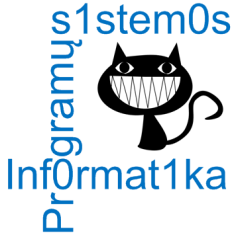


Interfaces (part 1)

Lecture 6
Adapted by
Dr. Kristina Lapin

Overview

- Interface types
  - highlight the main design and research issues for each of the different interfaces
- Consider which interface is best for a given application or activity

Interface type	See also
1. Command-based	
2. WIMP and GUI	
3. Multimedia	WIMP and web
4. Virtual reality	Augmented and mixed reality
5. Information visualization	Multimedia
6. Web	Mobile and multimedia
7. Consumer electronics and appliances	Mobile
8. Mobile	Augmented and mixed reality
9. Speech	
10. Pen	Shareable, touch
11. Touch	Shareable, air-based gesture
12. Air-based gesture	Tangible
13. Haptic	Multimodal
14. Multimodal	Speech, pen, touch, gesture, and haptic
15. Shareable	Touch
16. Tangible	
17. Augmented and mixed reality	Virtual reality
18. Wearable	
19. Robotic	
20. Brain–computer	

Table 6.1 The types of interfaces covered in this chapter

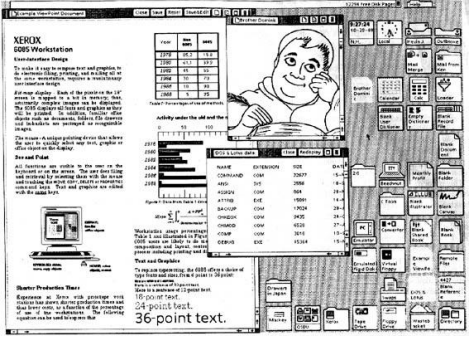
1. Command-based

- Commands such as abbreviations (e.g. ls) typed in at the prompt to which the system responds (e.g. listing current files)
- Some are hard wired at keyboard, others can be assigned to keys
- Efficient, precise, and fast
- Large overhead to learning set of commands

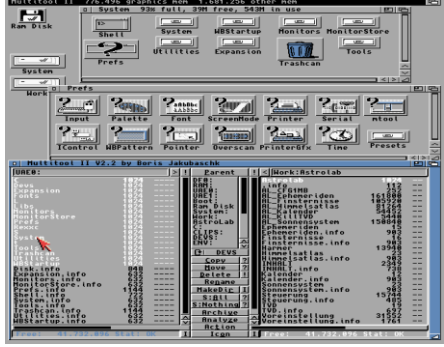
Second Life command-based interface for visually impaired users

Research and design issues

- Form, name types and structure are key research questions
- Consistency is most important design principle
  - e.g. always use first letter of command
- Command interfaces popular for web scripting



2. WIMP and GUI



- Xerox Star first WIMP -> rise to GUIs
- Windows
  - could be scrolled, stretched, overlapped, opened, closed, and moved around the screen using the mouse
- Icons
  - represented applications, objects, commands, and tools that were opened when clicked on
- Menus
  - offering lists of options that could be scrolled through and selected
- Pointing device
  - a mouse controlling the cursor as a point of entry to the windows, menus, and icons on the screen

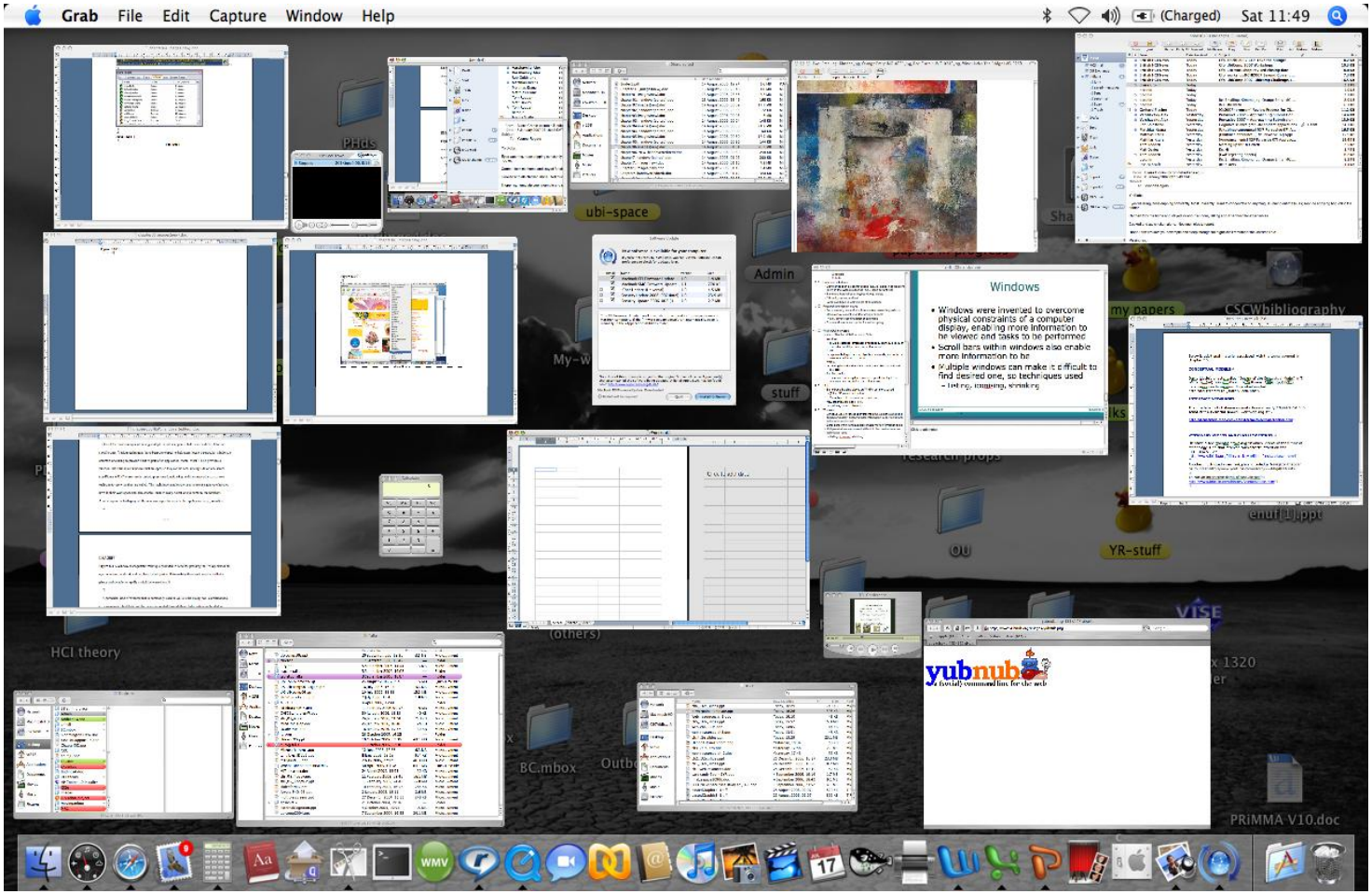
GUIs

- Same basic building blocks as WIMPs but more varied
  - Color, 3D, sound, animation,
  - Many types of menus, icons, windows
- New graphical elements, e.g.
  - toolbars, docks, rollovers

