
Interaction paradigms

Why paradigms?

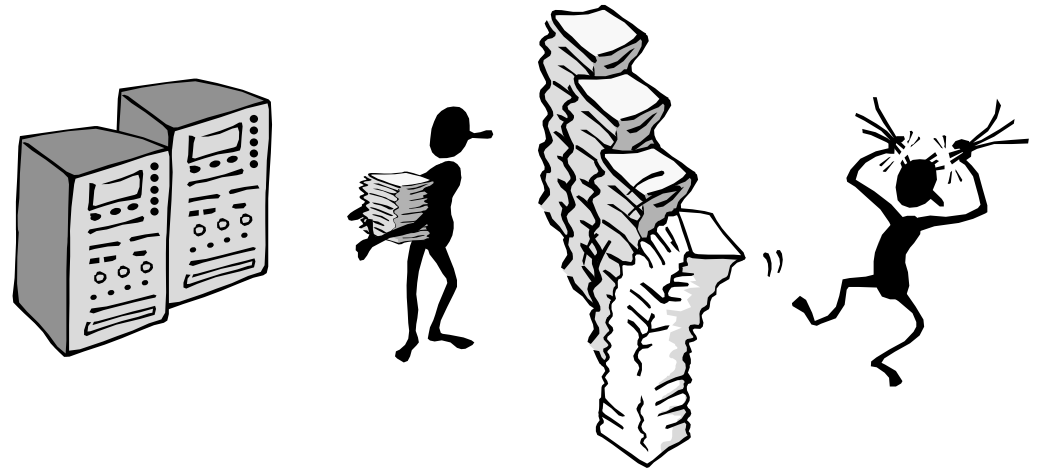
- Concern
 - How can an interactive system be developed to ensure its usability?
 - How can the usability of an interactive system be demonstrated or measured?
- Approach
 - Exemplification – Interaction paradigms
 - History of interactive system design provides paradigms for usable designs
 - Abstraction – Usability principles
 - Theoretically derived principles from knowledge of psychological, computational and sociological aspects of the problem domain.

Interaction paradigms

- Understanding HCI history is largely about understanding a series of paradigm shifts
 - Not all listed here are necessarily “paradigm” shifts, but are at least candidates
 - History will judge which are true shifts
- The greatest advances in HCI have come by way of exploratory and creative design.
- New computing technologies arrive, creating a new perception of the human-computer relationship.
- We can trace some of these shifts in the history of interactive technologies.

Interaction paradigms

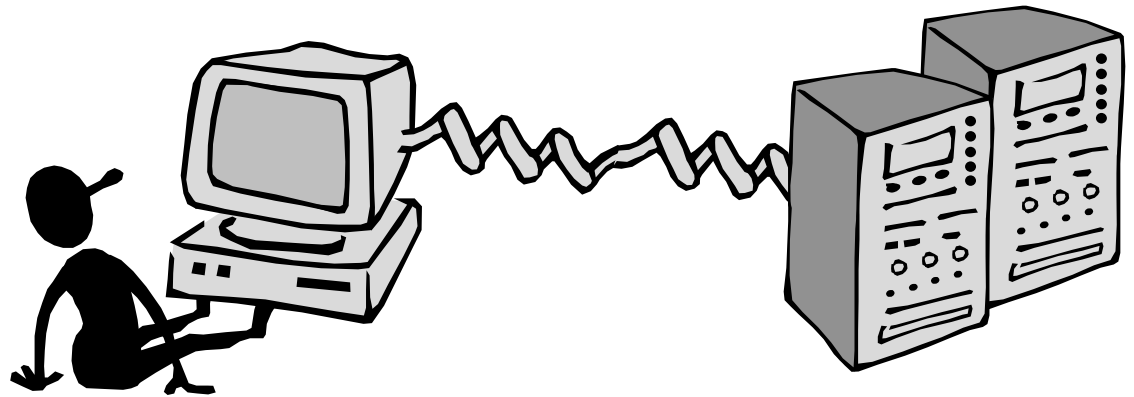
- The initial paradigm
 - Batch processing



