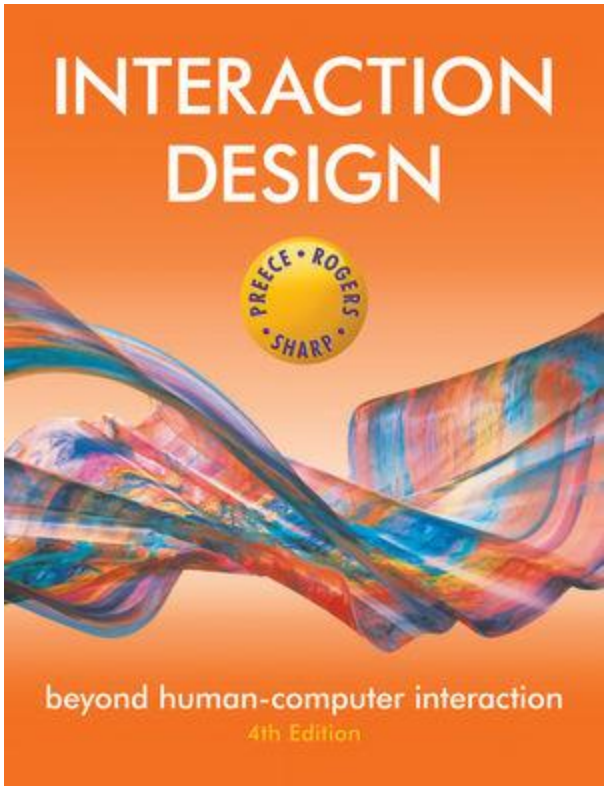


Chapter 6
INTERFACES

Road Map

- Chapter 6 INTERFACES
  - 6.1 Introduction
  - 6.2 Interface Types
  - 6.4 Which Interface?

Objectives

- Provide an overview of the many different kinds of interfaces.
- Consider which interface is best for given application or activity.

Overview

- Interface types

- Consider which interface is best for a given application or activity

INTERFACES
Introduction

- Until mid 1990s interaction designers concerned themselves to develop efficient and effective user interfaces for desktop computers aimed at a single user. This include determining how to structure menus to make options easy to navigate, designing icons and other graphical elements to be easily recognized and distinguished from one another, and developing logical dialog boxes that are easy to fill. Advances in graphical interfaces, speech, gesture and handwriting recognition, together with the internet, smartphones, wireless network, sensor technologies.
- The goal of this chapter is how to design interfaces for different environments, people, places, and activities.

Interfaces Types

- There are numerous types of interfaces:

1-Command-based	5-Information Visualization and dashboards	9-Speech	13-Haptic	17-Augmented Reality
2-WIMP and GUI	6-Web	10-Pen	14-Multimodal	18-Wearable
3-Multimedia	7-Consumer electronics and appliances	11-Touch	15-Shareable	19-Robots
4-Virtual Reality	8-Mobile	12-Air-based gesture	16-Tangible	20-Brain Computer Interaction

Interfaces Categories

- Some of the types are primarily concerned with :
  - A Function (intelligent, adaptive, smart)
  - Interaction style (command, graphical, multimedia)
  - Input/output device used (pen-based, speech-based, gesture-based)
  - Platform being designed for (PC, mobile, tablet, wearable)

1. Command-based

1. Command-based

- Require the user to type in Commands were abbreviations (e.g. ls or dir) 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

Command-Organization Strategies

A unifying interface concept or metaphor aids
- learning
- problem solving
- retention

Designers often err by choosing a metaphor closer to machine domain than to the user's task domain.

Simple command set
- Each command is chosen to carry out a single task. The number of commands match the number of tasks.
- For small number of tasks, this can produce a system easy to learn and use.
- E.g. the vi editor of Unix.

Command plus arguments/options

Command plus arguments

- Follow each command by one or more arguments that indicate objects to be manipulated, e.g.
  - COPY FILEA, FILEB
  - DELETE FILEA
  - PRINT FILEA, FILEB, FILEC
- Keyword labels for arguments are helpful for some users, e.g. COPY FROM=FILEA TO=FILEB.

- Commands may also have options to indicate special cases, e.g.:
  - PRINT/3,HQ FILEA
  - PRINT (3, HQ) FILEA
  - PRINT FILEA -3, HQ

  to produce 3 copies of FILEA on the printer in the headquarters building.
- Error rates and the need for extensive training increase with the number of possible options.

1. Command-based

- Examples:
  - Command Prompt in Windows
  - Ctrl+C for copy in Windows
  - Cmd+C for copy in Mac

- Commands-based interfaces have been substituted by GUI.
- Useful for Visual Impaired People such as textsl is used to interact with a game.

1. Command-based

- Useful for Visual Impaired People such as textsl is used to interact with a game.

2. WIMP and GUI

2. WIMP and GUI

- Xerox Star first WIMP -> rise to GUIs
- WIMP stands for “Windows, Icons, Menus, Pointer "
- 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
- Challenge now is to design GUIs that are best suited for tablet, smartphone and smartwatch interfaces

