Interaction paradigms

1

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.

2

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.

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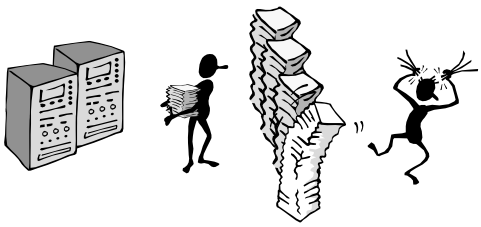
Interaction paradigms

- The initial paradigm
  - Batch processing



Impersonal computing

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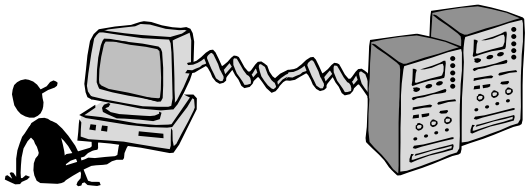
Interaction paradigms

- Example paradigm shifts
  - Batch processing
  - Time-sharing



Interactive computing

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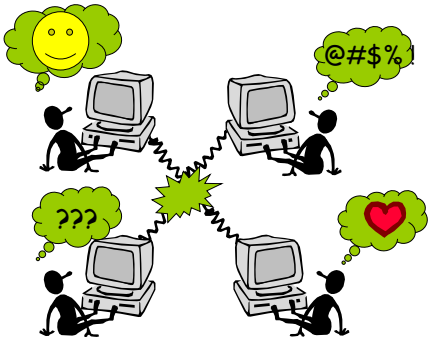
Interaction paradigms

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



Community computing

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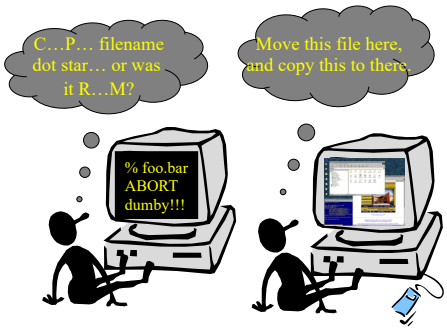
Interaction paradigms

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



Direct manipulation

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Interaction paradigms

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

Personal computing

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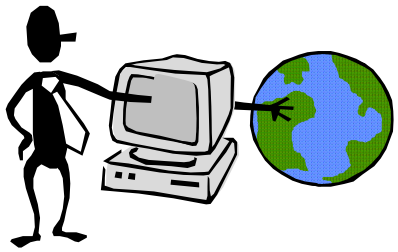
Interaction paradigms

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



Global information

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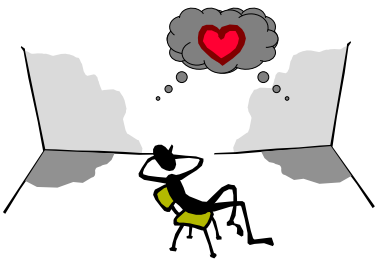
Interaction paradigms

- 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.

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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.

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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.

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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.

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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

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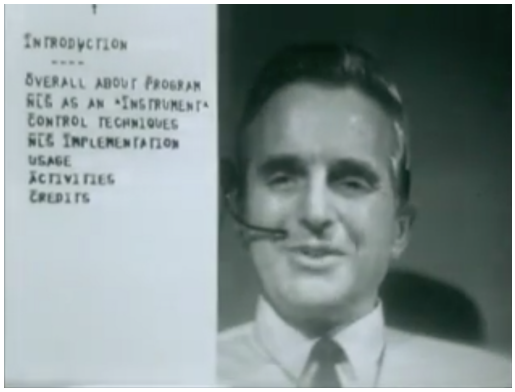
Interaction paradigms

The Mother of All Demos



https://www.youtube.com/watch?v=B6rKUf9DWRI

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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

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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.

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Interaction paradigms

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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.

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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.

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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).

