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

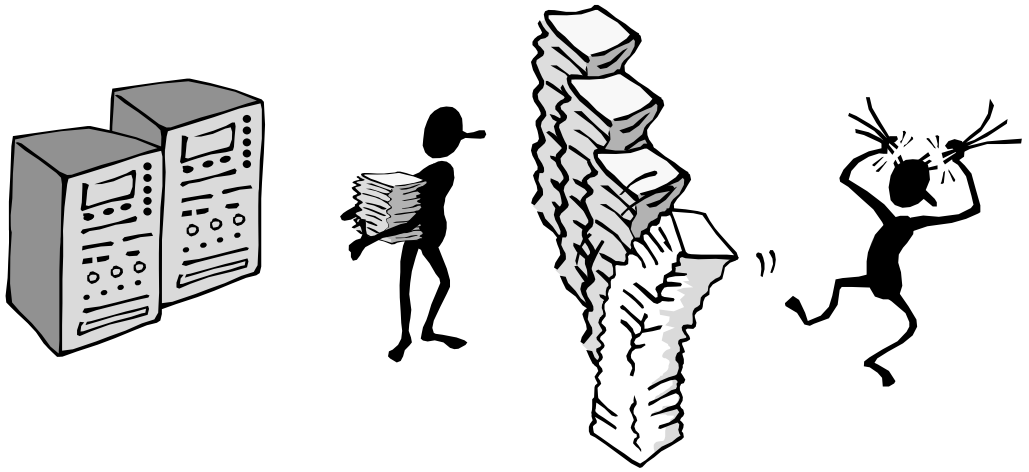
- The greatest advances in HCI have come by way of exploratory and creative design.

- 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

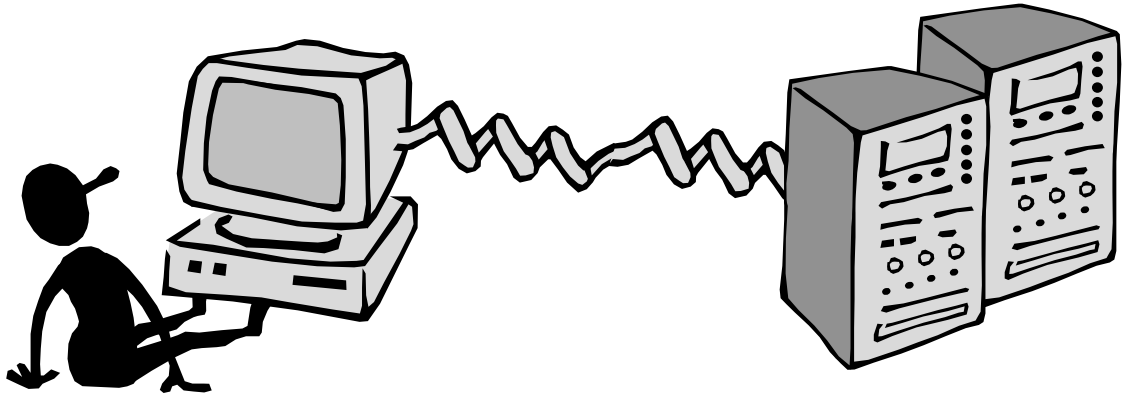
- The initial paradigm
  - Batch processing