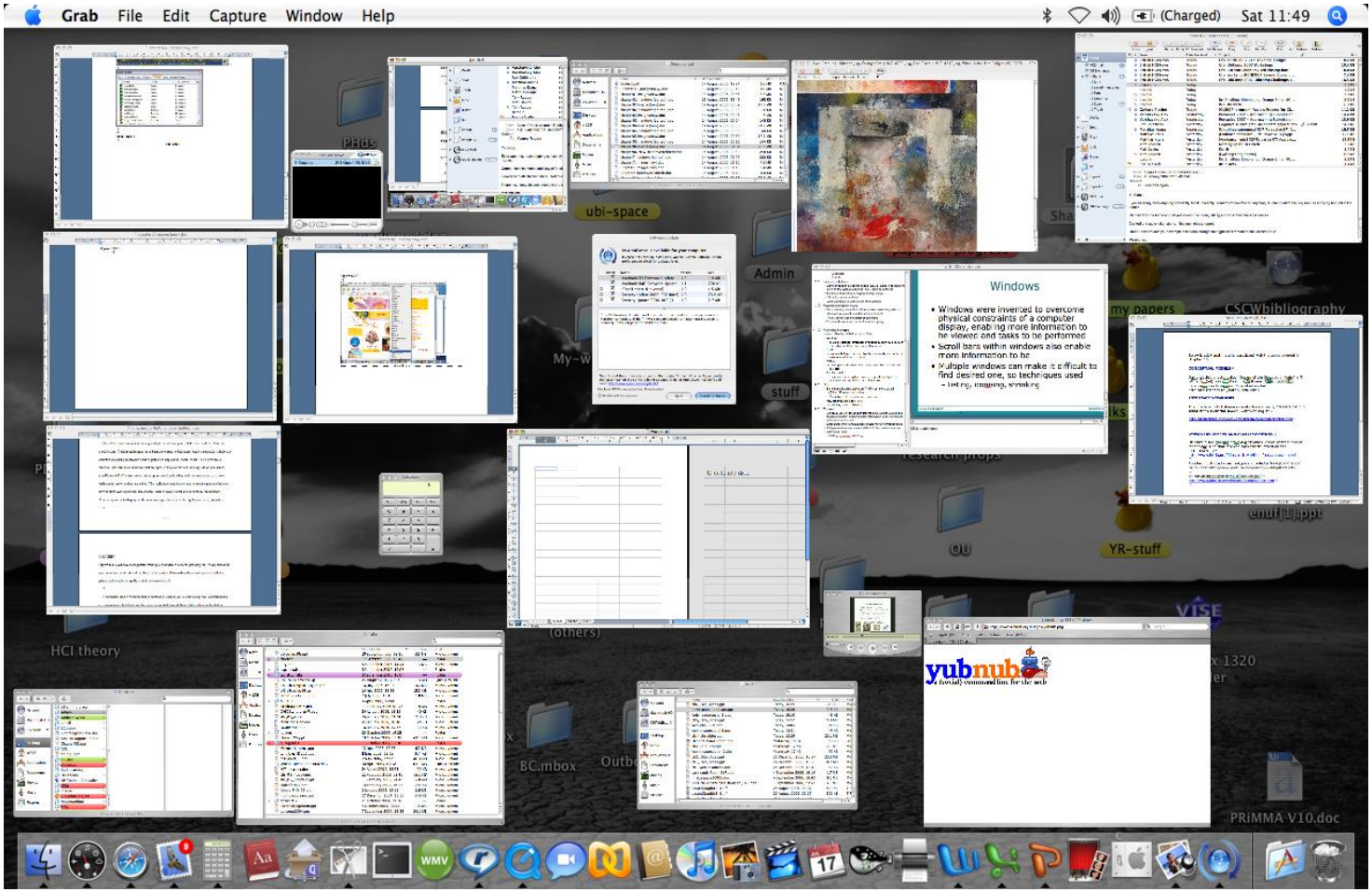
Windows

- 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

Task-Related Organization

"The primary goal for menu, form fill-in, and dialog-box designers is to create a sensible, comprehensible, memorable, and convenient organization relevant to the user's task."

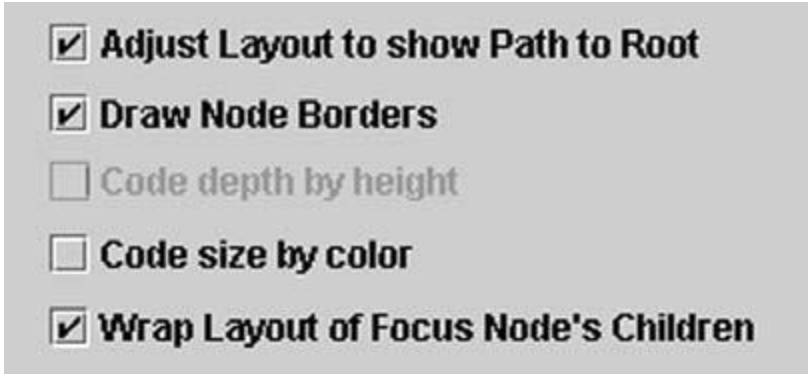
Binary Menus

- **Binary Menus**
  - Mnemonic letters
  - Radio Buttons
  - Button Choice

3. What is your marital status?
   - o Single
   - o Married
   - o Widowed/divorced/separated

Multiple-item Menus

- **Multiple-item Menus**
- **Multiple-selection menus or check boxes**



Pull-down, pop-up, and toolbar menus

- Pull-down menus
  - Always available to the user by making selections on a top menu bar
  - Key board shortcuts
    - E.g., Ctrl-C important to support expert user efficiency
  - Toolbars, iconic menus, and palletes
    - Offers actions on a displayed object
  - Pop-up menus
    - Appear on a display in response to a check or tap with a pointing device.

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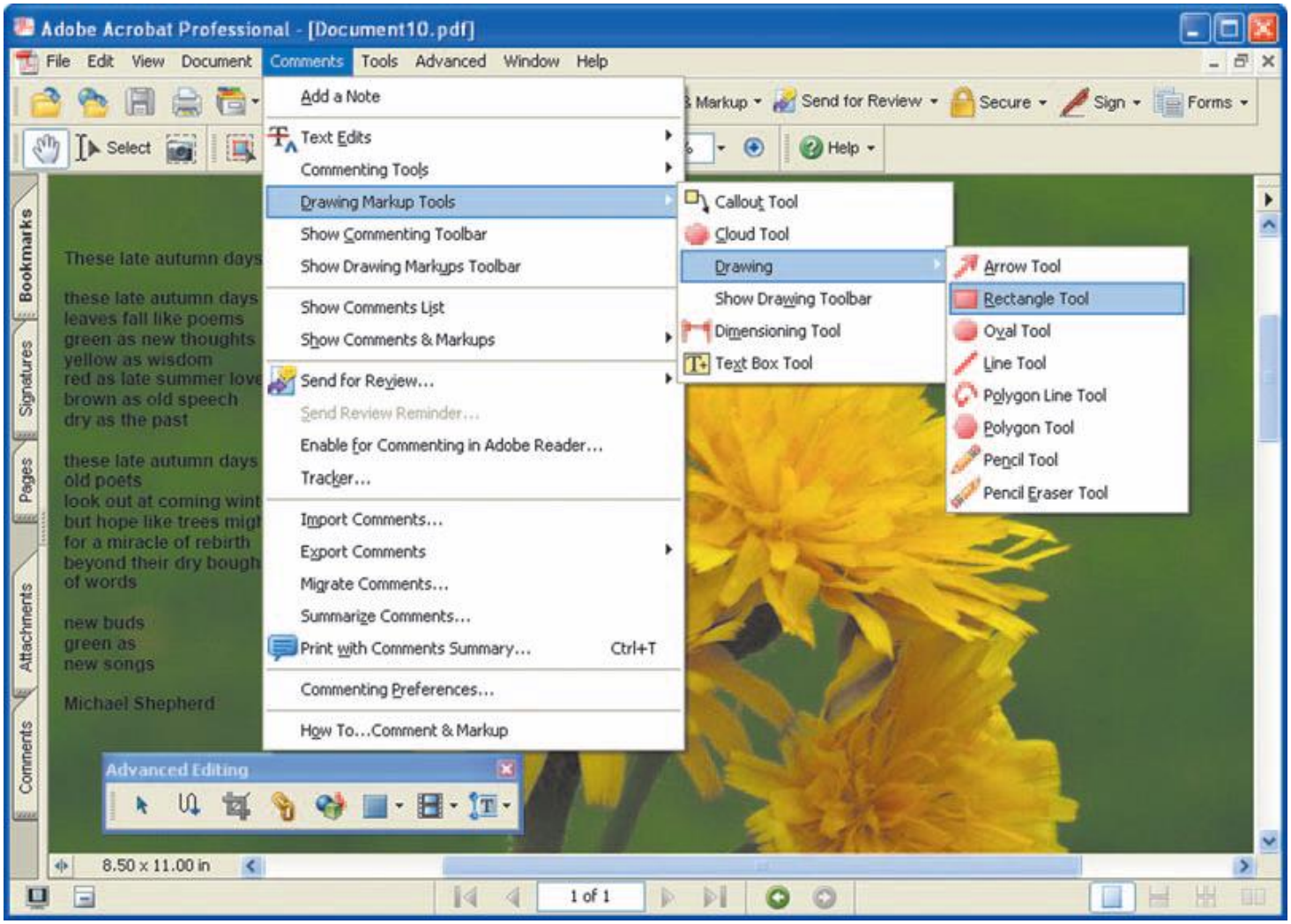
Cascading Pull-down Menu