Impersonal computing

Interaction paradigms

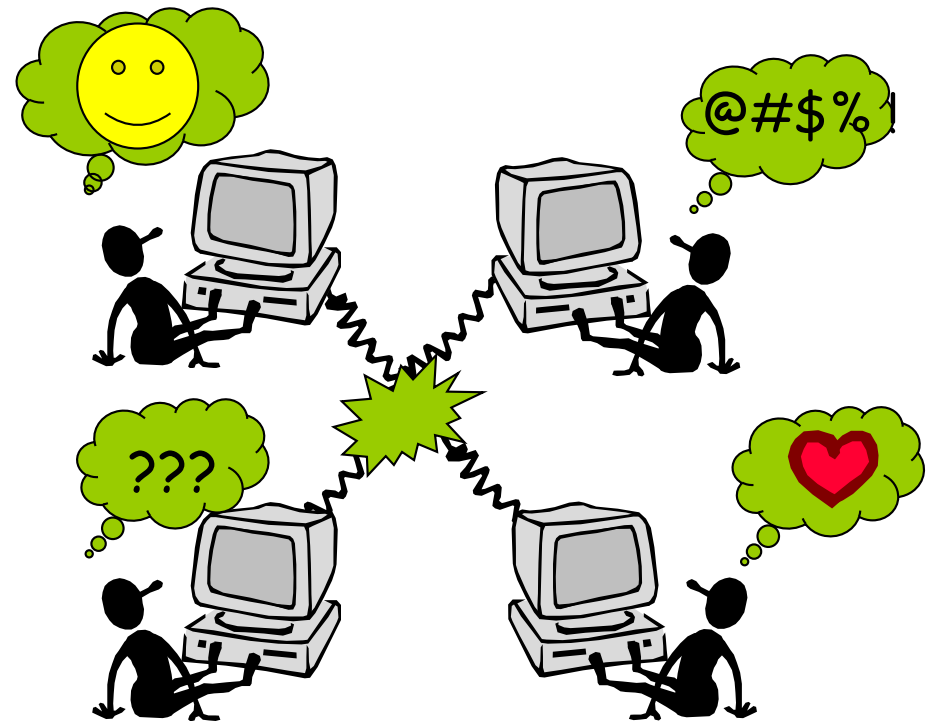
- Example paradigm shifts
 - Batch processing
 - Time-sharing



