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Week 5

User Interface

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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**

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

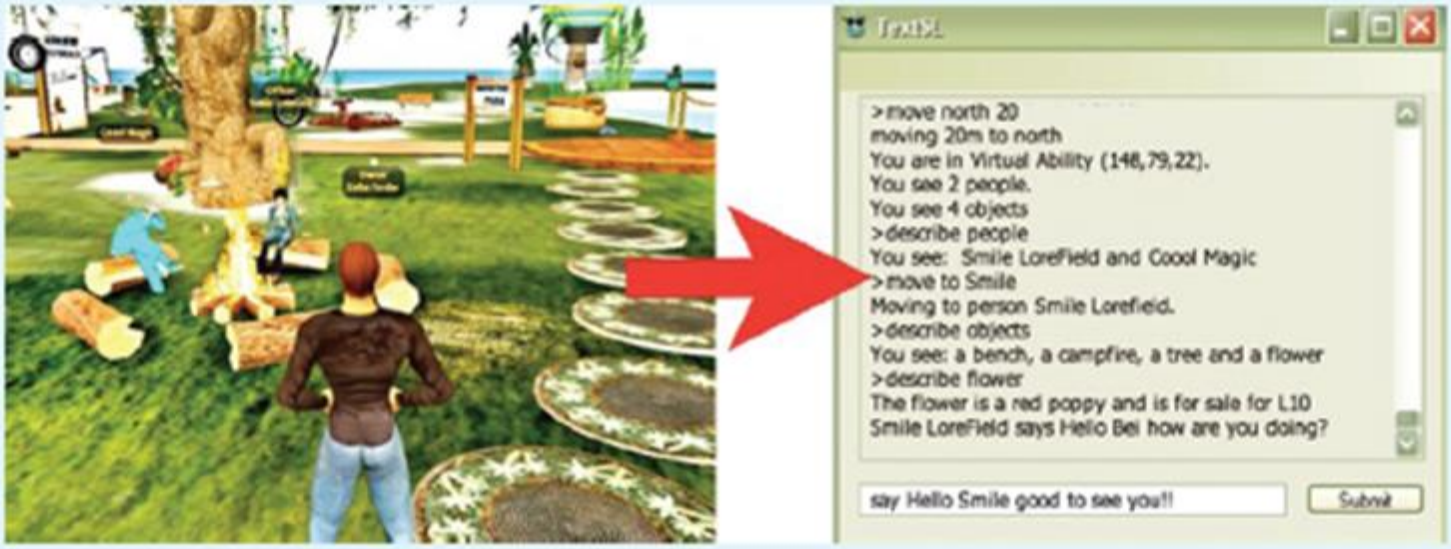

Figure 6.1 Second Life command-based interface for visually impaired users

Source: Reproduced with permission from http://www.eelke.com/images/textsl.jpg.

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

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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
- ➔ **Challenge now is to design GUIs that are best suited for tablet, smartphone and smartwatch interfaces**

