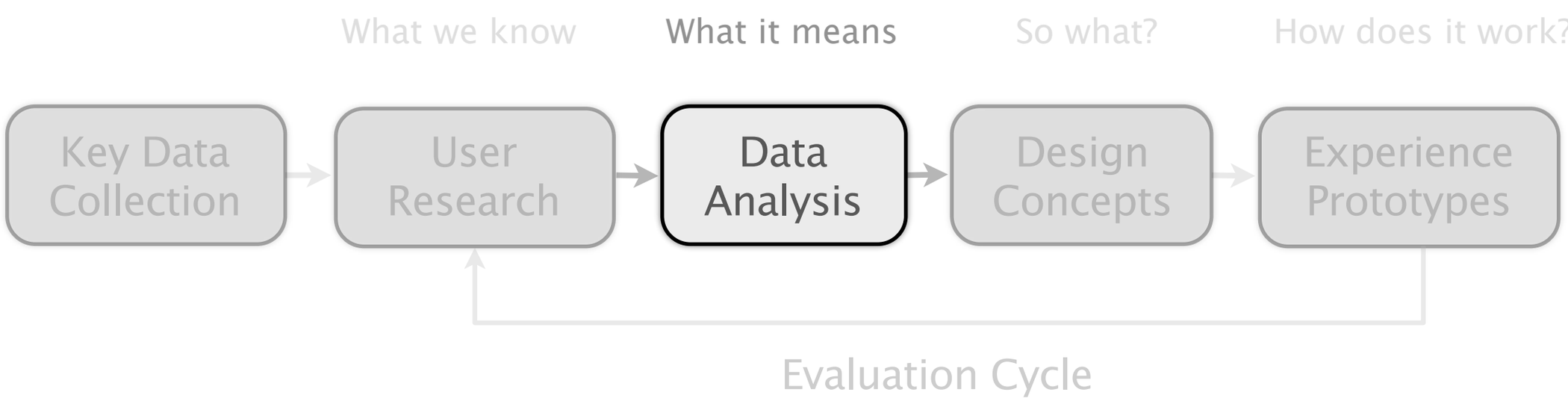

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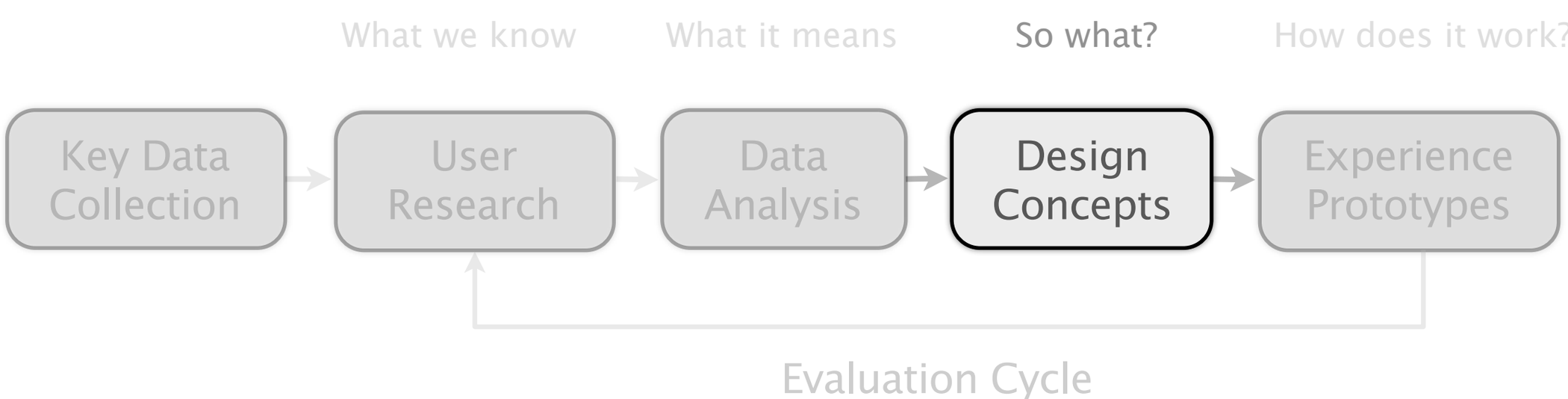