Interactive computing

Interaction paradigms

- Example paradigm shifts
 - Batch processing
 - Time-sharing
 - Networking

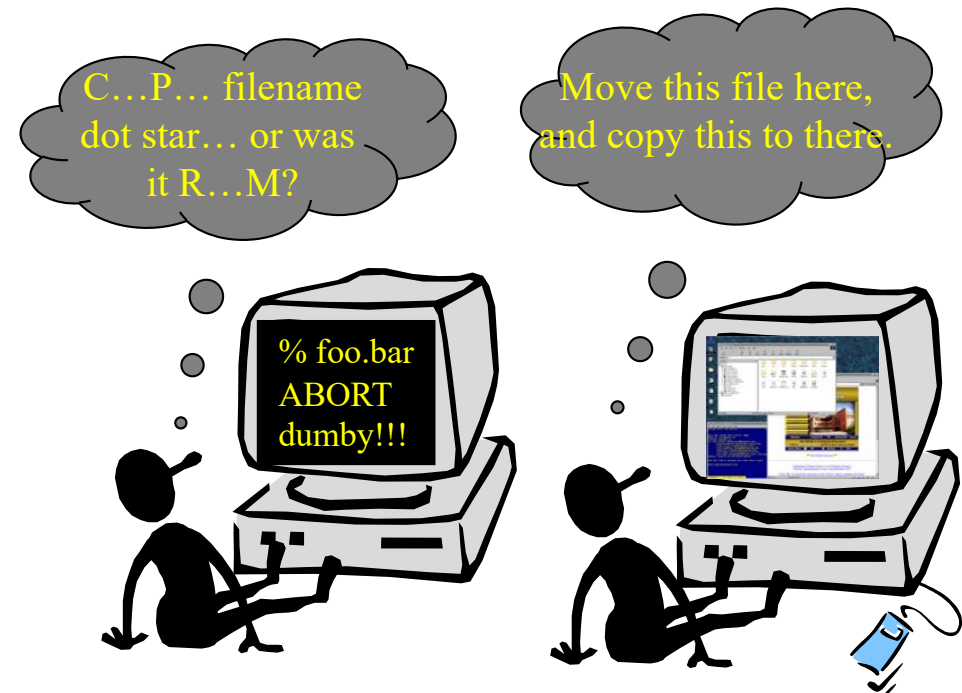


Community computing

Interaction paradigms

- Example paradigm shifts

- Batch processing
- Time-sharing
- Networking
- Graphical displays



Direct manipulation

Interaction paradigms

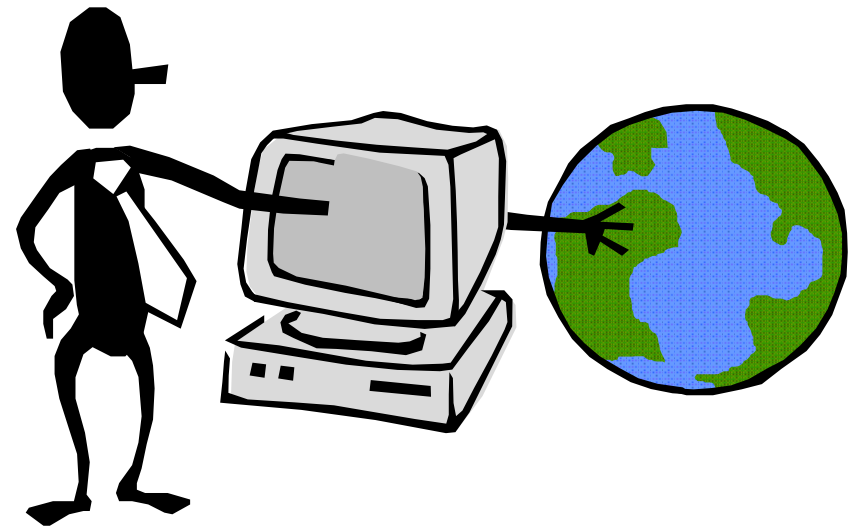
- Example paradigm shifts
 - Batch processing
 - Time-sharing
 - Networking
 - Graphical displays
 - **Microprocessor**



Personal computing

Interaction paradigms

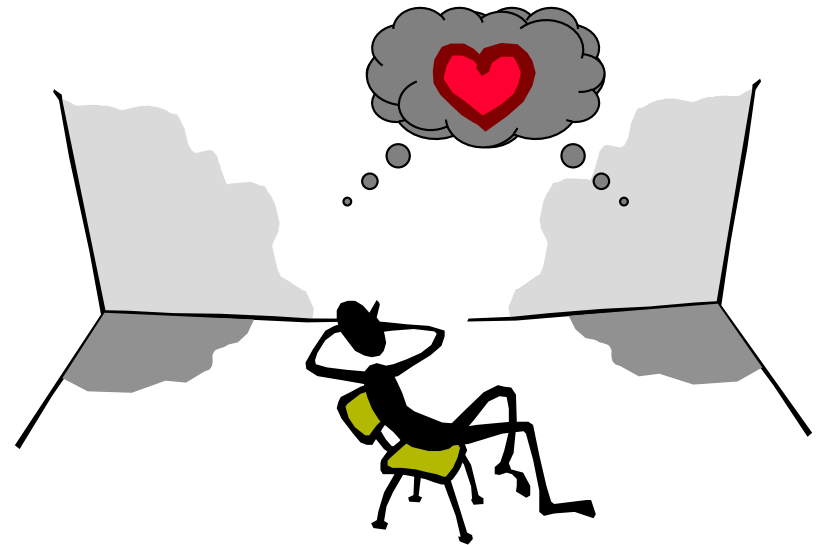
- Example paradigm shifts
 - Batch processing
 - Time-sharing
 - Networking
 - Graphical displays
 - Microprocessor
 - WWW



Global information

Interaction paradigms

- Example paradigm shifts
 - Batch processing
 - Time-sharing
 - Networking
 - Graphical displays
 - Microprocessor
 - WWW
 - Ubiquitous computing



A symbiosis of physical and electronic worlds in service of everyday activities.

Interaction paradigms

- 1940s and 1950s – explosive technological growth.
- 1960s – the explosion of growth in computing power would be wasted if there was not an equivalent explosion of ideas about how to channel that power.
- Licklider (director ARPA - US DoD Advanced Research Projects Agency)
 - <http://www.ibiblio.org/pioneers/licklider.html>
 - finance various research centres in USA to encourage new ideas about how best apply the new technology.
 - **Time-Sharing** - single computer supporting multiple users.