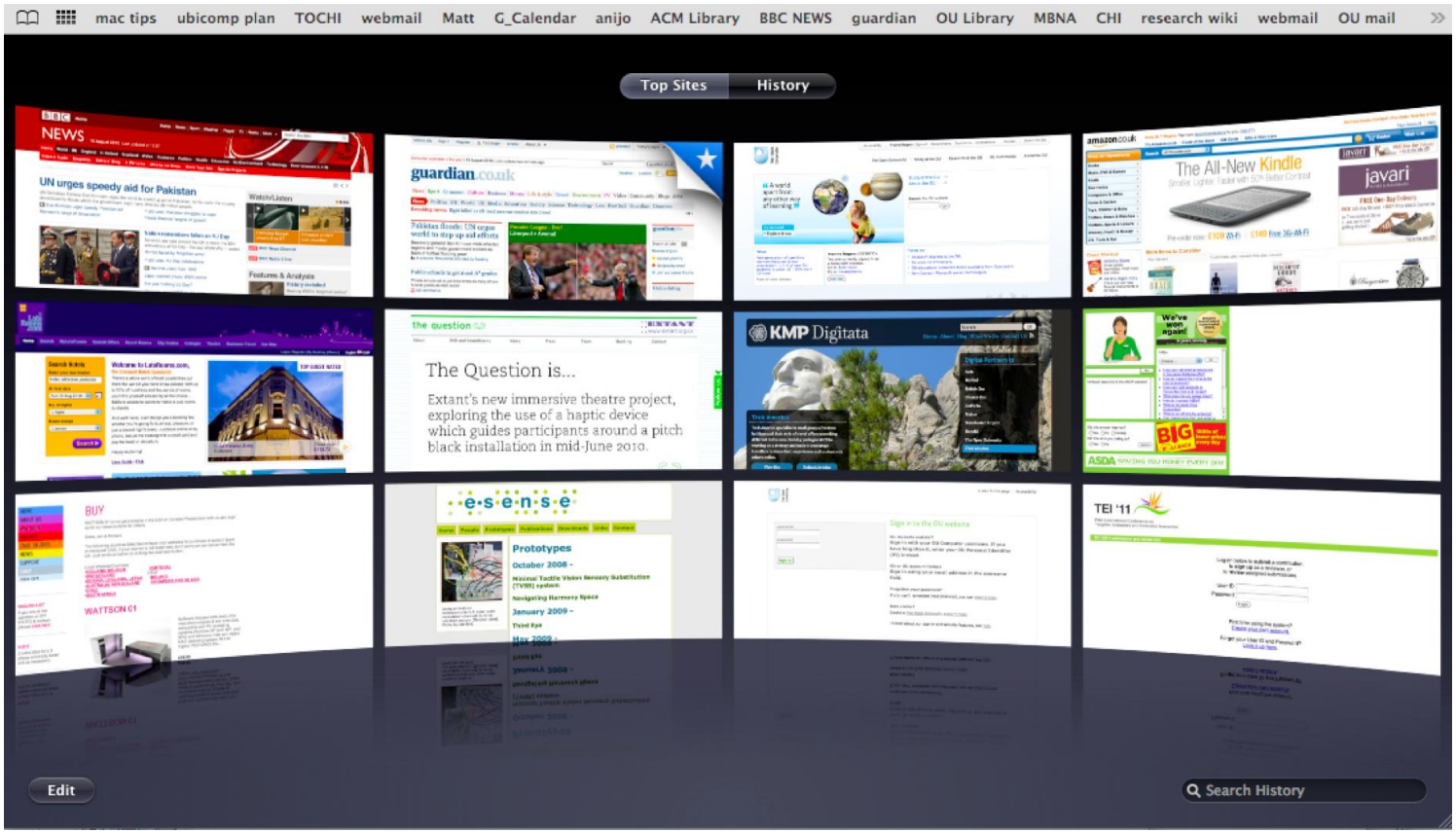
Windows

- Windows were invented to overcome physical constraints of a computer display
  - enable more information to be viewed and tasks to be performed
- Scroll bars within windows also enable more information to be viewed
- Multiple windows can make it difficult to find desired one
  - listing, iconising, shrinking are techniques that help

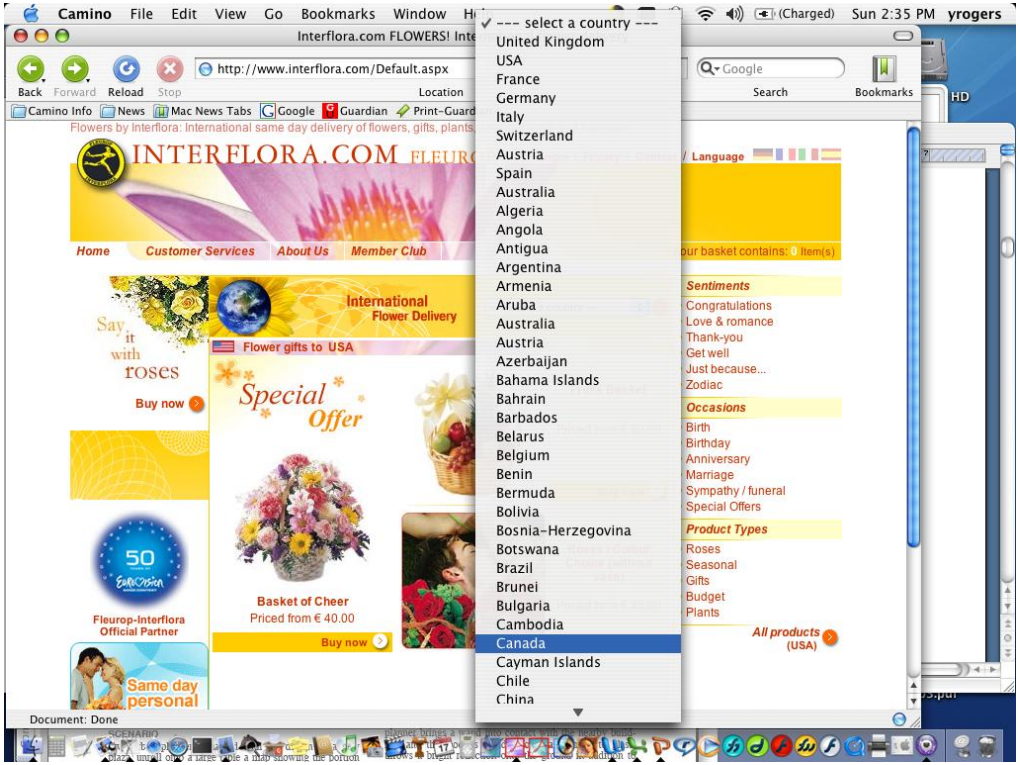
Apple's shrinking windows

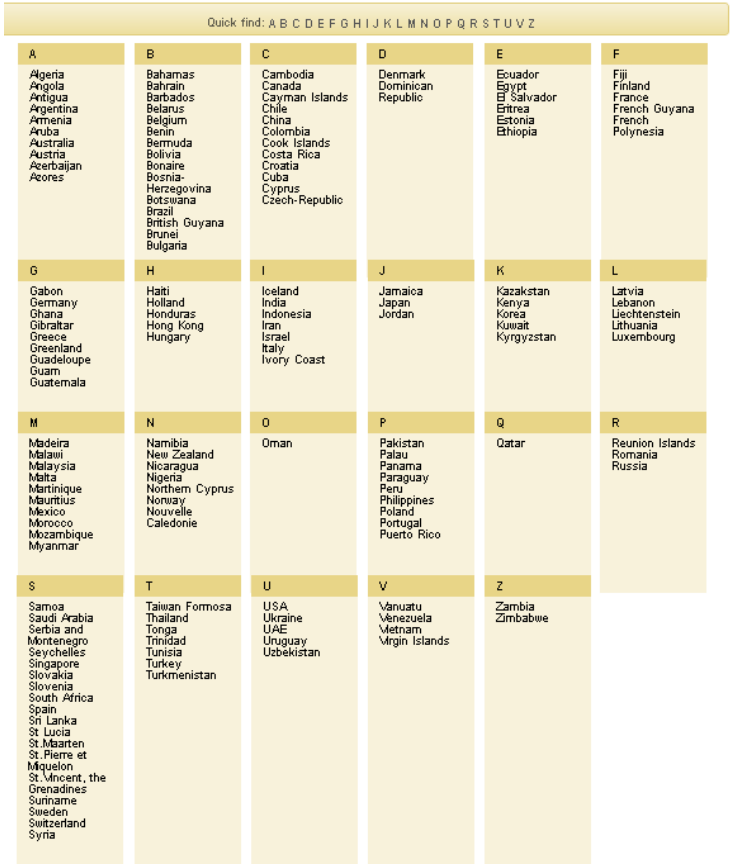


Safari panorama window view



Selecting a country from a scrolling window or table





Research and design issues

- Window management
  - enables users to move fluidly between different windows (and monitors)
- How to switch attention between windows without getting distracted