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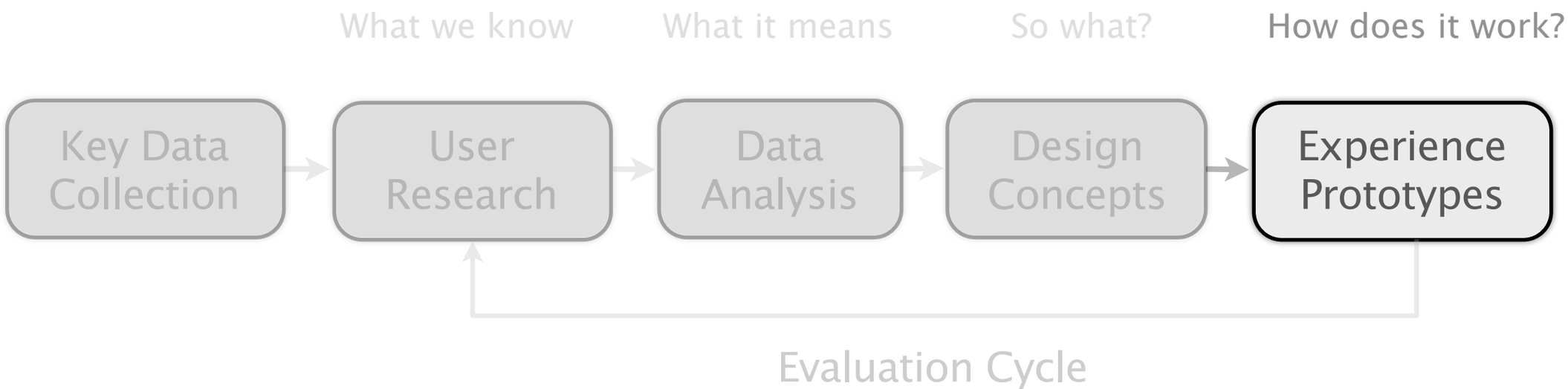
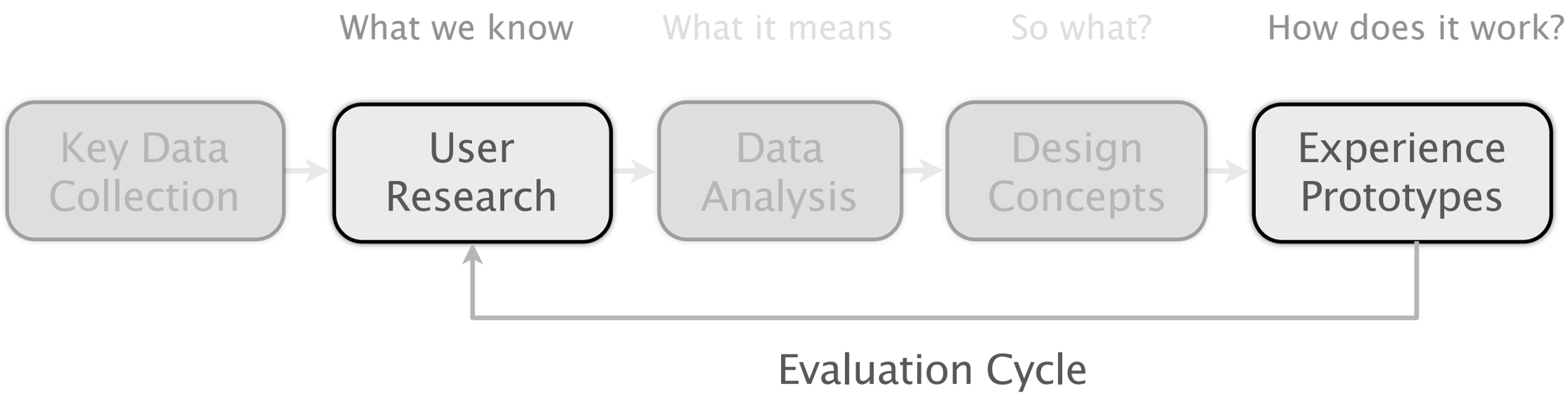