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

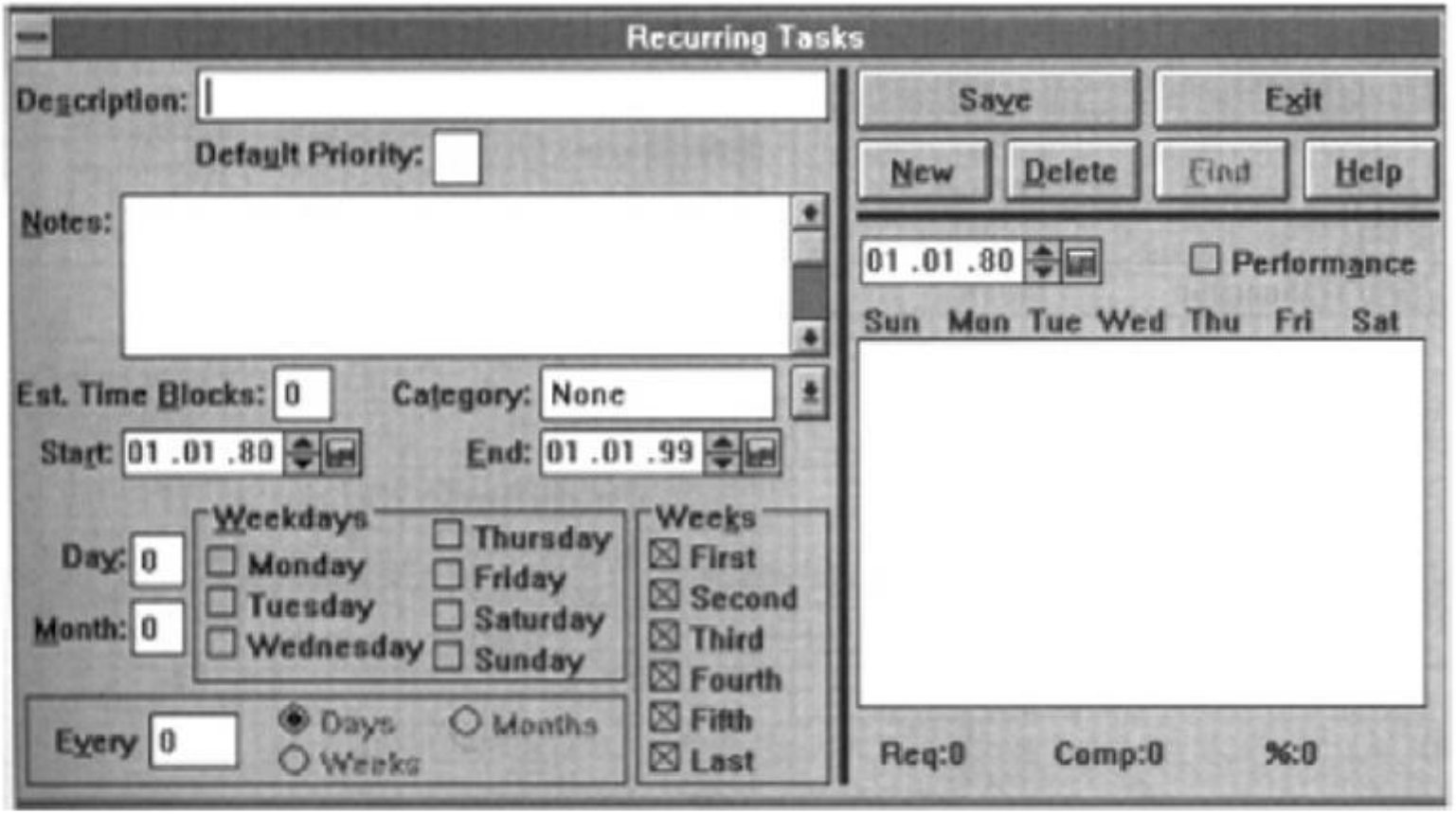
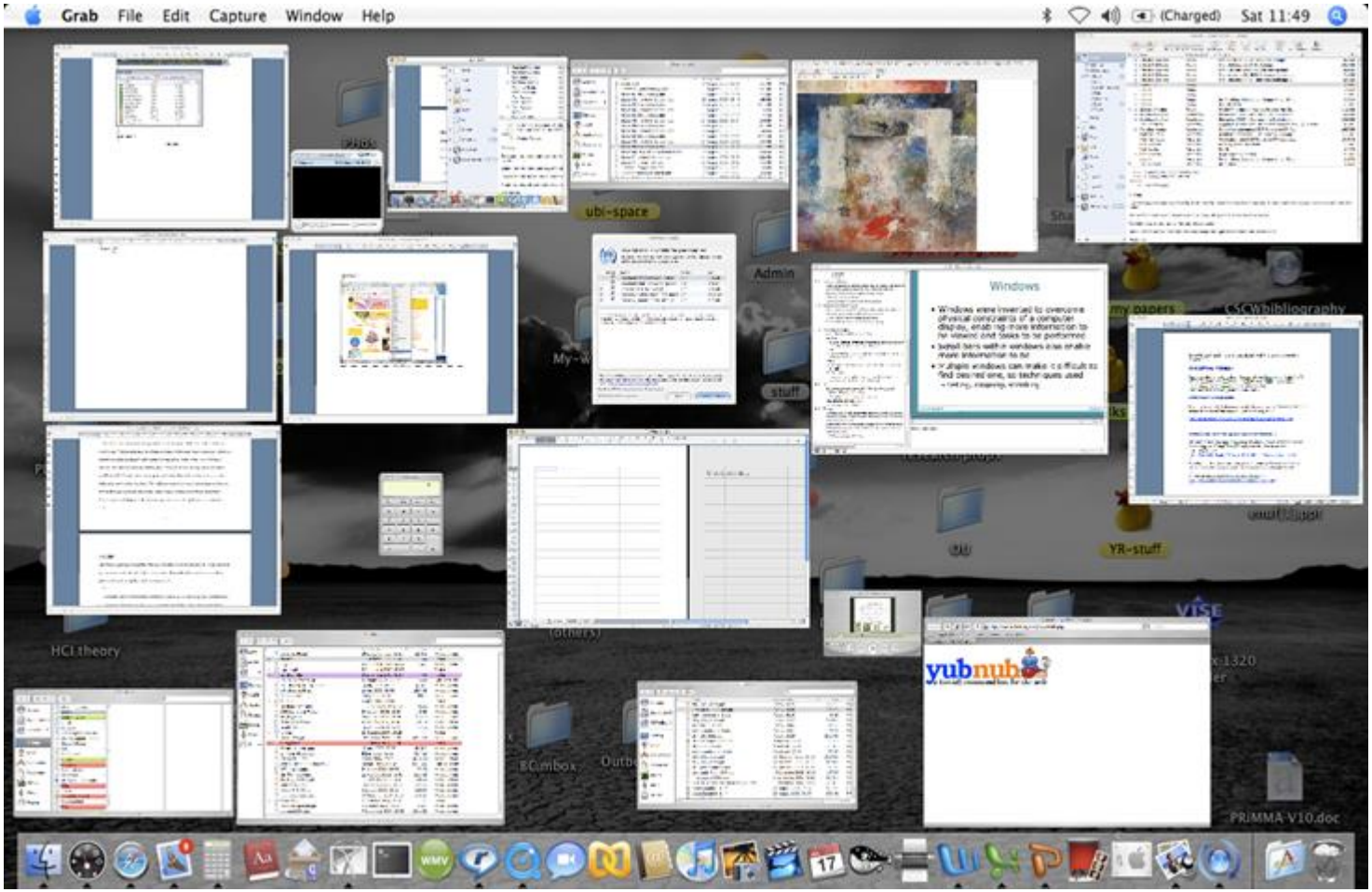