- Design principles of spacing, grouping, and simplicity should be used

Menus

- A number of menu interface styles
  - flat lists, drop-down, pop-up, contextual, and expanding ones, e.g., scrolling and cascading
- Flat menus
  - good at displaying a small number of options at the same time and where the size of the display is small, e.g. iPods
  - but have to nest the lists of options within each other, requiring several steps to get to the list with the desired option
  - moving through previous screens can be tedious

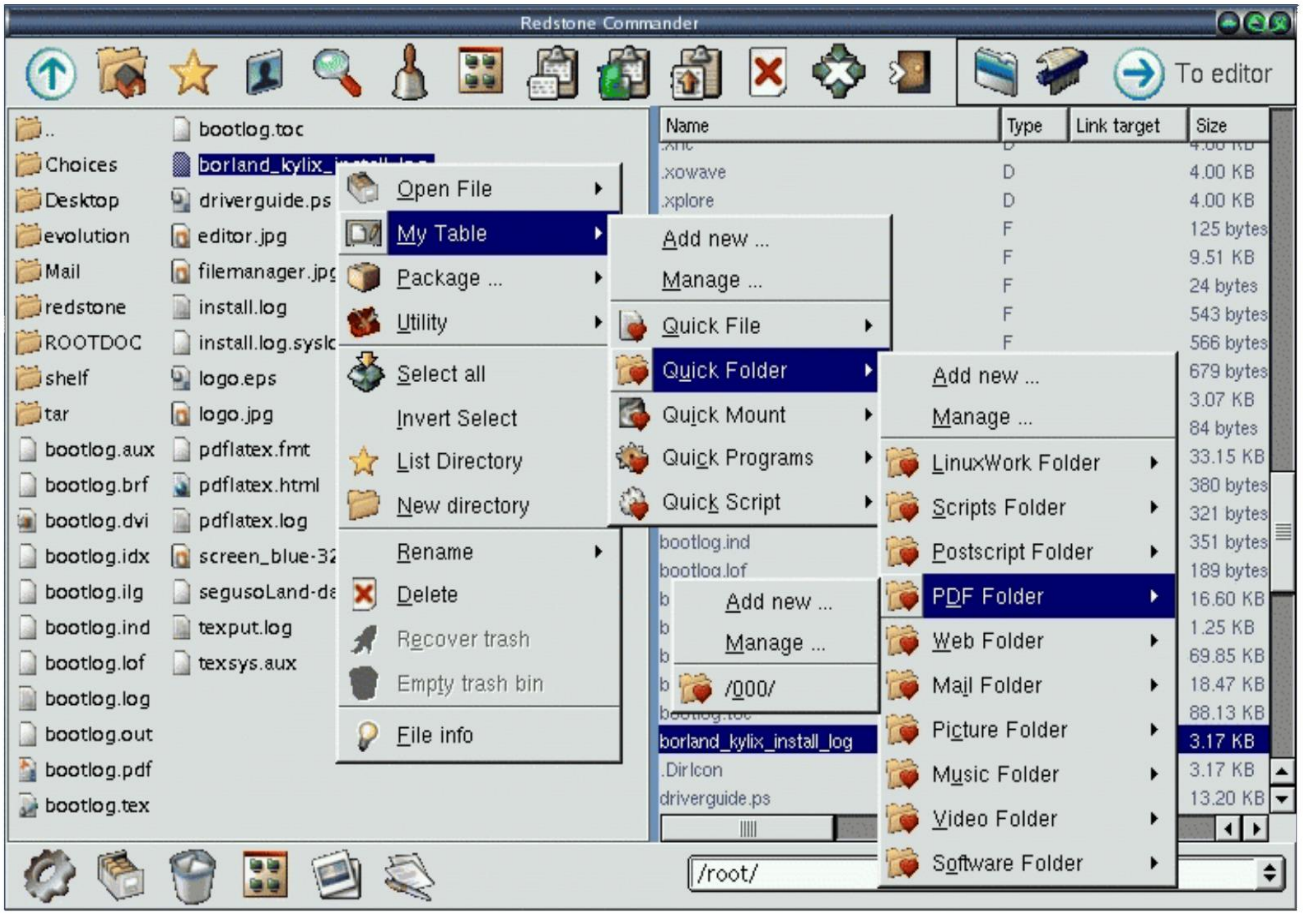
iPod flat menu structure

A sequence of options selected shown in the 4 windows

Expanding menus

- Enables more options to be shown on a single screen than is possible with a single flat menu
- More flexible navigation, allowing for selection of options to be done in the same window
- Most popular are cascading ones
  - primary, secondary and even tertiary menus
  - downside is that they require precise mouse control
  - can result in overshooting or selecting wrong options