Impersonal computing

Interaction paradigms

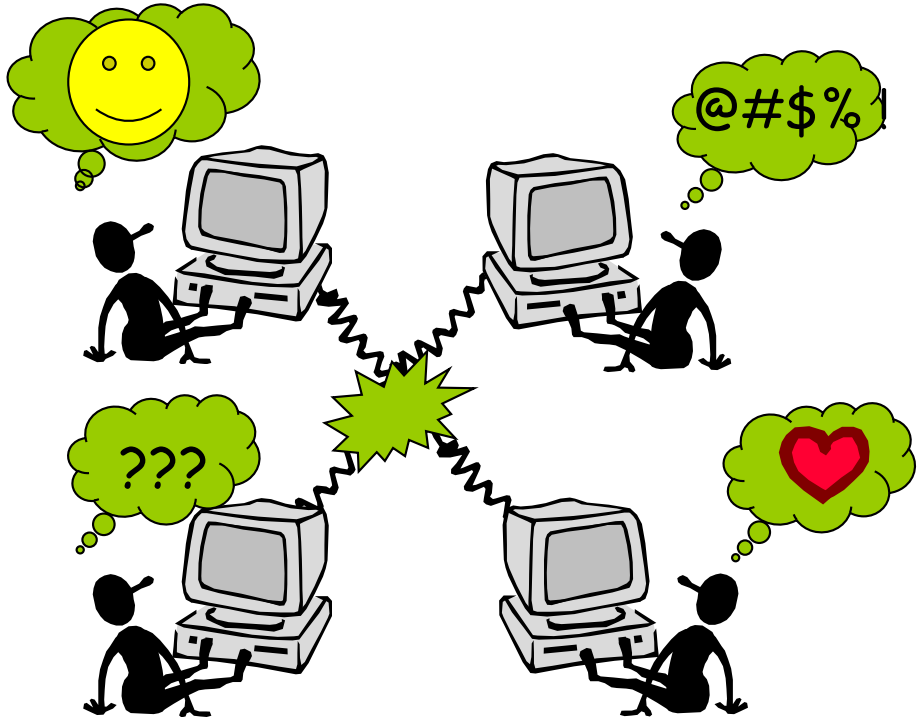
- Example paradigm shifts
  - Batch processing
  - Time-sharing



Interactive computing

Interaction paradigms

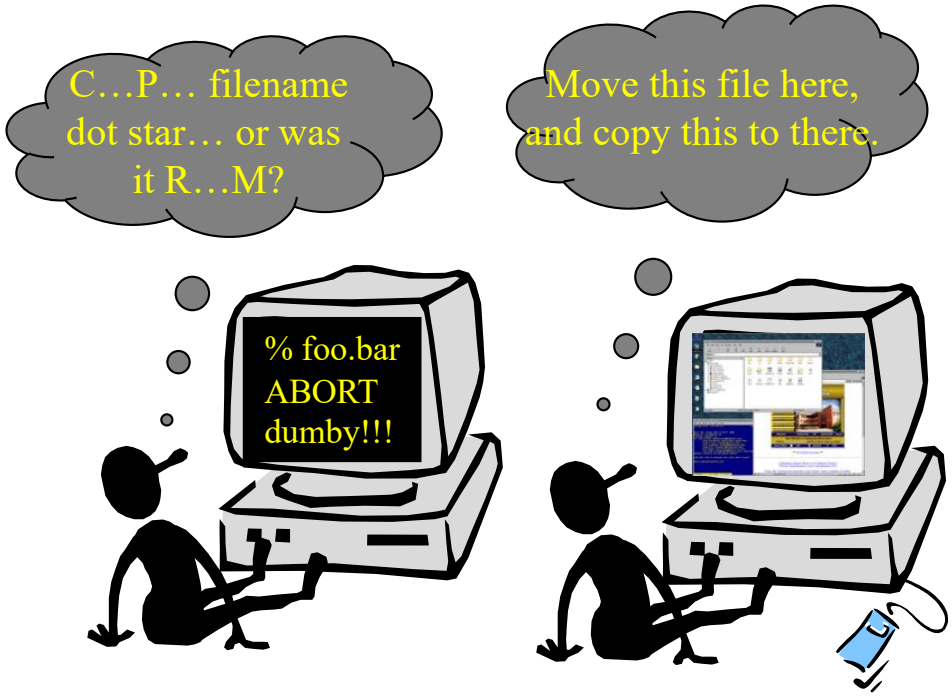
- Example paradigm shifts
  - Batch processing
  - Time-sharing
  - Networking