Figure 6.2 The boxy look of the first generation of GUIs. The window presents several check boxes, notes boxes, and options as square buttons

Source: Mullet, Kevin; Sano, Darrell, *Designing Visual Interfaces: Communication Oriented Techniques*, 1st, © 1995. Reproduced by permission of Pearson Education, Inc., Upper Saddle River, New Jersey.

Apple’s shrinking windows



Safari panorama window view

Figure 6.3 A window management technique provided in Safari: pressing the 4 × 3 icon in the top left corner of the bookmarks bar displays the 12 top sites visited, by shrinking them and placing them side by side. This enables the user to see them all at a glance and be able to rapidly switch between them

Selecting a country from a scrolling window

Figure 6.4 A scrolling menu

Source: Screenshot of Camino browser, ©The Camino Project.

Is this method any better?

F	G	H	I	J
Fiji	Gabon	Haiti	Iceland	Jamaica
Finland	Germany	Holland	India	Japan
France	Gibraltar	Honduras	Indonesia	Jordan
French Guyana	Greece	Hong Kong	Iran	
French Polynesia	Greenland	Hungary	Ireland	
	Guadeloupe		Israel	
	Guam		Italy	
	Guatemala		Ivory Coast	

Figure 6.5 An excerpt of the listing of countries in alphabetical order from interflora.co.uk

Source: www.interflora.co.uk. Reproduced with permission.