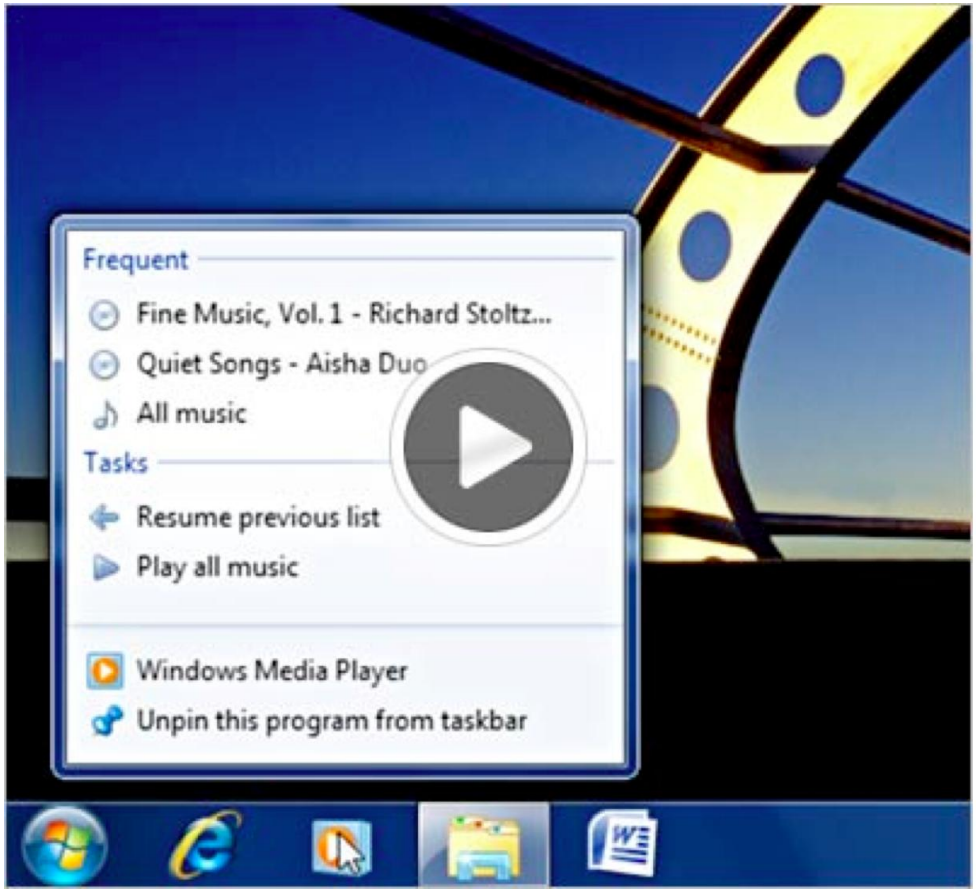
Cascading menu



Contextual menus

- Provide access to often-used commands that make sense in the context of a current task
- Appear when the user presses the Control key while clicking on an interface element
  - e.g., clicking on a photo in a website together with holding down the Control key results in options ‘open it in a new window,’ ‘save it,’ or ‘copy it’
- Helps overcome some of the navigation problems associated with cascading menus

Windows Jump List Menu



Research and design issues

- What are best names/labels/phrases to use?
- Placement in list is critical
  - Quit and save need to be far apart
- Many international guidelines exist emphasizing depth/breadth, structure and navigation
  - e.g. ISO 9241

Icon design

- Icons are assumed to be easier to learn and remember than commands
- Can be designed to be compact and variably positioned on a screen
- Now pervasive in every interface
  - e.g. represent desktop objects, tools (e.g. paintbrush), applications (e.g. web browser), and operations (e.g. cut, paste, next, accept, change)

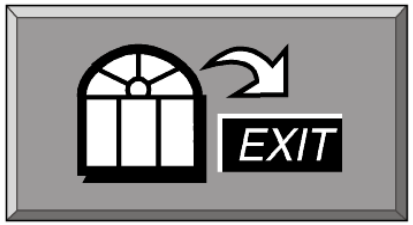
Icons

- Since the Xerox Star days icons have changed in their look and feel:
  - black and white -> color, shadowing, photorealistic images, 3D rendering, and animation
- Many designed to be very detailed and animated making them both visually attractive and informative
- GUIs now highly inviting, emotionally appealing, and feel alive

Icon forms

- The mapping between the representation and underlying referent can be:
  - similar (e.g., a picture of a file to represent the object file),
  - analogical (e.g., a picture of a pair of scissors to represent 'cut')
  - arbitrary (e.g., the use of an X to represent 'delete')
- Most effective icons are similar ones
- Many operations are actions making it more difficult to represent them
  - use a combination of objects and symbols that capture the salient part of an action

Early icons



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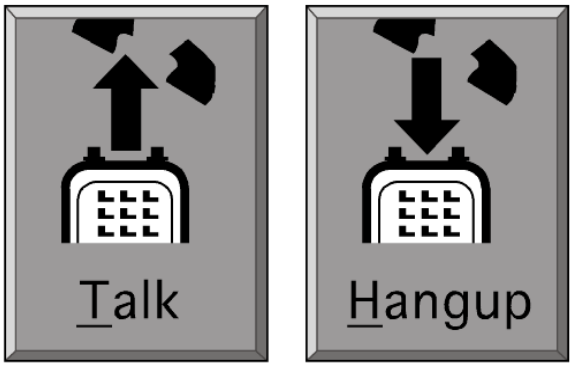

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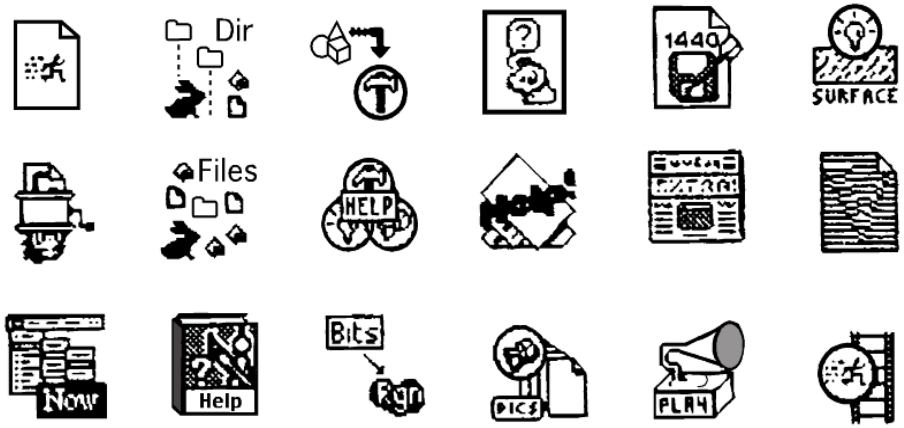
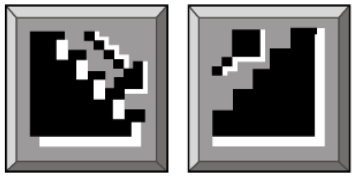


(d)

(c)