Interaction paradigms

- Mid 1950s – researchers were experimenting with the possibility of presenting and manipulating information from a computer in the form of images on a VDU (**Video Display Unit**).
- More suitable medium than paper to present vast quantities of strategic information for rapid assimilation.
- First applications were developed for military use.

Interaction paradigms

- 1962 - Ivan Sutherland (MIT) astonished the computer science community with the Sketchpad project

https://www.youtube.com/watch?v=6orsmFndx_o

- Computers for visualizing and manipulating different representation of the same data.

Part 3: Historical Perspective: "Computer Sketchpad"

(not shown
at CHI'83)

- * a classic and beautiful system
- * first CAD system
- * introduced constrained input
- * introduced instantiation

ACM CHI '83, SGVR Issue 13

Interaction paradigms

- Douglas Engelbart (1960s) - **Programming Toolkits**
 - Stanford Research Institute
 - 1963 – augmenting man's intellect
 - use computer technology as a means of complementing human problem solving capacities; use computers to teach humans.
 - humans attack complex intellectual problems like a carpenter produces beautifully complicated pieces of woodwork with a good set of tools.
 - the right programming toolkit provides building blocks to producing complex interactive systems.
 - 1968 NLS/Augment system demonstration

Interaction paradigms

- 1970s – emergence of computing power aimed at the masses - **Personal Computing**.
 - Seymour Papert - LOGO language – for simple graphics programming by children.
 - computer controlled mechanical turtle that dragged a pen along a surface to trace its path.
 - by typing English sentences, such as “Go forward” or “Turn left”, a child/programmer could teach the turtle to draw more and more complicate figures.
 - A system is more powerful as it becomes easier to use
 - “Logo is a programming language plus a philosophy of education”
<http://www.microworlds.com/company/philosophy.pdf>

Interaction paradigms

- 1970s - Alan Kay view of the future of computing was embodied in small, powerful machines which were dedicated to single users – **personal computers**.
 - together with the funding team of researchers at XEROX PARC creates a powerful and simple visually based programming environment for personal computing hardware - Smalltalk.
 - the Dynabook as the ultimate hand-held personal computer.

Interaction paradigms



Interaction paradigms

- **Windows Systems** and the **WIMP** interface
 - humans can pursue more than one task at a time.
 - windows used for dialogue partitioning => easy to “change the topic” .
 - 1981 - Xerox Star first commercial windowing system.
 - windows, icons, menus and pointers now familiar interaction mechanisms.

Interaction paradigms

- **Direct Manipulation**

- 1982 - Ben Shneiderman describes the following features of a direct manipulation interface:
 - visibility of objects
 - incremental action and rapid feedback
 - reversibility encourages exploration
 - syntactic correctness of all actions
 - replace language with action
- 1984 - Apple Macintosh
- WYSIWYG – minimal difference between the representation and the final product.
 - the user is able to visualize the final product from the computer's representation.