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**

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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

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

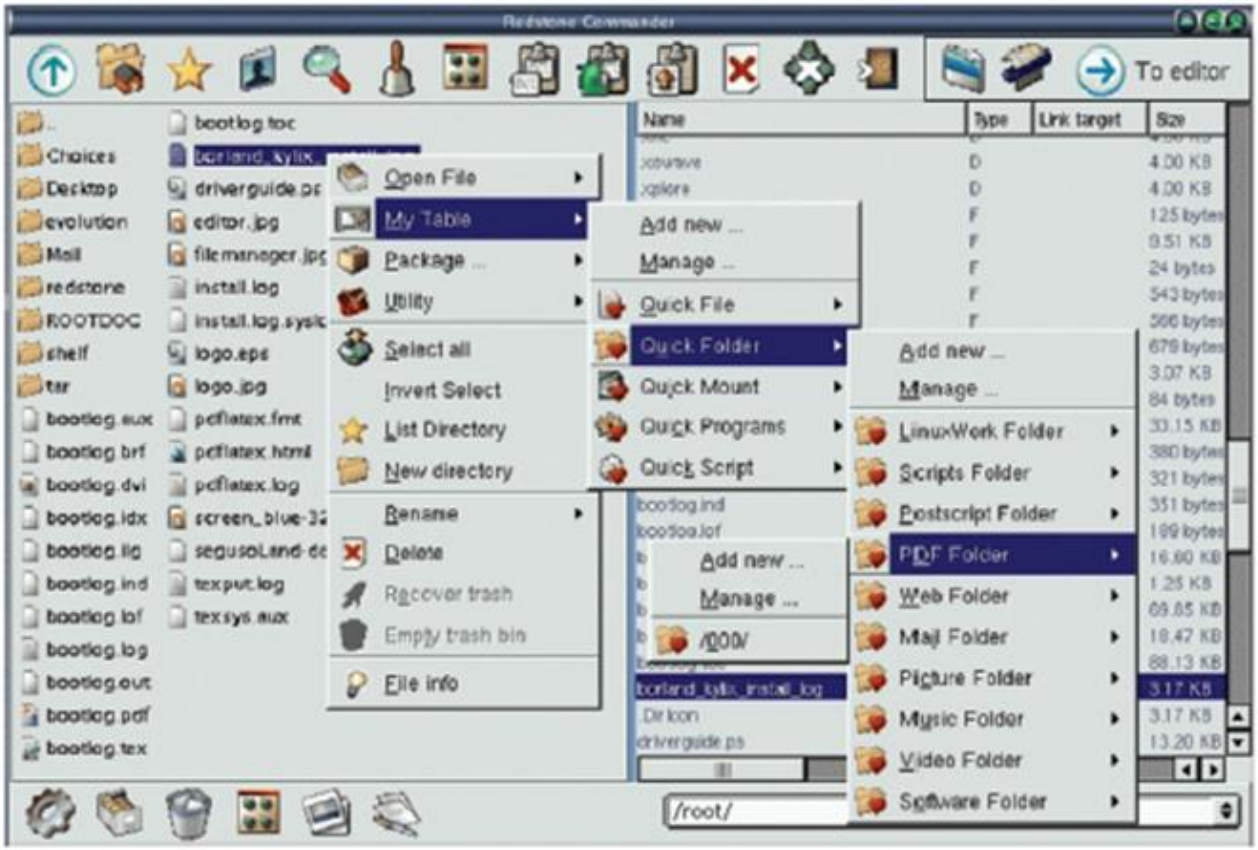

Figure 6.7 A cascading menu

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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