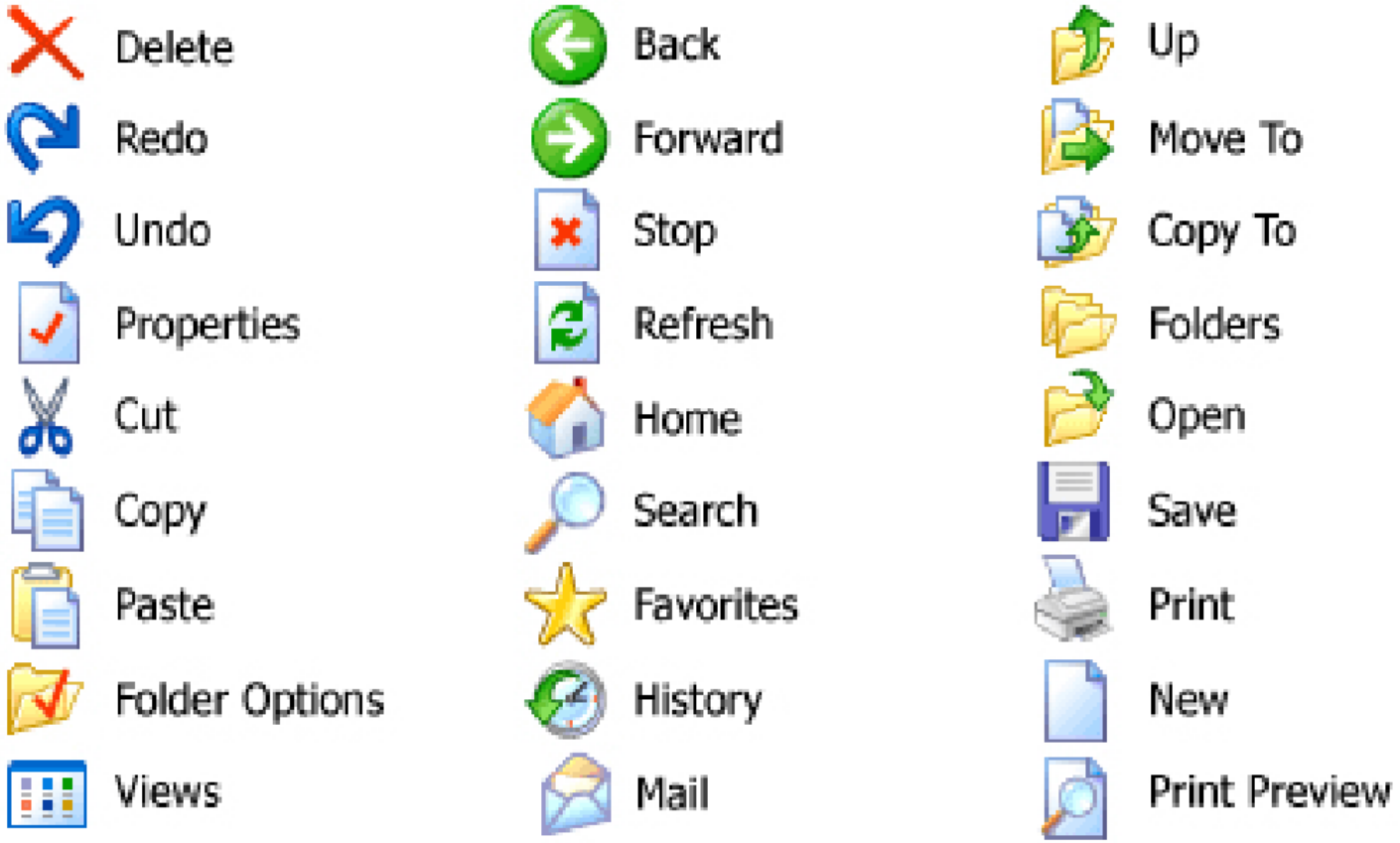


Newer icons






Simple icons plus labels



Activity

- Sketch simple icons to represent the operations to appear on a digital camera LCD screen:
  - Delete last picture taken
  - Delete all pictures stored
  - Format memory card

Toshiba's icons

- Which is which?
- Are they easy to understand
- Are they distinguishable?
- What representation forms are used?
- How do yours compare?

Research and design issues

- There is a wealth of resources now so do not have to draw or invent new icons from scratch
  - guidelines, style guides, icon builders, libraries
- Text labels can be used alongside icons to help identification for small icon sets
- For large icon sets (e.g. photo editing or word processing) use rollovers

3. Multimedia

- Combines different media within a single interface with various forms of interactivity
  - graphics, text, video, sound, and animations
- Users click on links in an image or text
  -> another part of the program
  -> an animation or a video clip is played
  ->can return to where they were or move on to another place

BioBlast multimedia learning environment

Pros and cons

- Facilitates rapid access to multiple representations of information
- Can provide better ways of presenting information than can any media alone
- Can enable easier learning, better understanding, more engagement, and more pleasure
- Can encourage users to explore different parts of a game or story
- Tendency to play video clips and animations, while skimming through accompanying text or diagrams

Research and design issues

- How to design multimedia to help users explore, keep track of, and integrate the multiple representations
  - provide hands-on interactivities and simulations that the user has to complete to solve a task
  - Use 'dynalinking,' where information depicted in one window explicitly changes in relation to what happens in another (Scaife and Rogers, 1996).
- Several guidelines that recommend how to combine multiple media for different kinds of task

4. Virtual reality

- Computer-generated graphical simulations providing:
  - "the illusion of participation in a synthetic environment rather than external observation of such an environment" (Gigante, 1993)
- provide new kinds of experience, enabling users to interact with objects and navigate in 3D space
- Create highly engaging user experiences

Pros and cons

- Can have a higher level of fidelity with objects they represent compared to multimedia
- Induces a sense of presence where someone is totally engrossed by the experience
  - "a state of consciousness, the (psychological) sense of being in the virtual environment" (Slater and Wilbur, 1999)
- Provides different viewpoints: 1st and 3rd person
- Head-mounted displays are uncomfortable to wear, and can cause motion sickness and disorientation

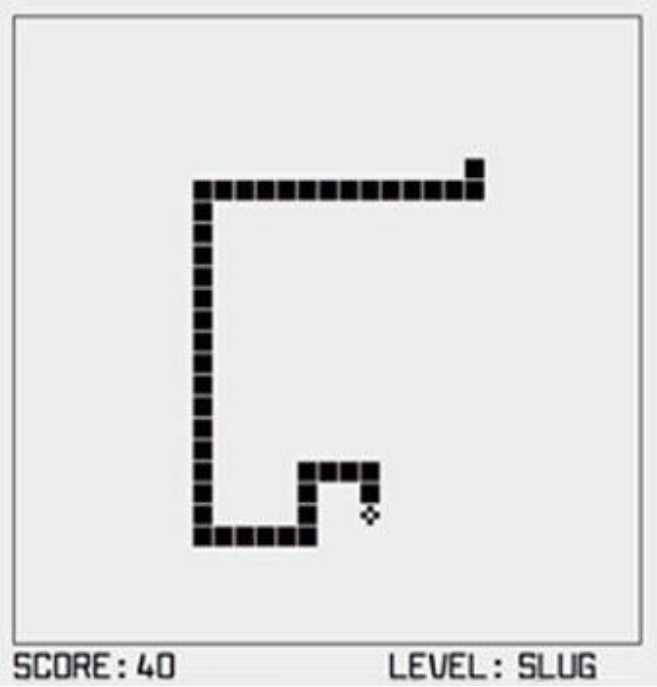
Virtual Gorilla Project

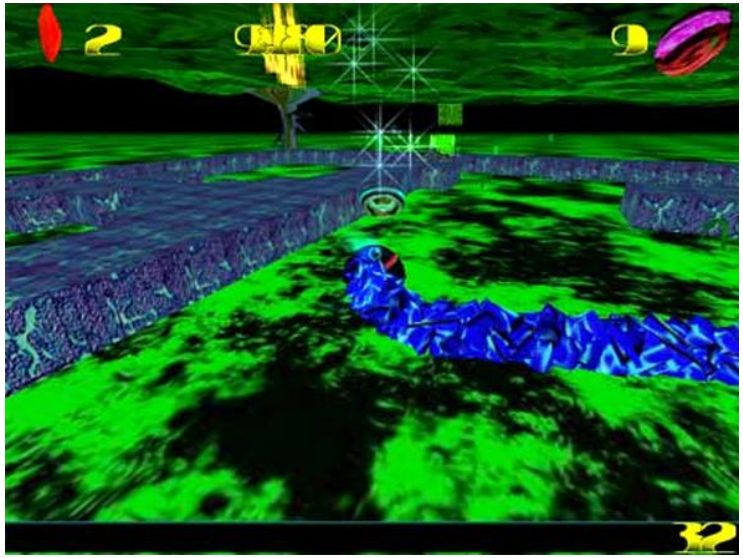
Student wears a head-mounted display and uses a jaystick to interact with a virtual zoo. She sees the virtual gorillas which react to her movements

Research and design issues

- Much research on how to design safe and realistic VRs to facilitate training
  - e.g. flying simulators
  - help people overcome phobias (e.g. spiders, talking in public)
- Design issues
  - how best to navigate through them (e.g. first versus third person)
  - how to control interactions and movements (e.g. use of head and body movements)
  - how best to interact with information (e.g. use of keypads, pointing, joystick buttons);
  - level of realism to aim for to engender a sense of presence