Community computing

Interaction paradigms

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



Direct manipulation

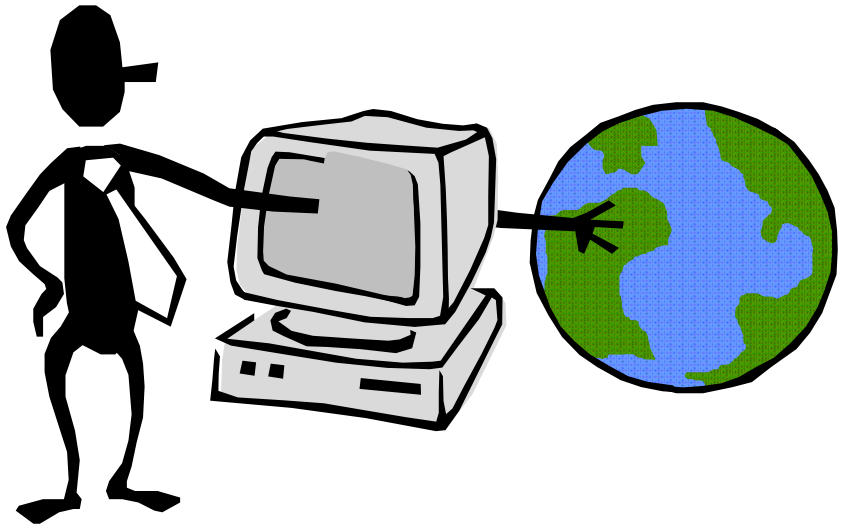
Interaction paradigms

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

Personal computing

Interaction paradigms

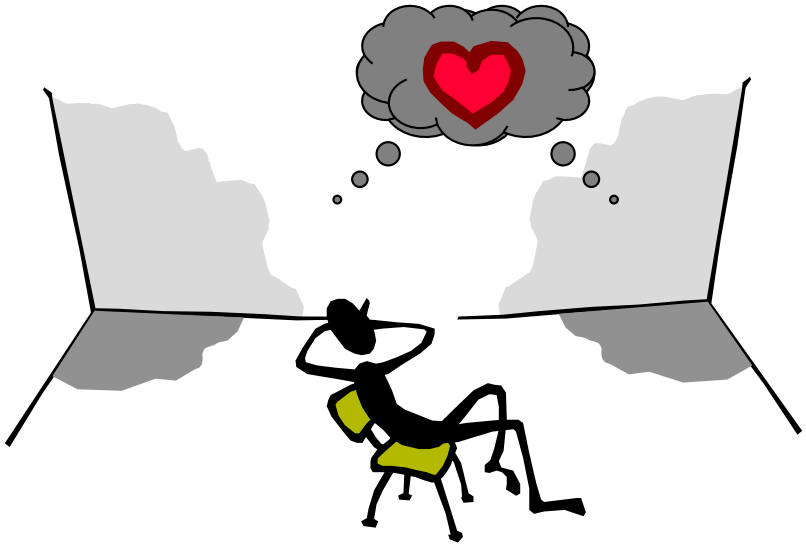
- Example paradigm shifts
  - Batch processing
  - Time-sharing
  - Networking
  - Graphical displays
  - Microprocessor
  - WWW



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.