Design Cycle



Evaluation and testing

- Multi-touch history
- Novel forms of interaction
- “Natural UIs”
- Design cycle
- Ethical considerations

Ethics: 5 principles of Adam Greenfeld

0. Do no harm
1. Default to harmlessness
2. Be self-disclosing
3. Be conservative of face
4. Be conservative of time
5. Be deniable

http://web.archive.org/web/20130131172818/http://boxesandarrows.com/all-watched-over-by-machines-of-loving-grace-some-ethical-guidelines-for-user-experience-in-ubiquitous-computing-settings-1/

Ethics: 5 principles of Adam Greenfeld

0. Do no harm

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Ethics: 5 principles of Adam Greenfeld

0. Do no harm
1. **Default to harmlessness**
   Ubiquitous systems must default to a mode that ensures their users' (physical, psychic and financial) safety.
2. Be self-disclosing
3. Be conservative of face
4. Be conservative of time
5. Be deniable

http://web.archive.org/web/20130131172818/http://boxesandarrows.com/all-watched-over-by-machines-of-loving-grace-some-ethical-guidelines-for-user-experience-in-ubiquitous-computing-settings-1/

Ethics: 5 principles of Adam Greenfeld

0. Do no harm
1. Default to harmlessness
2. **Be self-disclosing**

   Ubiquitous systems must contain provisions for immediate and transparent querying of their ownership, use, capabilities, etc., such that human beings encountering them are empowered to make informed decisions regarding exposure to same.
3. Be conservative of face
4. Be conservative of time
5. Be deniable

http://web.archive.org/web/20130131172818/http://boxesandarrows.com/all-watched-over-by-machines-of-loving-grace-some-ethical-guidelines-for-user-experience-in-ubiquitous-computing-settings-1/

Seamful design, coping with breakdowns

Seamless / seamful

From M. Weiser, UIST'94
Building Invisible Interfaces

Is a seamless building one in which you
never notice as you move from place to place?

Making everything the same is easy;

Hard is letting everything be itself, with other things

Goal: seamful systems, with beautiful seams

see Chalmers, M. and Maccoll, I. (2003)
Seamful and seamless design in ubiquitous computing

Ethics: 5 principles of Adam Greenfeld

0. Do no harm
1. Default to harmlessness
2. Be self-disclosing
3. **Be conservative of face**

   Ubiquitous systems are always already social systems, and must contain provisions such that wherever possible they do not unnecessarily embarrass, humiliate, or shame their users.
4. Be conservative of time
5. Be deniable

http://web.archive.org/web/20130131172818/http://boxesandarrows.com/all-watched-over-by-machines-of-loving-grace-some-ethical-guidelines-for-user-experience-in-ubiquitous-computing-settings-1/

Ethics: 5 principles of Adam Greenfeld

0. Do no harm
1. Default to harmlessness
2. Be self-disclosing
3. Be conservative of face
4. **Be conservative of time**

   Ubiquitous systems must not introduce undue complications into ordinary operations.
5. Be deniable

http://web.archive.org/web/20130131172818/http://boxesandarrows.com/all-watched-over-by-machines-of-loving-grace-some-ethical-guidelines-for-user-experience-in-ubiquitous-computing-settings-1/

Ethics: 5 principles of Adam Greenfeld

0. Do no harm
1. Default to harmlessness
2. Be self-disclosing
3. Be conservative of face
4. Be conservative of time
5. **Be deniable**

   Ubiquitous systems must offer users the ability to opt out, always and at any point.

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Other principles or challenges ?