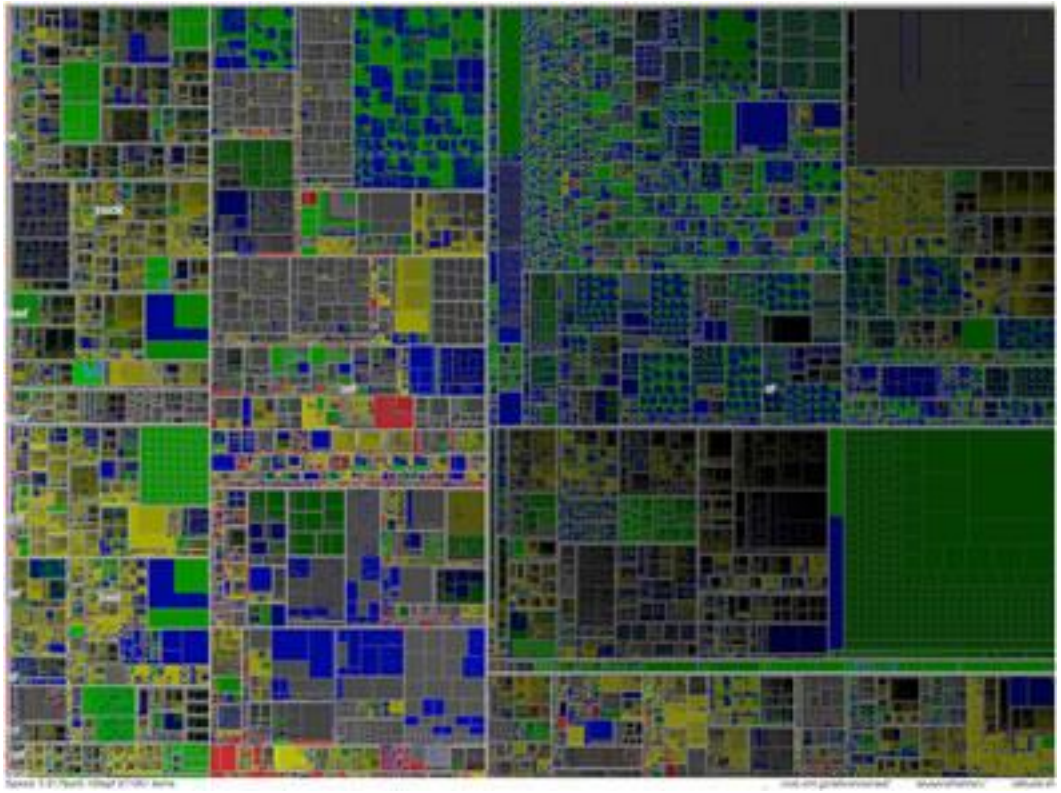
Which is the most engaging game of Snake?



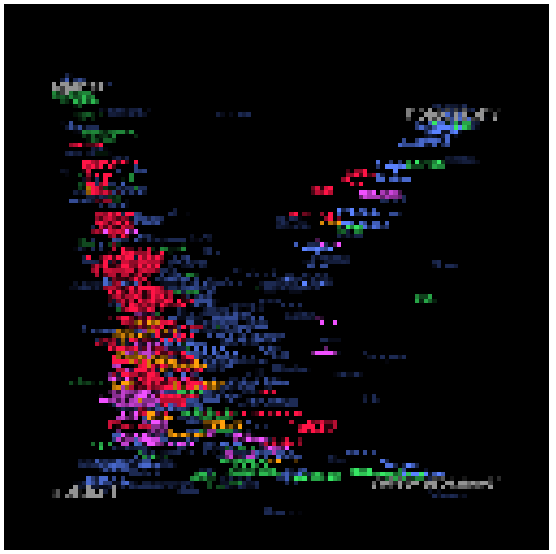


5. Information visualization

- Computer-generated interactive graphics of complex data
- Amplify human cognition, enabling users to see patterns, trends, and anomalies in the visualization (Card *et al,* 1999)
- Aim is to enhance discovery, decision-making, and explanation of phenomena
- Techniques include:
  - 3D interactive maps that can be zoomed in and out of and which present data via webs, trees, clusters, scatterplot diagrams, and interconnected nodes



Interactive visualization of millons items
http://www.cs.umd.edu/hcil/millionvis/



Visual Who
Visualization of electronic community
http://www.aalab.net/projects/maps/

Research and design issues

- whether to use animation and/or interactivity
- what form of coding to use, e.g. color or text labels
- whether to use a 2D or 3D representational format
- what forms of navigation, e.g. zooming or panning,
- what kinds and how much additional information to provide, e.g. rollovers or tables of text
- What navigational metaphor to use

6. Web

- Early websites were largely text-based, providing hyperlinks
- Concern was with how best to structure information at the interface to enable users to navigate and access it easily and quickly
- Nowadays, more emphasis on making pages distinctive, striking, and pleasurable

Usability versus attractive?

- Vanilla or multi-flavour design?
  - Ease of finding something versus aesthetic and enjoyable experience
- Web designers are:
  - "thinking great literature"
- Users read the web like a:
  - "billboard going by at 60 miles an hour" (Krug, 2000)
- Need to determine how to brand a web page to catch and keep 'eyeballs'

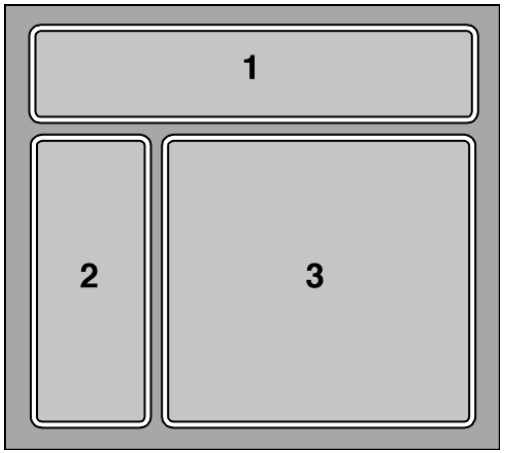
In your face ads

- Web advertising is often intrusive and pervasive
- Flashing, aggressive, persistent, annoying
- Often need to be ‘actioned’ to get rid of
- What is the alternative?

Research and design issues

- Need to consider how best to design, present, and structure information and system behaviour
- But also content and navigation are central
- Veen's design principles