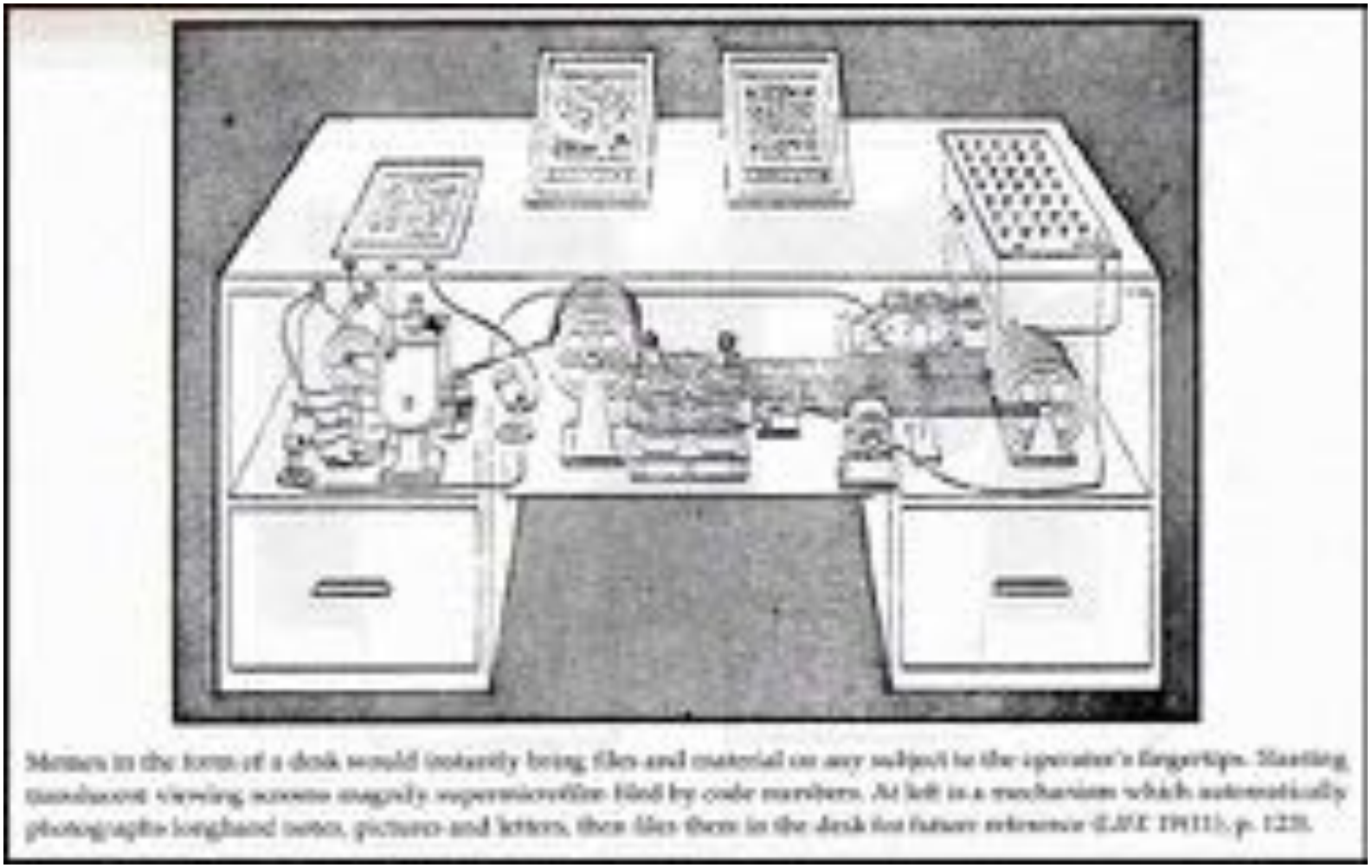
Interaction paradigms

- 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



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

Incrível: Nokia lança celular que envia mensagem de texto para outro celular

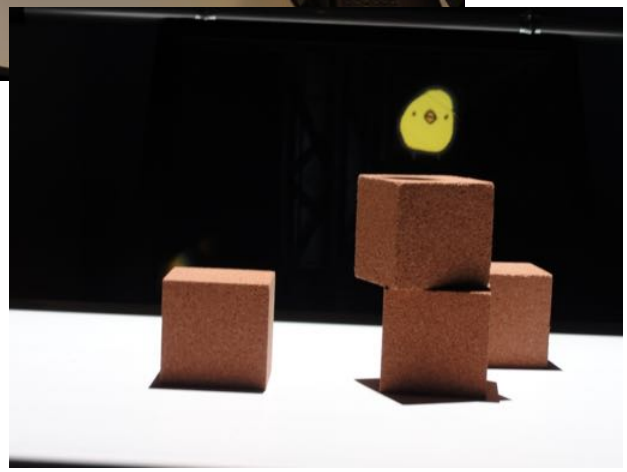
IBGE: até o final ao ano, em cada 50 mil casas, 1 terá acesso a internet