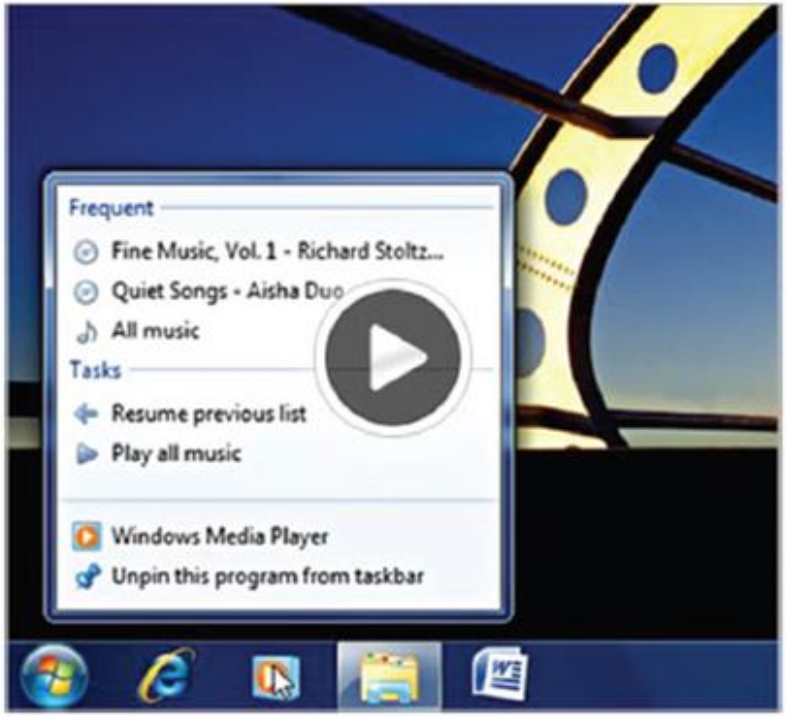

Figure 6.8 Windows jump list

Source: http://windows.microsoft.com/en-US/windows7/products/features/jump-lists.

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
- ➔ **Choice of menu to use determined by application and type of system**
  - ◆ flat menus are best for displaying a small number of options at one time
  - ◆ expanding menus are good for showing a large number of options

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
  - .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**

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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

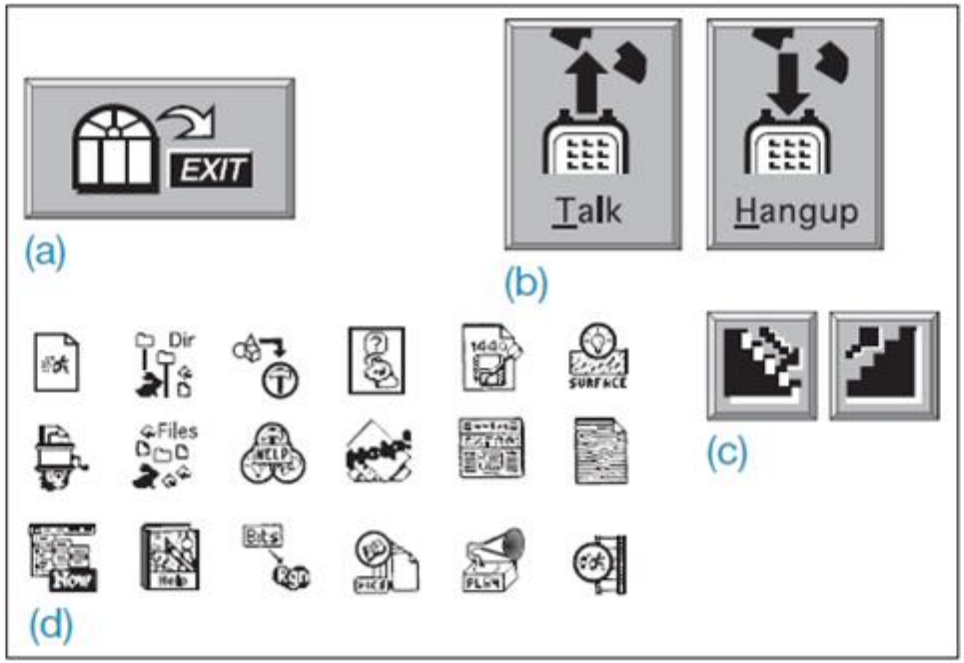

Figure 6.9 Poor icon set from the early 1990s. What do you think they mean and why are they so bad?