Cascading menu

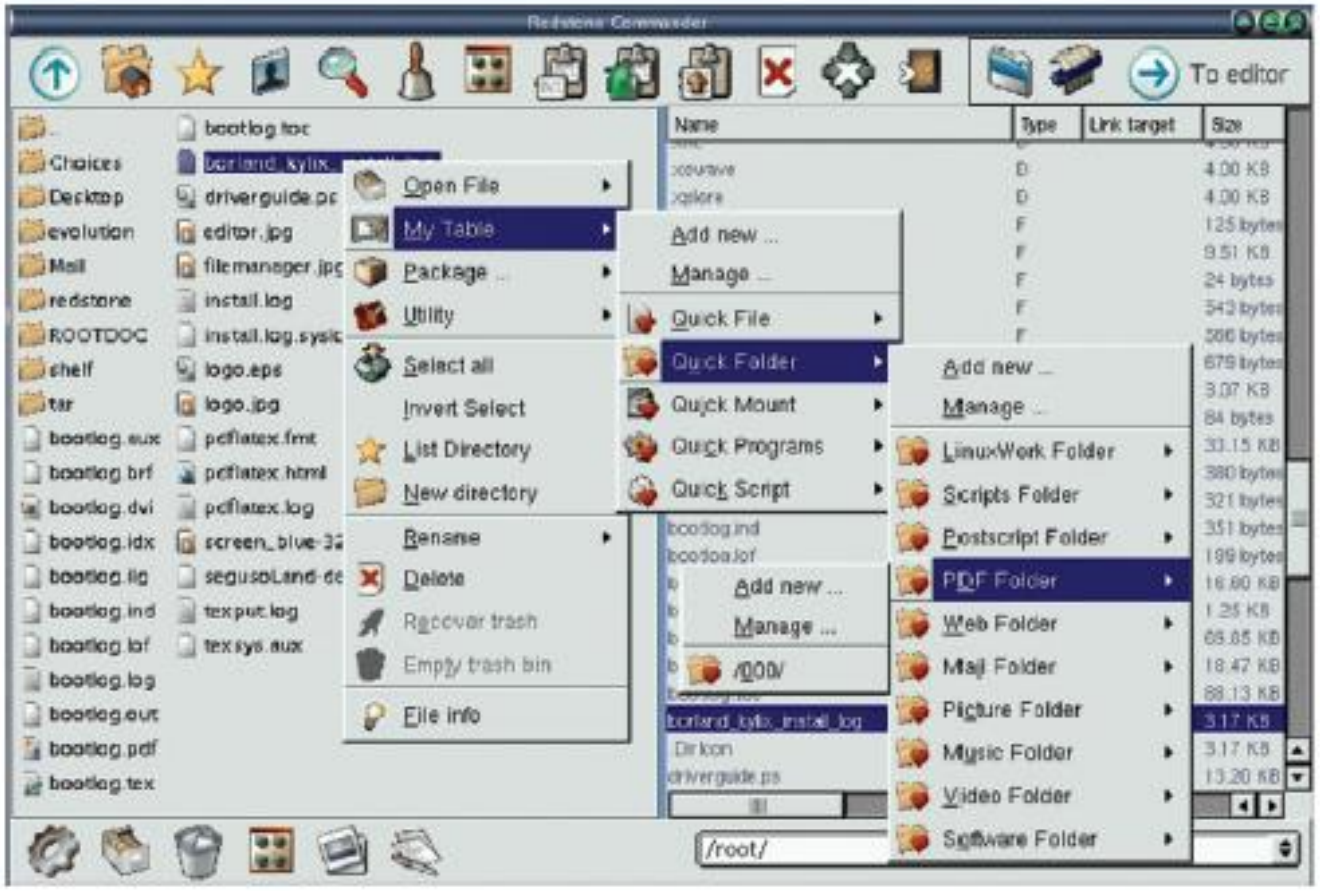
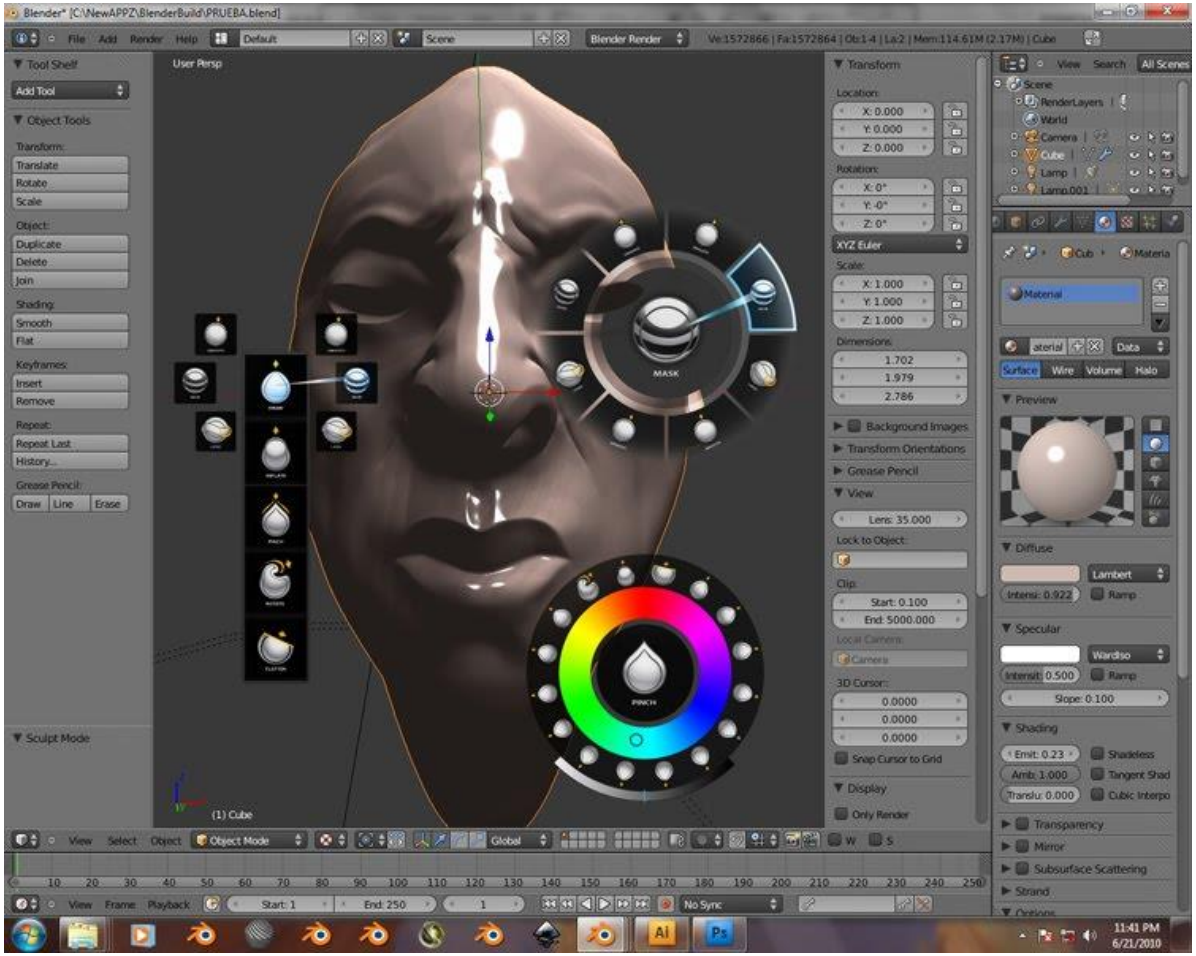