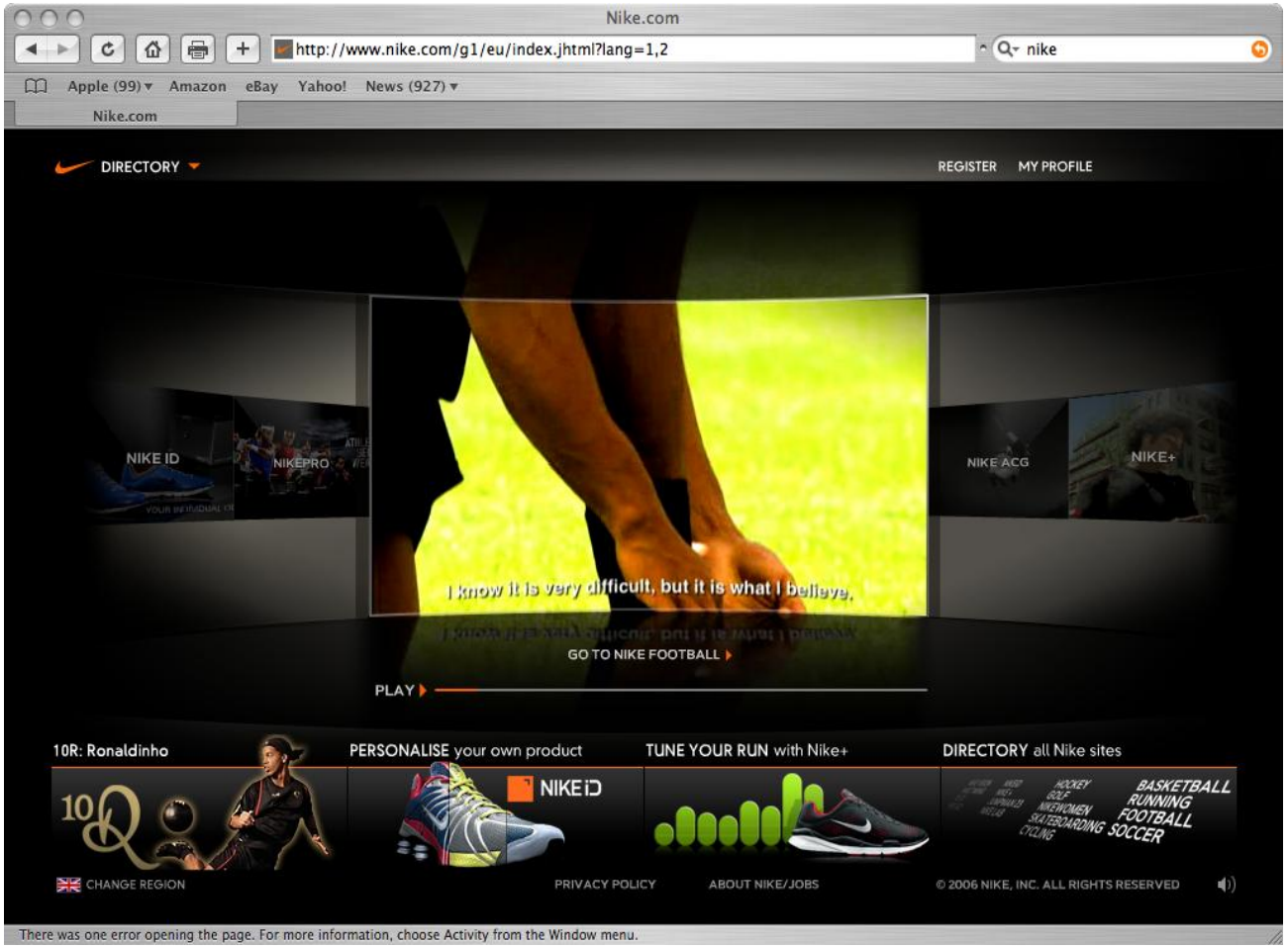
(1)Where am I?
(2)Where can I go?
(3) What's here?



Activity

- Look at the Nike.com website
- What kind of website is it?
- How does it contravene the design principles outlined by Veen?
- Does it matter?
- What kind of user experience is it providing for?
- What was your experience of engaging with it?

Nike.com


Nike.com
http://www.nike.com/g1/eu/index.jhtml?lang=1,2
nike
Apple (99)
Amazon
eBay
Yahoo!
News (927)
Nike.com
DIRECTORY
REGISTER
MY PROFILE
NIKE ID
NIKEPRO
NIKE ACG
NIKE+
I know it is very difficult, but it is what I believe.
GO TO NIKE FOOTBALL
PLAY
10R: Ronaldinho
PERSONALISE your own product
NIKEiD
TUNE YOUR RUN with Nike+
DIRECTORY all Nike sites
BASKETBALL
RUNNING
FOOTBALL
SOCCER
CHANGE REGION
PRIVACY POLICY
ABOUT NIKE/JOBS
© 2006 NIKE, INC. ALL RIGHTS RESERVED
There was one error opening the page. For more information, choose Activity from the Window menu.

7. Consumer electronics and appliances

- Everyday devices in home, public place, or car
  - e.g. washing machines, remotes, photocopiers, printers and navigation systems)
- And personal devices
  - e.g. MP3 player, digital clock and digital camera
- Used for short periods
  - e.g. putting the washing on, watching a program, buying a ticket, changing the time, taking a snapshot
- Need to be usable with minimal, if any, learning

A toaster

Research and design issues

- Need to design as transient interfaces with short interactions
- Simple interfaces
- Consider trade-off between soft and hard controls
  - e.g. buttons or keys, dials or scrolling

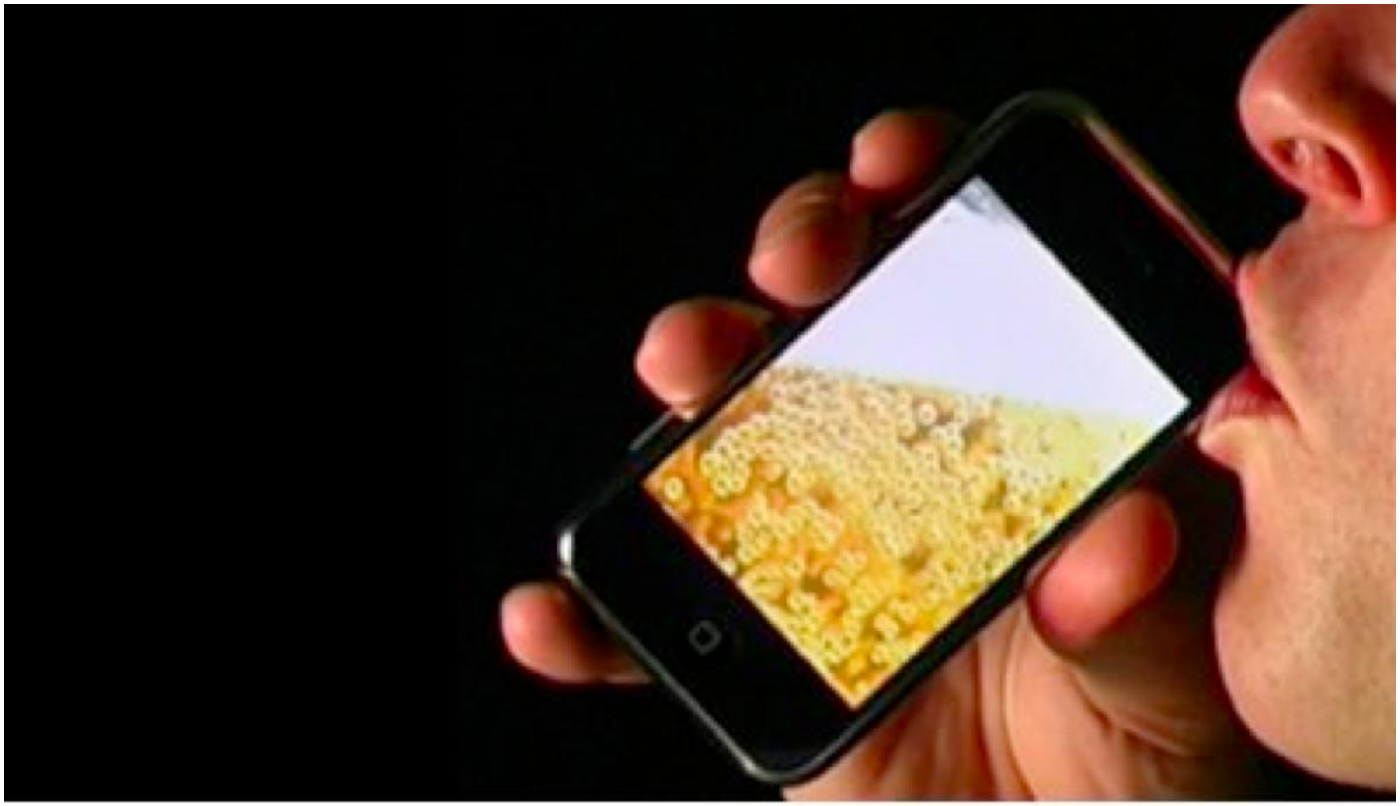
8. Mobile

- Handheld devices intended to be used while on the move
- Have become pervasive, increasingly used in all aspects of everyday and working life
- Applications running on handhelds have greatly expanded, e.g.
  - used in restaurants to take orders
  - car rentals to check in car returns
  - supermarkets for checking stock
  - in the streets for multi-user gaming
  - in education to support life-long learning