Source: K. Mullet and D. Sano: "Designing Visual Interfaces" Pearson 1995, reproduced with permission of Pearson Education.

Newer icons

Figure 6.11 Contrasting genres of Aqua icons used for the Mac. The top row of icons have been designed for user applications and the bottom row for utility applications

Simple flat 2D icons

Figure 6.12 Flat 2D icons designed for smartphone apps

Activity

➔ **Sketch simple icons to represent the following operations to appear on a digital camera screen:**

- Turn image 90 degrees sideways
- Auto-enhance the image
- Fix red-eye
- Crop the image

➔ **Show them to someone else and see if they can understand what each represents**

Basic edit icons on iPhone

- ➔ 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

Figure 6.14 Screen dump from the multimedia environment BioBLAST

Source: Screenshot from BioBlast, ©Wheeling Jesuit University.

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

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?

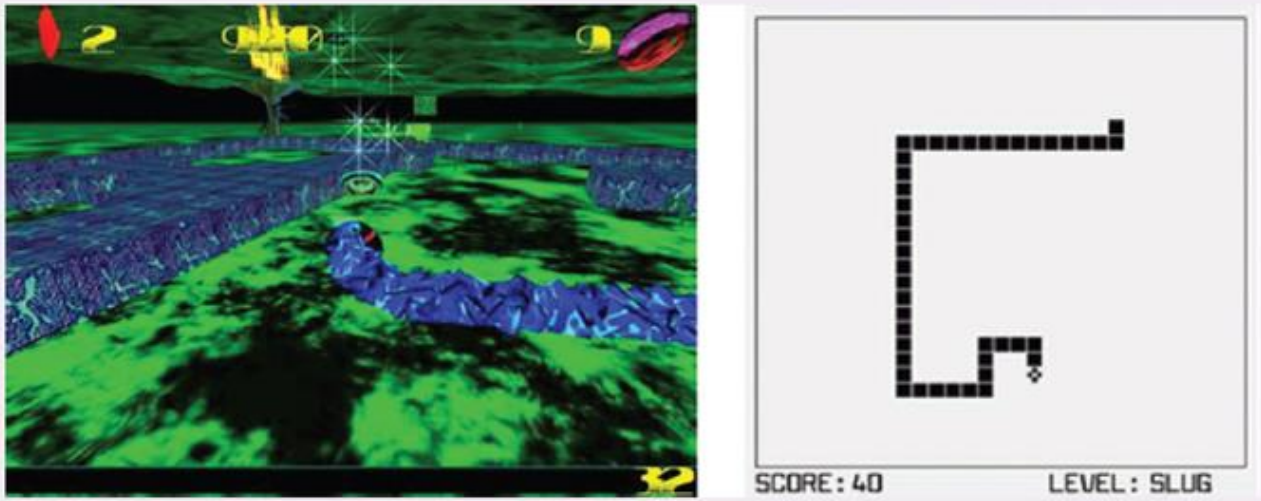

Figure 6.16 Two screenshots from the game Snake – the one on the left is played on a PC and the one on the right on a cell phone. In both games, the goal is to move the snake (the blue thing and the black squares, respectively) towards targets that pop up on the screen (e.g. the bridge, the star) and to avoid obstacles (e.g. a flower, the end of the snake's tail). When a player successfully moves his snake head over or under a target, the snake increases its length by one blob or block. The longer the snake gets, the harder it is to avoid obstacles. If the snake hits an obstacle, the game is over. On the PC version there are lots of extra features that make the game more complicated, including more obstacles and ways of moving. The cell phone version has a simple 2D bird's eye representation, whereas the PC version adopts a 3D third-person avatar perspective

5. Information visualization and dashboards

- ➔ 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

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Dashboards

- Show screenshots of data updated over periods of time - to be read at a glance
- Usually not interactive - slices of data that depict current state of a system or process
- Need to provide digestible and legible information for users
  - design its spatial layout so intuitive to read when first looking at it should also direct a user's attention to anomalies or unexpected deviations

Which dashboard is best?