Figure 6.7 A cascading menu

Pie Menu



Pie Menu

Menus for long lists

Selecting a country from a scrolling menu

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

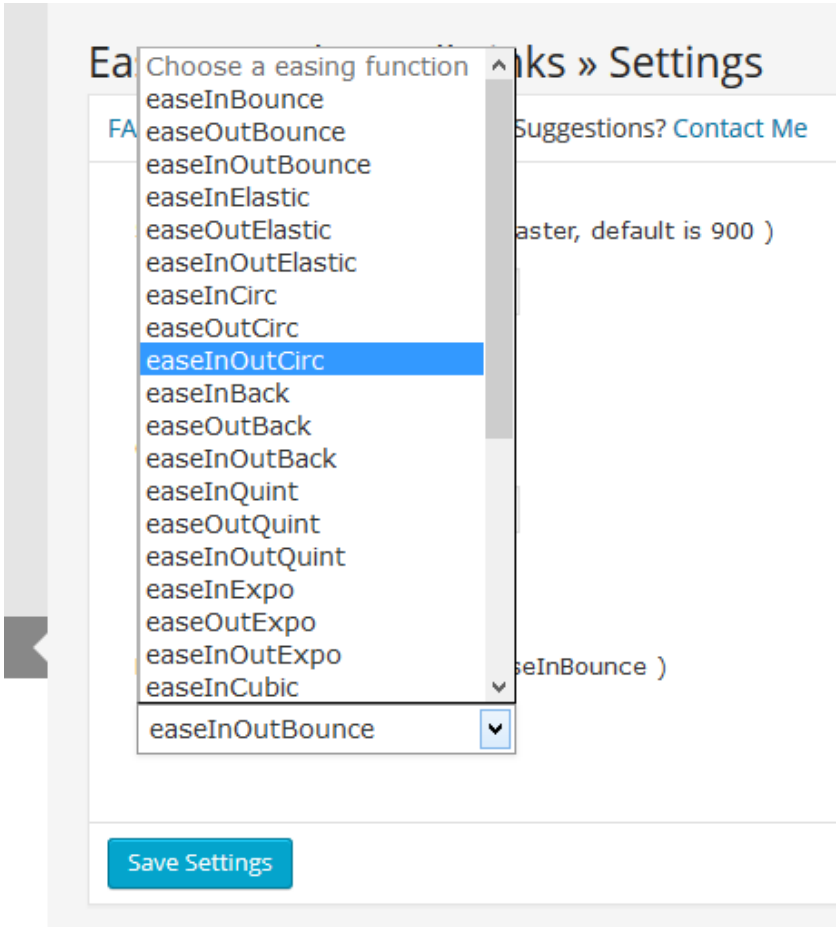
Source: www.interflora.co.uk. Reproduced with permission.

Menus for long lists

- **Menus for long lists**
  - Sometimes the list of menu items may be longer than 30 to 40 lines that can not reasonably fit on a display.
  - One solution is to create a tree structure menu but some times the desire is to limit the interface to one conceptual menu is strong.
  - Example: list of countries that can be categorized by alphabet order or to be kept on a scrolling menu as one list.

Menus for long lists

- **Scrolling menus**
  - Scrolling menus display the first portion of the menu and an additional menu item, typically an arrow that leads to the next set of items in the menu sequence.
  - Keyboard short-cuts might allow might allow users to type letters for directly scroll the first word starts with the letter but this feature is not always discovered.