The advent of the iPhone app

- A whole new user experience that was designed primarily for people to enjoy
  - many apps not designed for any need, want or use but purely for idle moments to have some fun
  - e.g. iBeer developed by magician Steve Sheraton
  - ingenious use of the accelerometer that is inside the phone

iBeer app

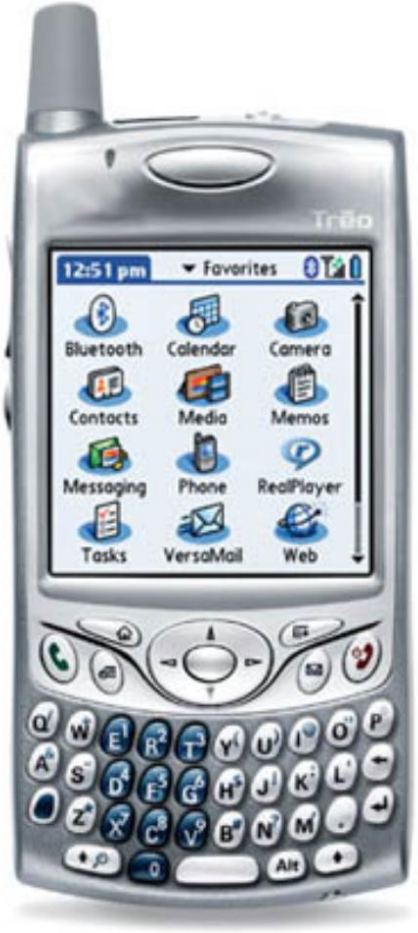


QR codes and cell phones

Mobile challenges

- Small screens, small number of keys and restricted number of controls
- Many smartphones now use multi-touch surface displays
- Innovative physical designs including:
  - roller wheels, rocker dials, up/down 'lips' on the face of phones, 2-way and 4-way directional keypads, soft keys, silk-screened buttons
- Usability and preference varies
  - depends on the dexterity and commitment of the user

Simple or complex phone for you and your grandmother?



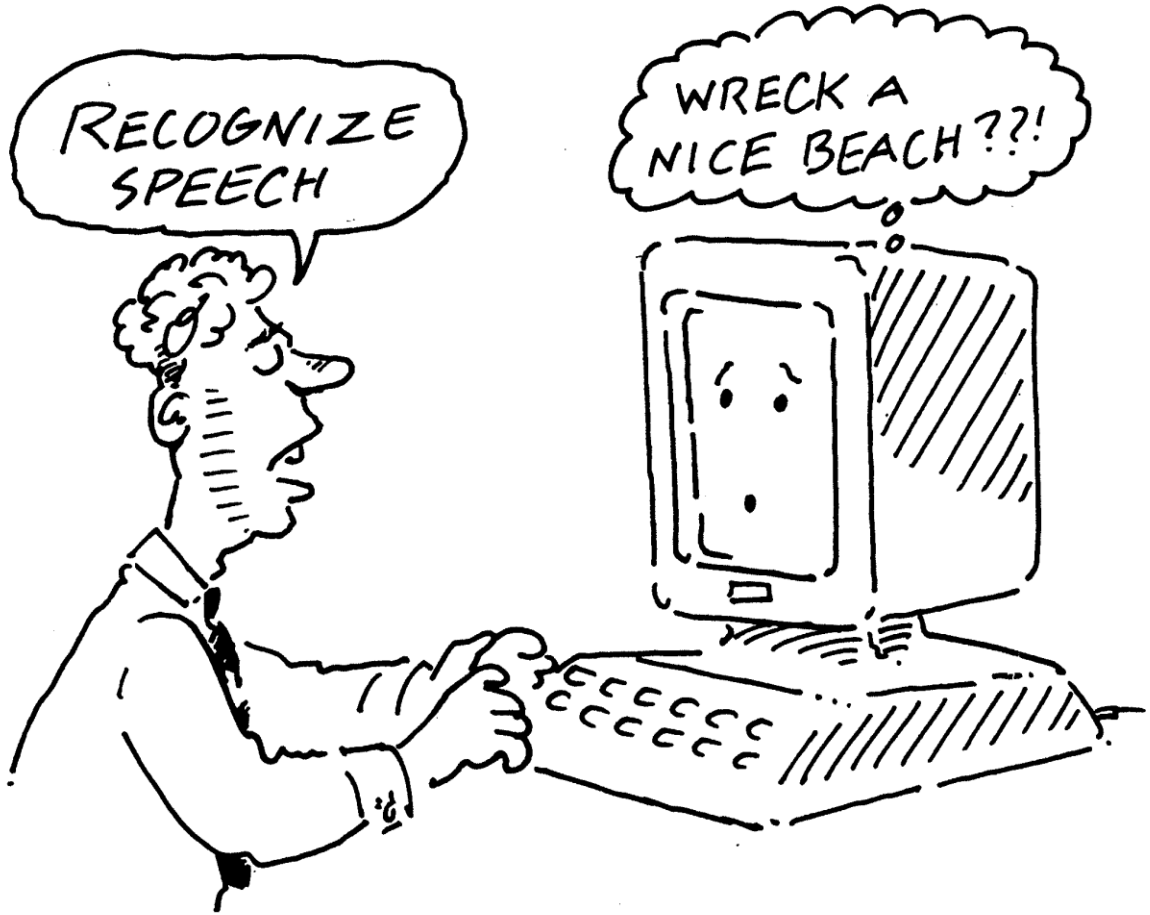
Research and design issues

- mobile interfaces can be tricky and cumbersome to use for those with poor manual dexterity or ‘fat’ fingers
- Key concern is designing for small screen and limited control space
    - e.g. mobile browsers allow users to view and navigate the internet, magazines etc., in a more streamlined way compared with PC web browsers

9. Speech

- Where a person talks with a system that has a spoken language application, e.g., timetable, travel planner
- Used most for inquiring about very specific information, e.g. flight times or to perform a transaction, e.g. buy a ticket
- Also used by people with disabilities
  - e.g. speech recognition word processors, page scanners, web readers, home control systems

Have speech interfaces come of age?



Get me a human operator!

- Most popular use of speech interfaces currently is for call routing
- Caller-led speech where users state their needs in their own words
  - e.g. "I'm having problems with my voice mail"
- Idea is they are automatically forwarded to the appropriate service
- What is your experience of speech systems?

Format

- Directed dialogs are where the system is in control of the conversation
- Ask specific questions and require specific responses
- More flexible systems allow the user to take the initiative:
  - e.g. "I'd like to go to Paris next Monday for two weeks."
- More chance of error, since caller might assume that the system is like a human
- Guided prompts can help callers back on track
  - e.g. "Sorry I did not get all that. Did you say you wanted to fly next Monday?"

Research and design issues

- How to design systems that can keep conversation on track
  - help people navigate efficiently through a menu system
  - enable them to easily recover from errors
  - guide those who are vague or ambiguous in their requests for information or services
- Type of voice actor (e.g. male, female, neutral, or dialect)
  - do people prefer to listen to and are more patient with a female or male voice, a northern or southern accent?

That's enough for today

Interface type	See also
1. Command-based	
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3. Multimedia	WIMP and web
4. Virtual reality	Augmented and mixed reality
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16. Tangible	
17. Augmented and mixed reality	Virtual reality
18. Wearable	
19. Robotic	
20. Brain–computer	

Next lecture

Table 6.1 The types of interfaces covered in this chapter