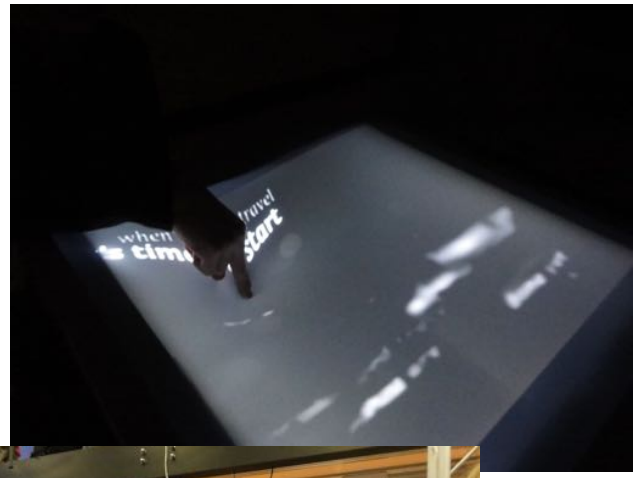
Especialista alerta: Quem não tem curso de datilografia ficará de fora do mercado de trabalho

Aprenda a compactar uma música para caber em 3 disquetes

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

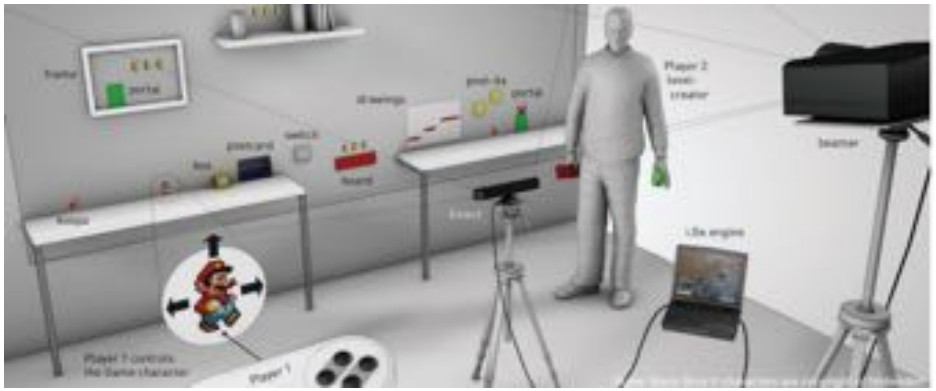
- **MARIO: Mid-Air Augmented Reality Interaction with Objects**
  Kim, H. et al. https://www.youtube.com/watch?v=SpshRCmlX5Y

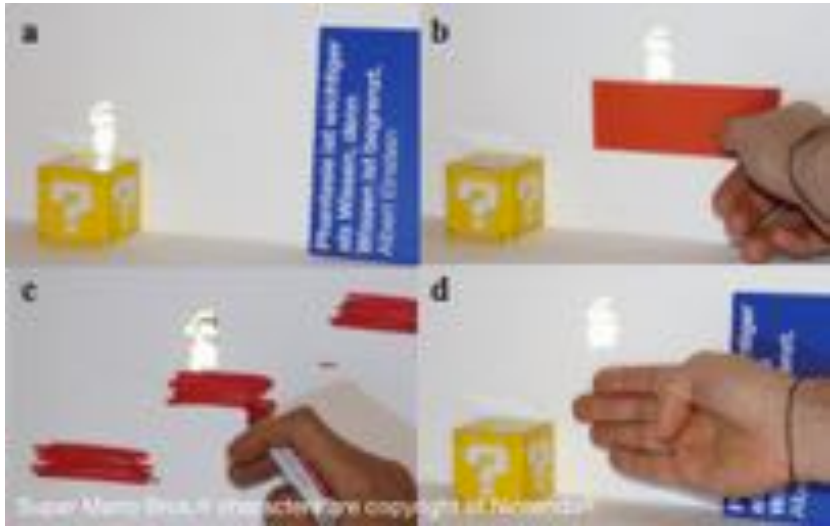
- **Singing Like a Tenor without a Real Voice**
  Jochen Feitsch, Marco Strobel, and Christian Geiger

- **'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

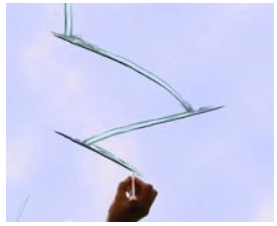
Entertainment

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=XlYxEbznsfU

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

Proxemic Interaction

Siftables

Touchscreen for data transfer

Sixth sense technology

David Merrill - Siftables

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

Interaction

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

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

Future perspectives

Future perspectives

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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