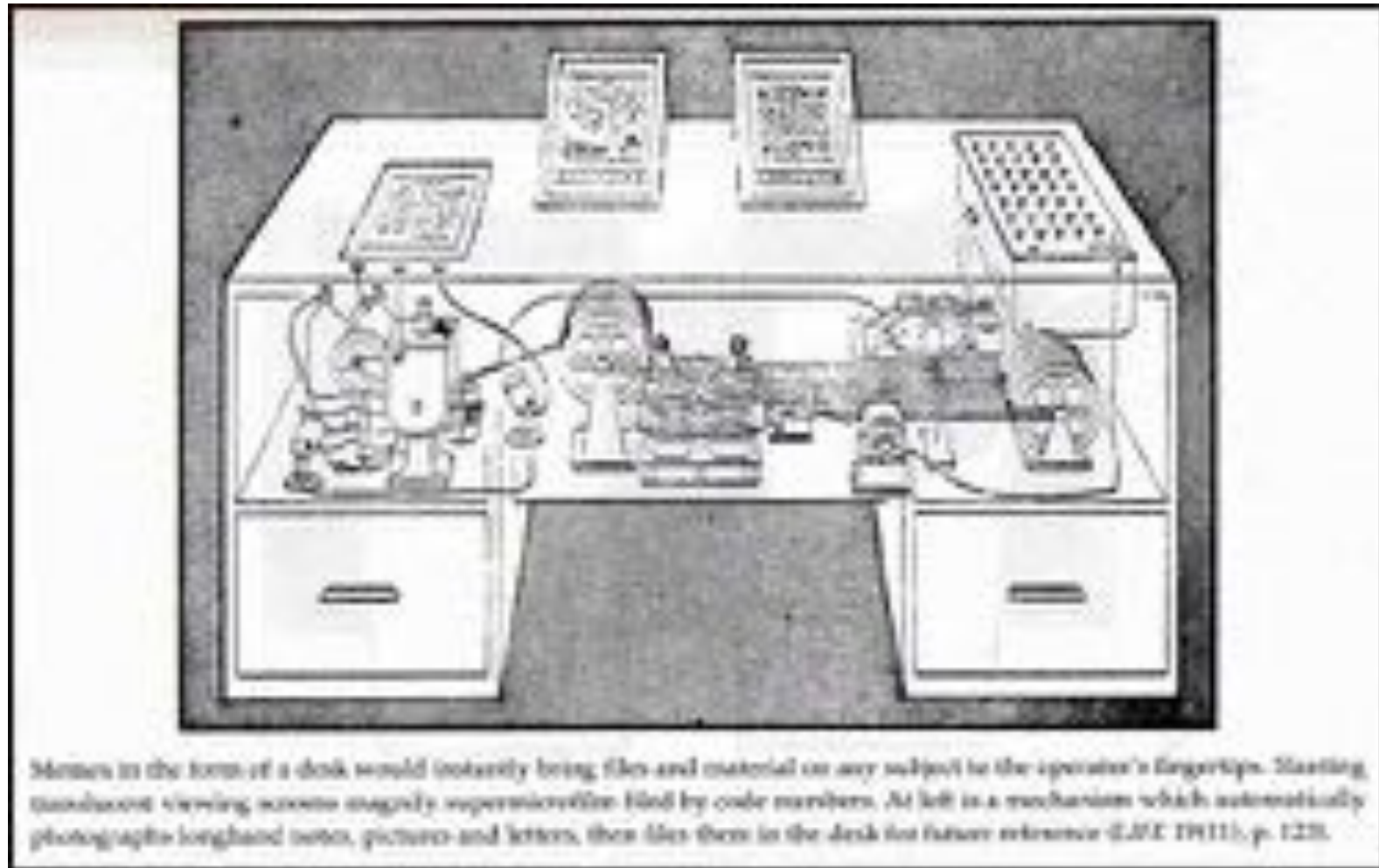
Interaction paradigms

- Hypertext

- 1945 - Vannevar Bush “As we may think” in The Atlantic Monthly.

- need support in managing explosion of information and scientific knowledge generated after the beginning of the World War II.
 - Memex – desk with the ability to produce and store a massive quantity of photographic copies of documented information. In addition, the Memex could keep track of links between parts of different documents (the stored information resembled a vast interconnected mesh of data).

Interaction paradigms



Memo in the form of a desk would instantly bring files and material on any subject to the operator's fingertips. Starting translucent viewing screen magnifies supersensitive film filed by code numbers. At left is a mechanism which automatically photographs longhand notes, pictures and letters, then files them in the desk for future reference (LIFE 1941), p. 123.

Interaction paradigms

- Hypertext

- mid 1960s – Ted Nelson describes hypertext as non-linear browsing structure
- the concept was coined by Ted Nelson to describe the non-linear structure of his system Xanadu.
 - “a potentially revolutionary worldwide publishing and information retrieval system based on the idea of interconnected, non-linear text and other media forms.”
- NLS (oN-Line System) include many characteristics of the hypertext systems: point- and-click, multiple windows, remote colaboration, cross-referencing. Many of the ideas that Engelbart’ s team developed – word processing, mouse – only attained commercial success decades after their invention.

Interaction paradigms

- **Multi-Modality**
 - a mode is a human communication channel
 - emphasis on simultaneous use of multiple channels for input and output
- **CSCW**
 - interaction between humans via the computer
 - the needs of the many must be represented in the one product
 - Social aspects
 - E-mail is the most prominent success
- **WWW**
 - Tim Berners-Lee
 - Simple, universal protocols (e.g. HTTP) and mark-up languages (e.g. HTML) made publishing and accessing easy

Interaction paradigms

- **Agent-based Interfaces**

- e-mail agents – filter e-mail
- web crawlers – search the WWW for documents user may find interesting.
- agents can:
 - perform repetitive tasks
 - watch and respond to events when the user is not present
 - learn from the user's own actions.
- MS Excel (sum function).
- Eager on HyperCard – when it notices that the user is repeating similar actions, it suggests the next action, which can be accepted or ignored by the user.