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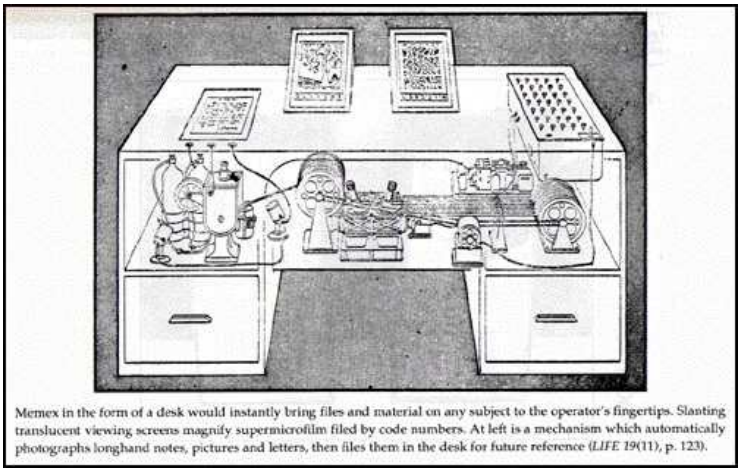
Interaction paradigms



Memex in the form of a desk would instantly bring files and material on any subject to the operator's fingertips. Slanting translucent viewing screens magnify supermicrofilm 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* 19(11), p. 123).

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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.

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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

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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.

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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…

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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.

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Future Perspectives

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Looking into the past

29

Future perspectives

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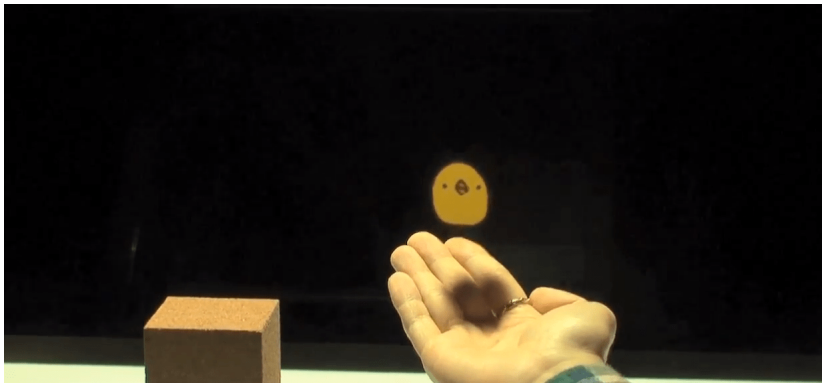
Future perspectives

MARIO: Mid-Air Augmented Reality Interaction with Objects

Hanyuool Kim, Issei Takahashi, Hiroki Yamamoto, Takayuki Kai, Satoshi Maekawa, and Takeshi Naemura



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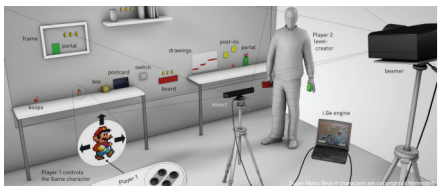
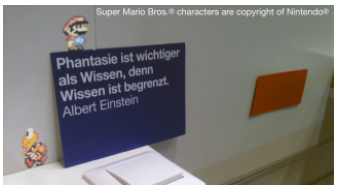
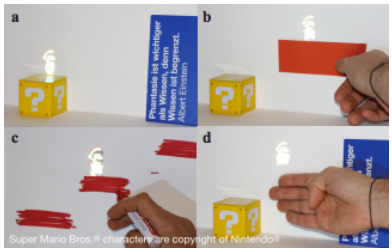
Future perspectives

Entertainment – ACE







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

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Future perspectives

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

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Future perspectives

Smell on mobile phone communications

Scentee smartphone notification smells

Mugaritz - smell a dish before you taste it

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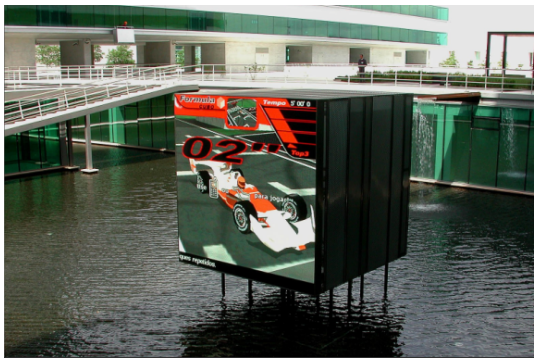
Entertainment

