Chapter 6: Interfaces and interactions
Overview

• Introduce the notion of a paradigm
• Provide an overview of the many different interface paradigms
  – highlight the main design and research issues for each
• Consider which is best for a given application or activity
Paradigm

• Refers to a particular approach that has been adopted by a community in terms of shared assumptions, concepts, values and practices
  – Questions to be asked and how they should be framed
  – Phenomena to be observed
  – How findings from experiments are to be analysed and interpreted
Paradigms in HCI

- The predominant 80s paradigm was to design user-centred applications for the single user on the desktop
  - one person, alone, one PC-style computer, simple 2D graphics, all relevant information online, all focus on direct manipulation of interface objects
- Shift in thinking occurred in the mid 90s
- Many technological advances led to a new paradigms for HCI
  - e.g., virtual reality, multimedia, agent interfaces, ubiquitous computing (ubicomp)
- Effect of moving interaction design ‘beyond the desktop’ resulted in many new challenges, questions, and choices for system designers
Ubicomp

• Radical change in the way people think about and interact with computers
  - many people, together, many and varied computers, sensors and displays, multiple media for I/O, much relevant information in the environment, focus on human activities/tasks rather than the tool
  - computers designed to ‘disappear’ into the background of user activity and environment

• Major rethink of what HCI is

• Focus of the HCI4 course
  - along with collaborative systems
Ubicomp

• How to enable people to interact with information and other people, as a part of their everyday lives of work, leisure, family, entertainment, etc.?
• Designing user experiences for people using interfaces that are part of the environment, with few or no controlling devices
• Providing contextually-relevant information to people at appropriate times and places
• Ensuring that information passed around via interconnected displays, devices, and objects, is secure and trustworthy
So many interface types

• 1980s: Command-based and desktop GUIs (especially WIMP — Windows/Icons/Menu/Pointer)

• 1990s: Advanced graphical (multimedia, virtual reality, information visualization); Web, Speech (voice); pen, gesture and touch

• 2000s: Mobile; Multimodal; Shareable; Tangible; Augmented and mixed reality; Wearable; Robotic
Command interfaces

- Commands such as abbreviations (e.g., `ls`) typed in at the prompt to which the system responds (e.g., listing current directory)
- Some are hard wired at keyboard, e.g., delete
- Efficient, precise, and fast
- Powerful composition e.g. Unix pipes, and argument specification, e.g. regular expressions
- History of past commands easily available
- Large overhead to learning set of commands
Research and design issues

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

• Xerox Star: first WIMP, gave rise to GUIs
  • Windows
    – could be scrolled, stretched, overlapped, opened, closed, and moved around the screen
  • 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
XEROX
6085 Workstation

User Interface Design

To make it easy to compose text and graphics to do electronic filing, printing, and mailing all at the same workstation, requires a revolutionary user interface design.

Bit-map display. Each of the pixels on the 19” screen is mapped to a bit in memory; thus, arbitrarily complex images can be displayed. The 6085 displays all fonts and graphics as they will be printed. In addition, familiar office objects such as documents, folders, file drawers, and in-baskets are portrayed as recognizable images.

The mouse. A unique pointing device that allows the user to quickly select any text, graphic, or office object on the display.

See and Point

All functions are visible to the user on the keyboard or on the screen. The user does filing and retrieval by selecting them with the mouse and sending the MOVE, COPY, DELETE, or PROPERTIES commands keys. Text and graphics are edited with the same keys.

Shorter Production Times

Experience at Xerox with prototype work stations has shown shorter production times and thus lower costs as a function of the percentage of time the workstations are utilized. The following equation can be used to express this:

Percentage of time the workstation is utilized = (18-point text) / (24-point text) x 100%
GUIs

• Same basic building blocks as WIMP 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, enabling more information to be viewed and tasks to be performed
- Scroll bars within windows also enable more information to be accessible
- Multiple windows can also make it difficult to find desired information
  - So: techniques such as listing, iconising, minimising, zooming...
Apple’s shrinking windows
Selecting a country from a scrolling window
Is this method any better?
Research and design issues

• Window management
  – enabling users to move fluidly between different windows (and monitors)

• How to switch attention between them to find information needed or maintain awareness without getting too 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
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

• Access to often-used commands that make sense in the context of a current task
  • e.g. when the user presses the Control key while clicking on a photo in a website 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

• Increasingly common
  – e.g. new versions of MS Word and Apple Pages
Research and design issues

• What are best names/labels/phrases to use?
• Placement in list can be critical
  – Quit and Save need to be far apart
• Many international guidelines exist emphasising 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 populate most applications and operating systems
  - represent documents, 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 animated
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

See also examples in the Xerox Star interface
Newer icons
Simple icons plus labels

<table>
<thead>
<tr>
<th>Delete</th>
<th>Back</th>
<th>Up</th>
</tr>
</thead>
<tbody>
<tr>
<td>Redo</td>
<td>Forward</td>
<td>Move To</td>
</tr>
<tr>
<td>Undo</td>
<td>Stop</td>
<td>Copy To</td>
</tr>
<tr>
<td>Properties</td>
<td>Refresh</td>
<td>Folders</td>
</tr>
<tr>
<td>Cut</td>
<td>Home</td>
<td>Open</td>
</tr>
<tr>
<td>Copy</td>
<td>Search</td>
<td>Save</td>
</tr>
<tr>
<td>Paste</td>
<td>Favorites</td>
<td>Print</td>
</tr>
<tr>
<td>Folder Options</td>
<td>History</td>
<td>New</td>
</tr>
<tr>
<td>Views</td>
<td>Mail</td>
<td>Print Preview</td>
</tr>
</tbody>
</table>
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 design resources now so do not have to draw or invent 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
- Research: auditory and tactile icons?
Web interfaces

• 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
useit.com: Jakob Nielsen's Website

Permanent Content

Alertbox
Jakob's column on Web usability

Fast, Cheap, and Good Usability Methods (Jan. 2)
The sooner you complete a usability study, the higher its impact on the design process. Slower methods should be deferred to an annual usability checkup.

Usability in the Movies (Dec. 18)
Progressive Disclosure (Dec. 4)
Digital Divide (Nov. 20)

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News

Usability Week 2007 Conference
- Hong Kong, March 5-9
- Washington, D.C., April 22-27
- London, May 6-11
- San Francisco, June 18-23

3-day camp: usability in practice
3-day immersion: interaction design

Ten full-day tutorials, including two new days on application usability:
- Page-level building blocks
- Dialogue and workflow design

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News.com Yahoo's IM update: A trojan horse of surprises
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For almost 10 years Swim has helped companies like yours design clear interfaces and make powerful functionality accessible. Let us know how we can help you.
Usability versus attractiveness debate

• 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’
Research and design issues

• Web interfaces are getting more like GUIs
• Need to consider how best to design, present and structure information and system behavior
• But content and navigation are also central
• A simple cut: 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 that contravention matter?
• What kind of user experience is it providing for?
• What was your experience of engaging with it?
Nike.com
Summary

• Many innovative interfaces have emerged post the WIMP/GUI era, including speech, wearable, mobile, and tangible
• Many new design and research questions need to be considered to decide which one to use
• Web interfaces are becoming more like GUI applications, using multimedia, collaboration...
• An important concern that underlies the design of any kind of interface is how information is represented to the user so they can carry out ongoing activity or task