Menus for long lists

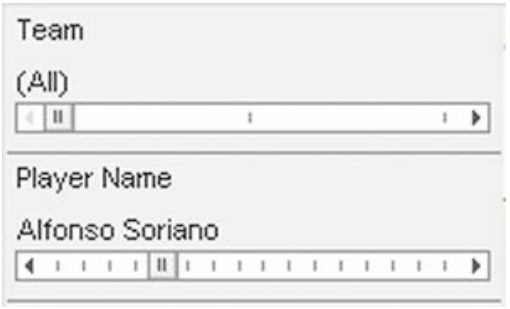
- **Menus for long lists**
  - Combo boxes
    - Combo boxes combine a scrolling menu with a text-entry filed. Users can type leading characters to scroll quickly through the list.

Menus for long lists

- Fisheye menus
  - Fisheye menus display all of the menu items on the screen at once, but show only items near the cursor at full size, items further away are displayed at a smaller size.
  - Fisheye menus have been made popular by Apple's Mac OS X.

Menus for long lists

- **Menus for long lists**
  - Sliders and alpha-sliders
    - When items consist of ranges or numerical values, a slider is a natural choice to allow the selection of a value.
    - The alph-aslider uses multiple levels of granularity in moving the slider thumb and therefore can support tens or hundreds of thousand of items.



Menus for long lists

- **Menus for long lists (cont.)**
  - Two-dimensional menus
    - “Fast and vast” two-dimensional menus give users a good overview of the choices, reduce the number of required actions, and allow rapid selection.
    - Multiple-column menus are useful in web-page design to minimize the scrolling needed to see a long list and to give users a single screen overview of the full set of choices using icons or text

Two- Dimensional Menus

contains icons

Two- Dimensional Menus
contains Text

Popular Searches

Cafes & Coffee Shops
Chinese Takeaways
Domestic Cleaning
Estate Agents
Function Rooms & Banqueting
Gas Engineers
Indian Restaurants
Mot Testing
Plumbers
Skip Hire
Taxis & Private Hire Vehicles
More Popular Searches

Accountants
Beauty Salons & Consultants
Car Body Repairs
Day Nurseries
Driving Schools
Farmers
Furniture Shops
Grocers & Convenience Stores
Mobile Hairdressers
Newsagents
Pubs
Solicitors
Tyres

Architects
Boarding Kennels
Carpenters & Joiners
Dentists
Dry Cleaners
Fencing Services
Garage Services
Hairdressers
Mobile Phone Repairs & Services
Painters & Decorators
Restaurants
Supermarkets
Vets

Barbers
Builders
Charity Shops
Doctors (medical Practitioners)
Electricians & Electrical Contractors
Florists
Garden Services
Hotels & Inns
Mortgages
Pharmacies
Roofing Services
Takeaway Food
Window Cleaners

Popular Locations

Newcastle Upon Tyne
Sheffield
Nottingham
Aberdeen
Norwich
Peterborough

London
Birmingham
Liverpool
Belfast
Cardiff
Coventry
Swansea
Reading

Manchester
Glasgow
Bristol
Edinburgh
Leicester
Southampton
Northampton
Leeds

Menus for long lists

- **Embedded menus and hotlinks**
  - Embedded menus are an alternative to explicit menus
  - It is natural to allow users reading about people, events, and places to retrieve detailed information by selecting menus in context.

Embedded Menus

3. Multimedia

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

Multimedia Examples

- Fisher-price
  The ABC's Zoo Learning Game :
  http://www.fisher-price.com/en_US/gamesandactivities/onlinegames/theabcszoolearninggame.html

Multimedia - Activity

- Watch Donald Norman in his first multimedia CD-ROM book (1994): https://vimeo.com/channels/1057867

- What do you think should be included in a modern day e-textbook?

Multimedia - Activity

- What do you think should be included in a modern day e-textbook?
- Users who interact with educational multimedia usually play video and animations while skimming through text or static diagrams.
- The former are dynamic, easy and enjoyable to watch while the latter are static, boring, and difficult to read from the screen.
- One way to encourage more systematic and extensive interactions (interact with dynamic and static components) is to require certain activities to be completed that require reading the text before the user move to the next part.

4. Virtual reality

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

Microsoft unleashes virtual reality in latest Minecraft

- http://nypost.com/2015/06/15/microsoft-unleashes-virtual-reality-in-latest-minecraft/

4. Virtual reality

- VR places users in an immersive (engross in) environment that blocks out the world.
  - Users see an artificial world inside their stereoscopic (image that has depth and solidness) goggles, which is updated as they turn their heads.
- Video : Comcept technology 3D HMD (Head mounted display) PERIPHERAL AND STEREOSCOPIC VISION GOGGLES.mp4

4. Virtual reality

- VR places users in an immersive (engross in) environment that blocks out the world.
  - Users control an activity by hand gestures inside a data glove which allows them to point, select, grasp, and navigate.

Data Glove

4. Virtual reality

- VR places users in an immersive (engross in) environment that blocks out the world.
  - Handheld controllers allow users to have six-degree-of-freedom pointer (3 dimensions of position, 3 dimensions of orientation).

4. Virtual reality

- VR places users in an immersive (engross in) environment that blocks out the world.
  - Virtual worlds allow users to travel through the human body, swim through oceans, participate in fantasy worlds with other distant internet-connected collaborators.

Which is the most engaging game of Snake?