The Cube (YDreams),
Vodafone Headquarters, Lisbon



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

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Entertainment

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Future perspectives

Siftables
David Merrill

https://www.youtube.com/watch?v=JP0w9lZoLwU

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Future perspectives

The Visitors Center, Santander Headquarters, Madrid, YDreams 2014

https://www.youtube.com/watch?v=bzDlJ6TTc6w

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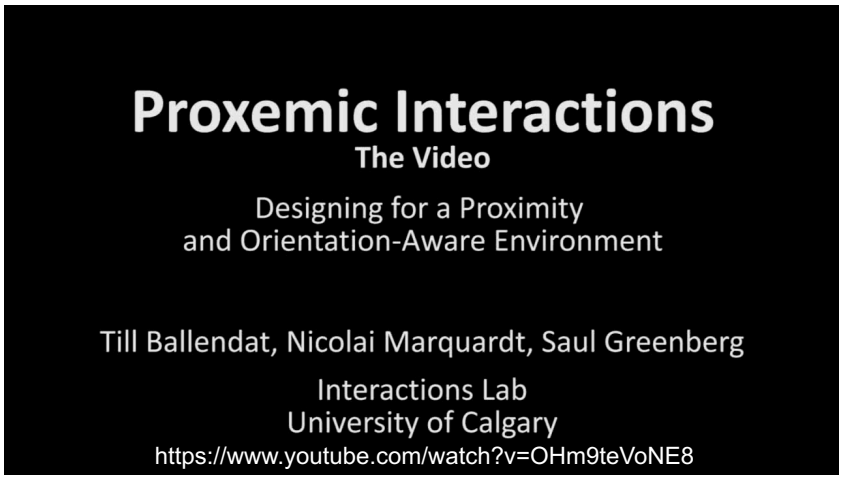
Interaction



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Future perspectives

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

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Future perspectives

Persuasion

An attempt to change attitudes or behaviours or both (without using coercion or deception).

B. J. Fogg, 2003

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Future perspectives

Persuasive Technology

Interactive computing systems designed to change people's attitudes and behaviours.

B. J. Fogg, 2003

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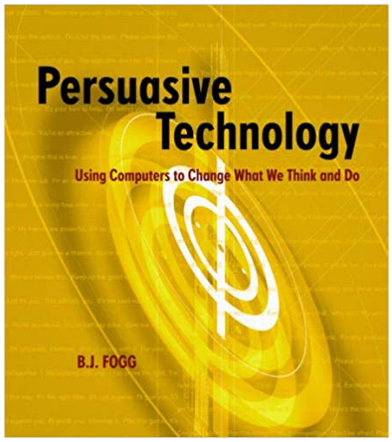
Future perspectives



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Future perspectives

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Future perspectives

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

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Future perspectives

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Future perspectives

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Future perspectives

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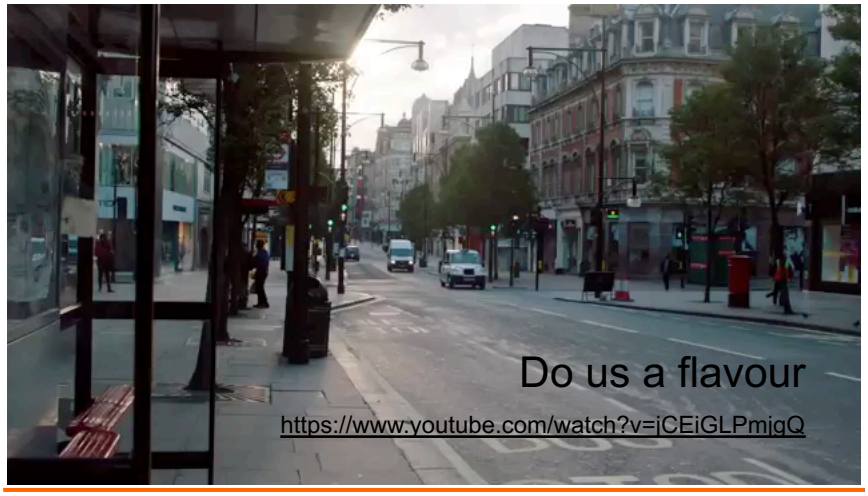
Future perspectives



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Future perspectives

Moon for All Mankind

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Future perspectives

Field trip to Mars

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Future perspectives

… and don't forget …BE CREATIVE!

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