Interaction paradigms

- **Augmented and virtual reality**
 - AR :
 - Combines real objects with virtual objects in a real environment;
 - registers (aligns) real and virtual objects with each other.
 - VR:
 - the user interacts in a synthetic world
 - immersion
 - 1960s - Ivan Sutherland implemented the first virtual reality system. Using wireframe graphics and a see-through head-mounted display (HMD), it allowed users to occupy the same space as virtual objects.

Interaction paradigms

- Ubiquitous Computing

“The most profound technologies are those that disappear.”

Mark Weiser, 1991

- Late 80s – computer was very apparent
- How to make it disappear?
 - Shrink and embed/distribute it in the physical world
 - Design interactions that don't demand our intention
- Invisible computing, smart objects...

Interaction paradigms

- Sense-based and context aware interaction
 - Humans are good at recognizing the “context” of a situation and reacting appropriately
 - Automatically sensing physical phenomena (e.g., light, temp, location, identity) is becoming easier.

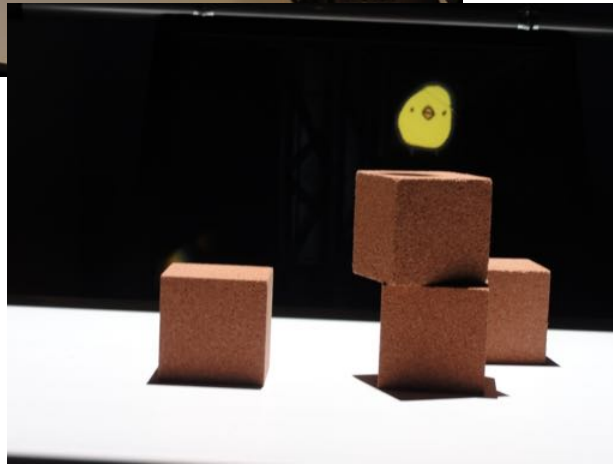
Future Perspectives

Looking into the past



Future perspectives

Entertainment – ACE



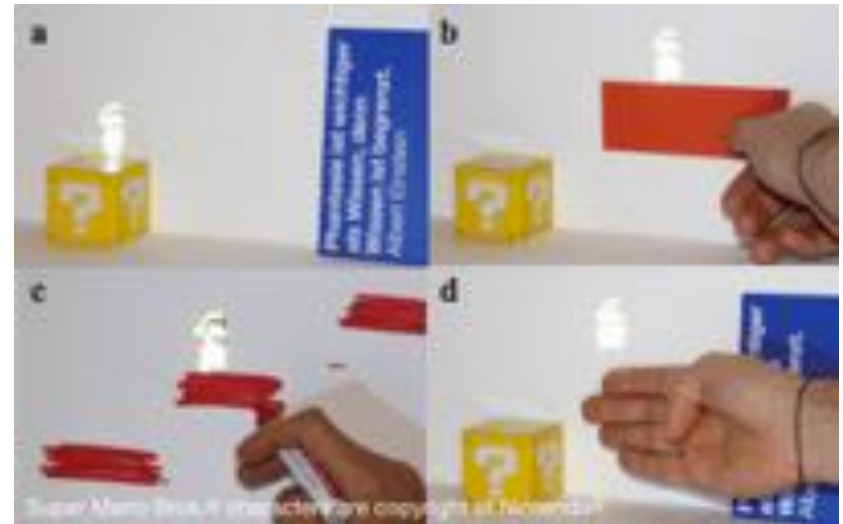
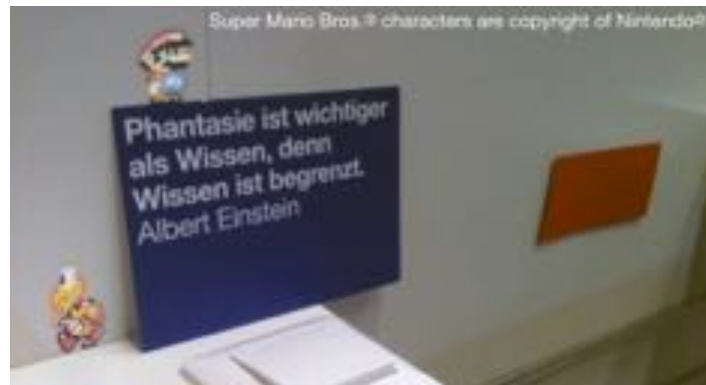
Future perspectives