(a)

Figure 6.18 Screenshots from two dashboards: (a) British Airways frequent flier club that shows how much a member has flown since joining them, and (b) London City that provides various information feeds. Which is the easier to read and most informative?

Which dashboard is best?

(b)

Figure 6.18 Screenshots from two dashboards: (a) British Airways frequent flier club that shows how much a member has flown since joining them, and (b) London City that provides various information feeds. Which is the easier to read and most informative?

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 to enable users to navigate and access it easily and quickly
- Nowadays, more emphasis on making pages distinctive, striking, and pleasurable
- Need to think of how to design information for multi-platforms - keyboard or touch?
  - e.g. smartphones, tablets, PCs

Usability versus attractive?

- **Vanilla or multi-flavor 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 behavior
- But also content and navigation are central
- Veen's (2001) design principles
  - (1) Where am I?
  - (2) Where can I go?
  - (3) What's here?

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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?

7. Mobile

- Handheld devices intended to be used while on the move
- Have become pervasive, increasingly used in all aspects of everyday and working life
- Apps running on mobiles 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

Figure 6.20 The iBeer smartphone app

Source: iBeer™ Photo ©2010 HOTTRIX® Reproduced with permission.

QR codes and cell phones

QR codes and cell phones

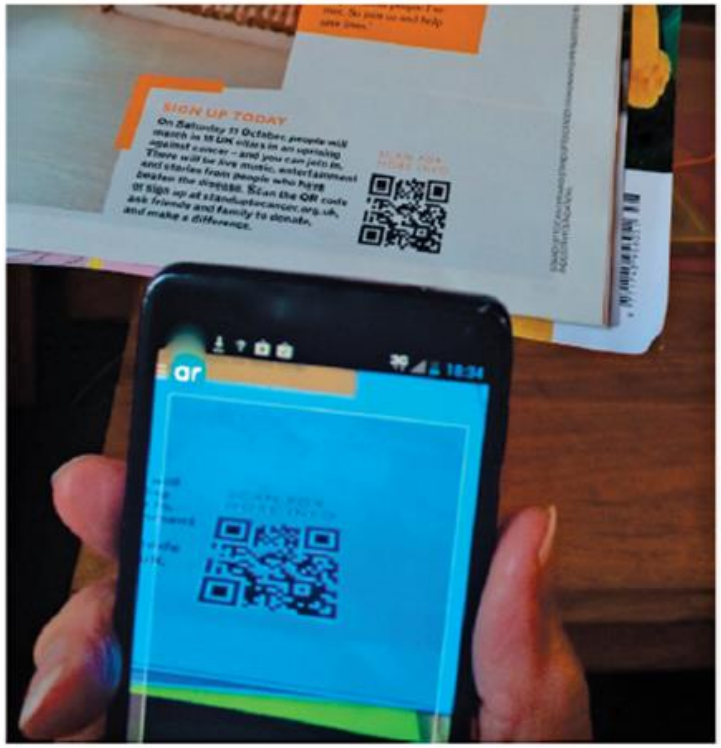

Figure 6.21 QR code appearing on a magazine page

Mobile challenges

- Smaller screens, small number of physical keys and restricted number of controls
- Innovative physical designs including:
  - roller wheels, rocker dials, up/down ‘lips’ on the face of phones, 2-way and 4-way directional keypads, softkeys, silk-screened buttons
- Usability and preference varies
  - depends on the dexterity and commitment of the user
- Smartphones overcome mobile physical constraints through using multi-touch displays

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 hit area**
  - area on the phone display that the user touches to make something happen, such as a key, an icon, a button or an app
  - space needs to be big enough for fat fingers to accurately press
  - if too small the user may accidentally press the wrong key

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Summary

- Many innovative interfaces have emerged post the WIMP/GUI era, including speech, wearable, mobile, brain and tangible
- Raises many design and research questions to decide which to use
  - e.g. how best to represent information to the user so they can carry out ongoing activity or task
- New interfaces that are context-aware or monitor raise ethical issues concerned with what data is being collected and what it is used for