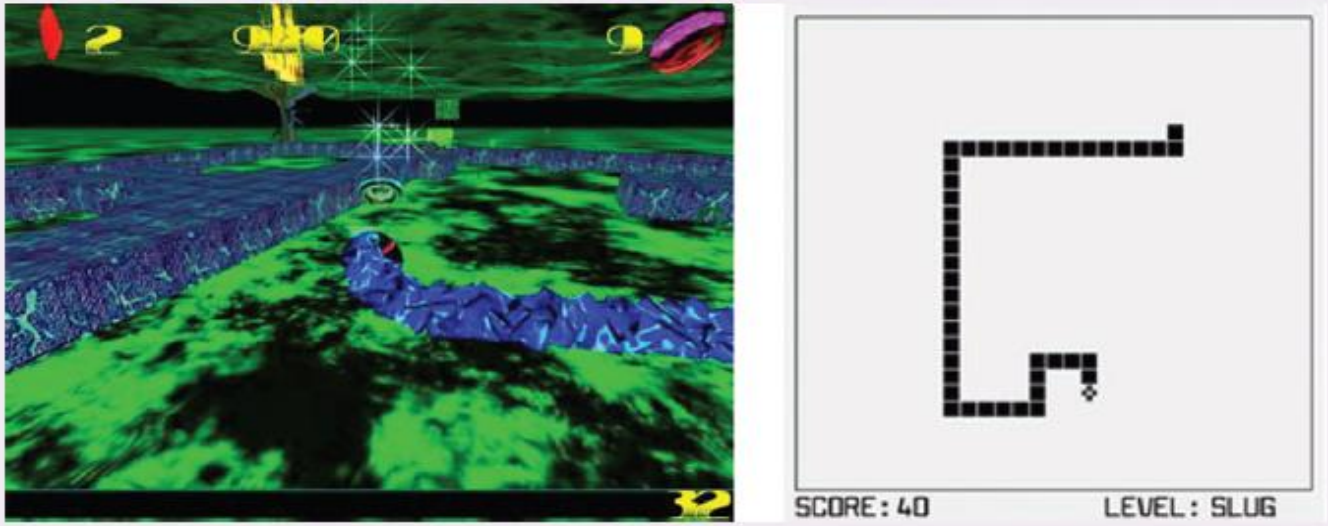


Figure 6.16 Two screenshots from the game Snake – the one on the left is played on a PC and the one on the right on a cell phone. In both games, the goal is to move the snake (the blue thing and the black squares, respectively) towards targets that pop up on the screen (e.g. the bridge, the star) and 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

Realism versus abstraction?

- One of the challenges facing interaction designers is whether to use realism or abstraction when designing an interface. This means designing objects either to (i) give the illusion of behaving and looking like real-world counterparts or (ii) appear as abstractions of the objects being represented. This concern is particularly relevant when implementing conceptual models that are deliberately based on an analogy with some aspect of the real world. For example, is it preferable to design a desktop to look like a real desktop, a virtual house to look like a real house, or a virtual terrain to look like a real terrain? Or, alternatively, is it more effective to design representations as simple abstract renditions, depicting only a few salient features?
- One of the main benefits of using realism at the interface is that it can enable people to feel more comfortable when first learning an application. The rationale behind this is that such representations can readily tap into people's understanding of the physical world. Hence, realistic interfaces can help users initially understand the underlying conceptual model. In contrast, overly schematic and abstract representations can appear to be too computer-like and may be off-putting to the newcomer. The advantage of more abstract interfaces, however, is that they can be more efficient to use. Furthermore, the more experienced users become, the more they may find comfortable interfaces no longer to their liking. A dilemma facing designers, therefore, is deciding between creating interfaces to make novice users feel comfortable (but more experienced users less comfortable) and designing interfaces to be effective for more experienced users (but maybe harder to learn by novices).

Virtual reality

- Virtual Technology can be through:
  - Headsets that have head tracking that allows developers to create more compelling games, movies, and virtual environment.
  - 3D Software toolkits to program desktops virtual environments to use mice, keyboard, joystick.
  - 3D Movies in IMAX require wearing pair of glasses.

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

Information visualization

- http://www.oecdbetterlifeindex.org
- http://hint.fm/wind/
- http://www.scientificamerican.com/article/water-in-water-out/
- http://www.cs.umd.edu/hcil/

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

Dashboards

- dashboard" is another name for "progress report" or "report." Often, the "dashboard" is displayed on a web page that is linked to a database which allows the report to be constantly updated.
- http://citydashboard.org/london/

Activity -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?

Activity-Which dashboard is best?

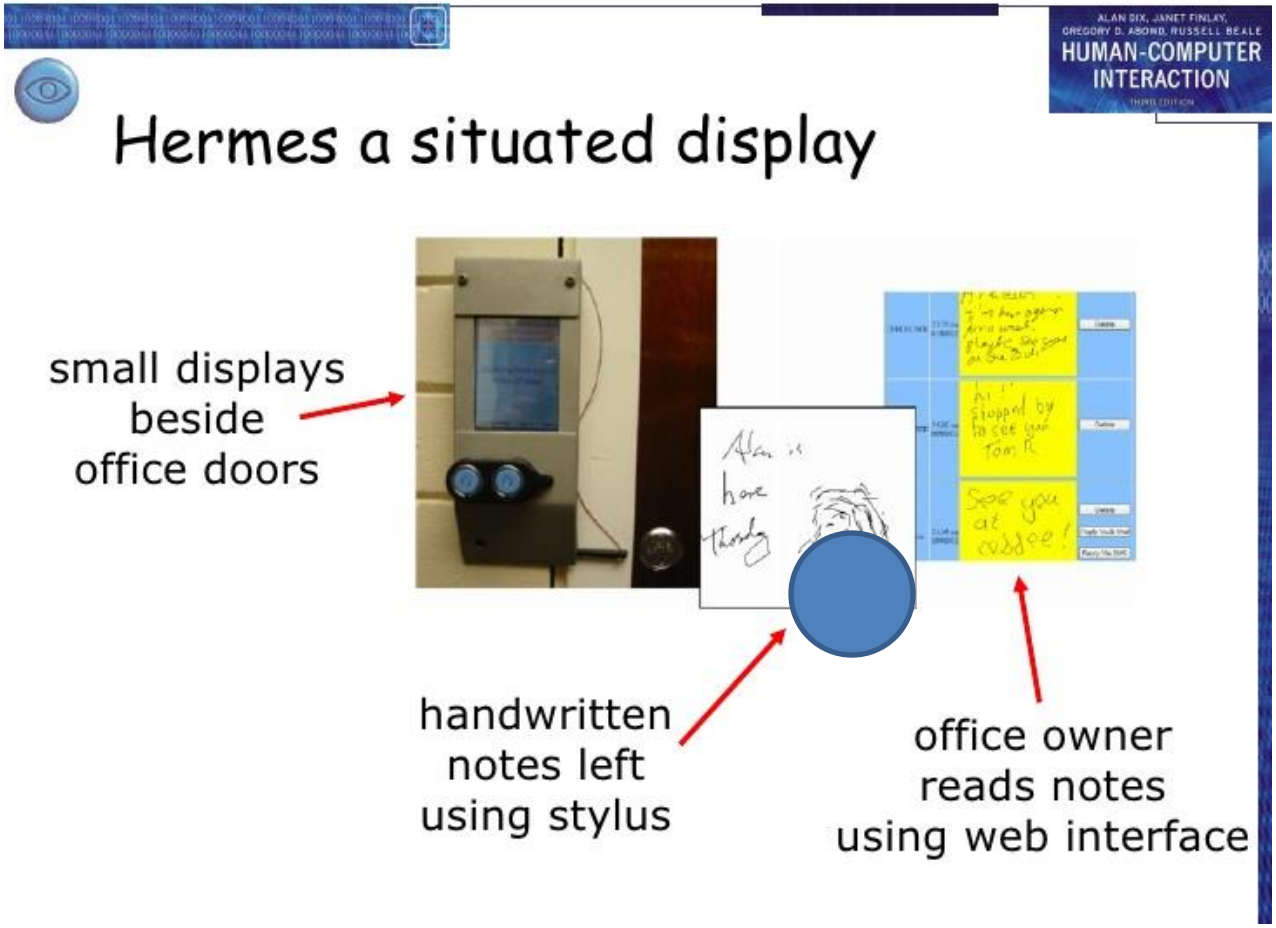
(b)

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?