Entertainment - ACE 2013

- **D-FLIP: Dynamic and Flexible Interactive PhotoShow**
Vi, C.T. et al. <https://www.youtube.com/watch?v=AxWjhSkThew>
- **MARIO: Mid-Air Augmented Reality Interaction with Objects**
Kim, H. et al. <https://www.youtube.com/watch?v=SpshRCmIX5Y>
- **Singing Like a Tenor without a Real Voice**
Jochen Feitsch, Marco Strobel, and Christian Geiger
- **‘P.S.(Postscript)’ : Hearing of Your Heartstring**
Myongjin Moon and Yeseul Kim

Future perspectives

Entertainment – ACE



<https://vimeo.com/121008093>

Oswald, P., Tost J. and Wettach, R., The Real Augmented Reality: Real-time game editor in a Spatial Augmented Environment, ACE 2014.

Future perspectives

Entertainment – ACE



Tsujita, H. and Rekimoto, J. Smiling Makes Us Happier: Enhancing Positive Mood and Communication with Smile-Encouraging Digital Appliances, Ubicomp 2011.

Future perspectives

Smell on mobile phone communications



Scentee smartphone notification smells



Mugaritz - smell a dish before you taste it

Future perspectives

Multisensory experiences



Ultraviolet's room

Future perspectives

Entertainment

The Cube – Vodafone headquarters, Lisbon (Ydreams)



Funky forests



Javier Lloret -Tetris Madrid



Water board



Entertainment

The Cube (YDreams),
Vodafone Headquarters, Lisbon

<https://www.youtube.com/watch?v=O72BKIGLpnQ>

Entertainment



Future perspectives

Experience

McDonalds Interactive billboard



Real-time interaction with augmented reality mascots



Noon - A Secret Told By Objects

Prada retail experience



Interactive Visitors Center - Ciudad Grupo Santander, Madrid



Experiences

Augmented reality Mascot
Flapi (YDreams)

<https://www.youtube.com/watch?v=XIYxEbznsfU>

Experiences

Santander – The Visitors Center (YDreams)

<https://www.youtube.com/watch?v=bzDIJ6TTc6w>

Future perspectives

Interaction

YDreams' Augmented Reality experience
with depth-sensing camera



[Reactable](#) in [Ibiza](#)

Siftables



Proxemic Interaction



Touchscreen for data transfer

Sixth sense technology



David Merrill - Siftables

<https://www.youtube.com/watch?v=JP0w9IZoLwU>

Interaction

Proxemic Interactions

The Video

Designing for a Proximity
and Orientation-Aware Environment

Till Ballendat, Nicolai Marquardt, Saul Greenberg

Interactions Lab
University of Calgary

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

Interaction

Sixth Sense
Pattie Maes

<https://www.youtube.com/watch?v=nZ-VjUKAsao>

Future perspectives

Have fun...

Let's dance



Hands from above



Fun theory

The Speed Camera Lottery



Piano stairs



Bottle Bank Arcade



Future perspectives

The virtual Crash Billboard

<https://www.youtube.com/watch?v=UqrJh1W0FOw>

Future perspectives

Apotek Hjörtat presents
The Coughing Billboard

https://www.youtube.com/watch?v=_Uj-MMAys4M

Future perspectives



https://www.youtube.com/watch?v=w82j_m-qr2g

Future perspectives



<https://www.youtube.com/watch?v=qRgWttqFKu8>

Future perspectives



Future perspectives

Tesco virtual supermarket in subway station



<https://www.youtube.com/watch?v=fGaVFRzTTP4>

Future perspectives

Children are preparing the future...



http://www.ted.com/talks/thomas_suarez_a_12_year_old_app_developer?language=en

Future perspectives

Take care...

<http://www.youtube.com/watch?v=OINa46HeWg8>



Future perspectives

... and don't forget ...BE CREATIVE!

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