Activity-Which dashboard is best?

- Much thought has gone into the visual design of BA dashboard – the pictograms are simple and colorful and draws the reader's attention. The first thing that grabs the attention is that the flier has flown an enormous number of miles that is equivalent to three weeks in the air. The information in the lower right-hand corner adds a bit of humor.
- The London dashboard is incredibly busy, visually, and requires the viewer to spend time scanning it to find some relevant information. the individual graphics and text are relatively simple and easy to understand. It provides much more information than the British Airways dashboard about transport, the level of service, the weather, news, headlines, cycle hire capacity, weather forecast, and air pollution. After a few times glancing at it, the viewer can learn where to look to see feeds that interest them.

Situated Displays



http://www.hcibook.com/e3/casestudy/hermes/

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

Activity - A toaster

Figure 6.19 A typical toaster with basic physical controls

Activity - A toaster

- Look at the controls on the toaster and describe what each does. Consider how these might be replaced with an LCD screen. What would be gained and lost from changing the interface in this way?

Activity - A toaster

- To design the controls to appear on an LCD screen would enable more information and options to be provided. For example: only toast one slice, keep the toast warm, automatically pop up when the toast is burning. It will allow precise timing of the toasting in terms of minutes and seconds. However, as has happened with the design evolution of microwave ovens, a downside is that it is likely to increase the complexity of what previously was a set of logical and very simple actions to make it more difficult to use.

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
- 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. games
  - Smart use of the accelerometer (measuring vibrations) that is inside the phone.
  - Listen to music or watch videos.

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 on the face of phones, 2-way and 4-way directional keypads, softkeys, silk-screened buttons
- Usability and preference varies
  - depends on the ability to use the hands and commitment of the user
- Smartphones overcome mobile physical constraints through using multi-touch displays

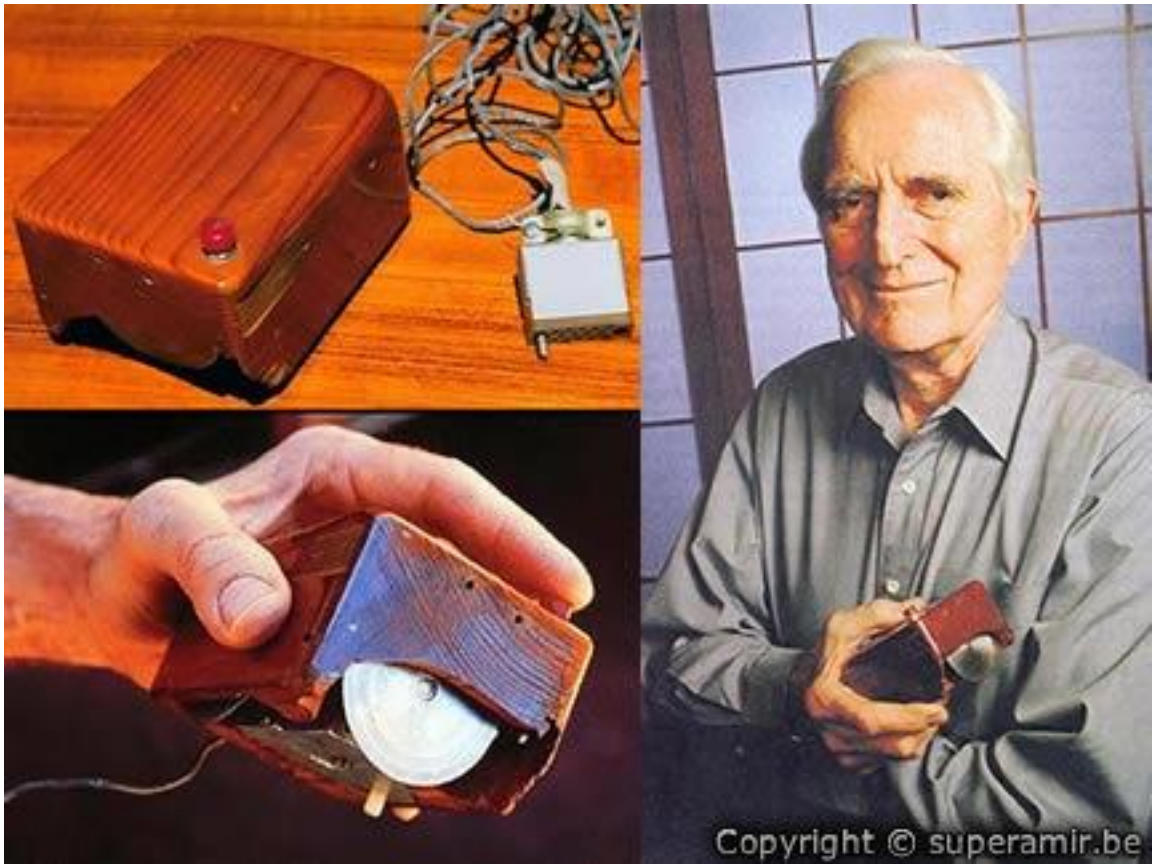
Research and design issues

- 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

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

Mouse



The first mouse was developed by Douglas Engelbart around 1964

Mouse

Standard Mouse

Optical Mouse

Foot Mouse

Mouse

- Mouse : is a small, palm sized box housing a weighted ball, as the box is moved over the tabletop, the ball is rolled by the table and rotates inside the housing. This rotation is detected by small rollers that are in contact with the ball, and these adjust the values of potentiometers. The changing values of these potentiometers can be directly related to changes in position of the ball.

10. Pen

- Enable people to write, draw, select, and move objects at an interface using lightpens or styluses
  - capitalize on the well-honed drawing skills developed from childhood
- Digital pens, e.g. Anoto, use a combination of ordinary ink pen with digital camera that digitally records everything written with the pen on special paper

11. Touch

- Touch pads are touch-sensitive tablets usually around 3-4 inches square. Used extensively with apple lap tops.
- Touch screens, such as walk-up kiosks, detect the presence and location of a person's touch on the display

- Multi-touch support a range of more dynamic finger tip actions, e.g. swiping, flicking, pinching, pushing and tapping

- Now used for many kinds of displays, such as Smartphones, iPods, tablets and tabletops

12. Air-based gestures

- Uses camera recognition, sensor and computer vision techniques
  - can recognize people's body, arm and hand gestures in a room
  - systems include Kinect
- Movements are mapped onto a variety of gaming motions, such as swinging, bowling, hitting and punching
- Players represented on the screen as avatars doing same actions

Home entertainment

- Universal appeal
  - young children, grandparents, professional gamers, technophobes
- A touch less system that recognizes gestures
- surgeons can interact with and manipulate MRI or CT images

Figure 6.25 Touchless gesturing in the operating theater
Source: Courtesy of Kenton O'Hara, Microsoft.

14. Multi-modal

- Meant to provide enriched and complex user experiences
  - multiplying how information is experienced and detected using different modalities, i.e. touch, sight, sound, speech
  - support more flexible, efficient, and expressive means of human–computer interaction
  - Most common is speech and vision

15. Shareable

- Shareable interfaces are designed for more than one person to use
  - provide multiple inputs and sometimes allow simultaneous input by co-located groups
  - large wall displays where people use their own pens or gestures
  - interactive tabletops where small groups interact with information using their fingertips
  - e.g. DiamondTouch, Smart Table and Surface

A smartboard

(a)

Figure 6.27 (a) A SmartBoard in use during a meeting and (b) Mitsubishi's interactive tabletop interface, where collocated users can interact simultaneously with digital content using their fingertips

Source: (a) ©2006 SMART Technologies Inc. Used with permission. (b) Image courtesy of Mitsubishi Electric Research Labs.

16. Tangible

- Type of sensor-based interaction, where physical objects, e.g., bricks, are coupled with digital representations
- When a person manipulates the physical object/s it causes a digital effect to occur, e.g. an animation
- Digital effects can take place in a number of media and places or can be embedded in the physical object

Example

- A simple example of tangible UI is the computer mouse. Dragging the mouse over a flat surface and having a pointer moving on the screen accordingly. There is a very clear relationship about the behaviors shown by a system with the movements of a mouse.Another example of a tangible UI is the *Marble Answering Machine* by Durrell Bishop (1992).
- Another example of a tangible UI is the Marble Answering Machine by Durrell Bishop (1992). A marble represents a single message left on the answering machine. Dropping a marble into a dish plays back the associated message or calls back the caller.
- Another example is the Topobo system. The blocks in Topobo are like LEGO blocks which can be snapped together, but can also move by themselves using motorized components. A person can push, pull, and twist these blocks, and the blocks can memorize these movements and replay them.

Examples

- Chromarium cubes
  - when turned over digital animations of color are mixed on an adjacent wall
  - faciliates creativity and collaborative exploration
- Flow Blocks
  - depict changing numbers and lights embedded in the blocks
  - vary depending on how they are connected together
- Urp
  - physical models of buildings moved around on tabletop
  - used in combination with tokens for wind and shadows -> digital shadows surrounding them to change over time

17. Augmented and Mixed Reality

- In which users see the real world with an overlay of additional information.
- Augmented reality - virtual representations are superimposed on physical devices and objects
- Mixed reality - views of the real world are combined with views of a virtual environment
- Many applications including medicine, games, learning, museums, and everyday exploring

Augmented Reality Applications

- Users are looking at the walls of a building, their semitransparent eyeglasses may show the location of electrical wires.

Augmented Reality Applications

- In medicine
  - virtual objects, e.g. X-rays and scans, are overlaid on part of a patient's body
  - aid the physician's understanding of what is being examined or operated
- In air traffic control
  - dynamic information about aircraft overlaid on a video screen showing the real planes, etc. landing, taking off, and taxiing
  - Helps identify planes difficult to make out

- Guide visitors through tourist attractions, tourist-guide eyeglasses could allow visitors to view labels about architectural features in the historic town.

An augmented map

Figure 6.30 An augmented map showing the flooded areas at high water level overlaid on the paper map. The handheld device is used to interact with entities referenced on the map

Source: Reproduced with permission.

Top Gear James May in AR

- Appears as a 3D character to act as personal tour guide at Science Museum

Figure 6.31 James May appearing in 3D Augmented Reality

Source: http://www.wired.com/2012/04/top-gear-host-narrates-museum-exhibits-as-augmented-reality-avatar/. Roberto Baldwin/Wired/©Conde Nast

18.Wearables

- First developments were head- and eyewear-mounted cameras that enabled user to record what was seen and to access digital information
- Since, jewellery, head-mounted caps, smart fabrics, glasses, shoes, and jackets have all been used
  - provide the user with a means of interacting with digital information while on the move
- Applications include automatic diaries, tour guides, cycle indicators and fashion clothing

Google Glass: short-lived

Figure 6.32 Google Glass

Source: https://www.google.co.uk/intl/en/glass/start/.
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- What were the pros and cons?

Research and design issues

- Comfort
  - needs to be light, small, not get in the way, fashionable, and preferably hidden in the clothing
- Hygiene
  - is it possible to wash or clean the clothing once worn?
- Ease of wear
  - how easy is it to remove the electronic gadgetry and replace it?
- Usability
  - how does the user control the devices that are embedded in the clothing?

19. Robots and drones

- Four types of robot
  - remote robots used in hazardous settings
  - domestic robots helping around the house
  - pet robots as human companions
  - sociable robots that work collaboratively with humans, and communicate and socialize with them – as if they were our peers

20. Brain-computer interfaces

- Brain–computer interfaces (BCI) provide a communication pathway between a person's brain waves and an external device, such as a cursor on a screen
- Person is trained to concentrate on the task, e.g. moving the cursor
- BCIs work through detecting changes in the neural functioning in the brain
- BCIs apps:
  - Games
  - enable people who are paralysed to control robots

Which interface?

- Is multimedia better than tangible interfaces for learning?
- Is speech as effective as a command-based interface?
- Is a multimodal interface more effective than a monomodal interface?
- Will wearable interfaces be better than mobile interfaces for helping people find information in foreign cities?
- Are virtual environments the ultimate interface for playing games?
- Will shareable interfaces be better at supporting communication and collaboration compared with using networked desktop PCs?

Which interface?

- Will depend on task, users, context, cost, robustness, etc.
- Mobile platforms taking over from PCs
- Speech interfaces also being used much more for a variety of commercial services
- Appliance and vehicle interfaces becoming more important
- Shareable and tangible interfaces entering our homes, schools, public places, and workplaces

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