



# HUMAN-COMPUTER INTERACTION

THIRD  
EDITION



DIX  
FINLAY  
ABOWD  
BEALE

## chapter 3

### the interaction



# ergonomics

physical aspects of interfaces  
industrial interfaces



# Ergonomics

- Study of the physical characteristics of interaction
- Also known as human factors – but this can also be used to mean much of HCI!
- Ergonomics good at defining standards and guidelines for constraining the way we design certain aspects of systems



# Ergonomics - examples

- arrangement of controls and displays
  - e.g. controls grouped according to function or frequency of use, or sequentially
- surrounding environment
  - e.g. seating arrangements adaptable to cope with all sizes of user
- health issues
  - e.g. physical position, environmental conditions (temperature, humidity), lighting, noise,
- use of colour
  - e.g. use of red for warning, green for okay, awareness of colour-blindness etc.



# interaction styles

dialogue ... computer and user

distinct styles of interaction



# Common interaction styles

- command line interface
- menus
- natural language
- question/answer and query dialogue
- form-fills and spreadsheets
- WIMP
- point and click
- three-dimensional interfaces



# Command line interface

- Way of expressing instructions to the computer directly
  - function keys, single characters, short abbreviations, whole words, or a combination
- suitable for repetitive tasks
- better for expert users than novices
- offers direct access to system functionality
- command names/abbreviations should be meaningful!

Typical example: the Unix system



# Menus

- Set of options displayed on the screen
- Options visible
  - less recall - easier to use
  - rely on recognition so names should be meaningful
- Selection by:
  - numbers, letters, arrow keys, mouse
  - combination (e.g. mouse plus accelerators)
- Often options hierarchically grouped
  - sensible grouping is needed
- Restricted form of full WIMP system



# Natural language

- Familiar to user
- speech recognition or typed natural language
- Problems
  - vague
  - ambiguous
  - hard to do well!
- Solutions
  - try to understand a subset
  - pick on key words



# Query interfaces

- Question/answer interfaces
  - user led through interaction via series of questions
  - suitable for novice users but restricted functionality
  - often used in information systems
- Query languages (e.g. SQL)
  - used to retrieve information from database
  - requires understanding of database structure and language syntax, hence requires some expertise



# Form-fills

- Primarily for data entry or data retrieval
- Screen like paper form.
- Data put in relevant place
- Requires
  - good design
  - obvious correction facilities

The screenshot shows a window titled "Go-faster Travel Agency Booking". Inside, a message says "Please enter details of journey:". There are four text input fields: "Start from: Lancaster", "Destination: Atlanta", and "Via: Leeds" (which is currently selected). Below these are three radio button options: "First class /  Second class /  Bargain" and "Single /  Return". A final empty text field is labeled "Seat number:". On the left side of the window, there is a vertical toolbar with buttons for "Favorites", "History", and "Search".



# Spreadsheets

- first spreadsheet VISICALC, followed by Lotus 1-2-3  
MS Excel most common today
- sophisticated variation of form-filling.
  - grid of cells contain a value or a formula
  - formula can involve values of other cells
    - e.g. sum of all cells in this column
  - user can enter and alter data spreadsheet maintains consistency



# WIMP Interface

Windows  
Icons  
Menus  
Pointers

... or windows, icons, mice, and pull-down menus!

- default style for majority of interactive computer systems, especially PCs and desktop machines



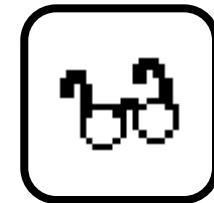
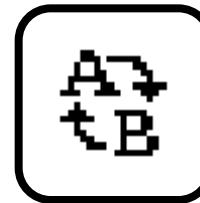
# Point and click interfaces

- used in ..
  - multimedia
  - web browsers
  - hypertext
- just click something!
  - icons, text links or location on map
- minimal typing

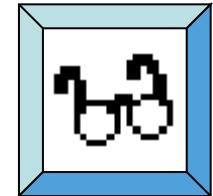
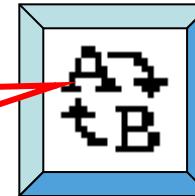


# Three dimensional interfaces

- virtual reality
- 'ordinary' window systems
  - highlighting
  - visual affordance
  - indiscriminate use just confusing!
- 3D workspaces
  - use for extra virtual space
  - light and occlusion give depth
  - distance effects



flat buttons ...



... or sculptured

click me!



# elements of the wimp interface

windows, icons, menus, pointers

+++

buttons, toolbars,  
palettes, dialog boxes

also see supplementary material  
on choosing wimp elements



# Windows

- Areas of the screen that behave as if they were independent
  - can contain text or graphics
  - can be moved or resized
  - can overlap and obscure each other, or can be laid out next to one another (tiled)
- scrollbars
  - allow the user to move the contents of the window up and down or from side to side
- title bars
  - describe the name of the window



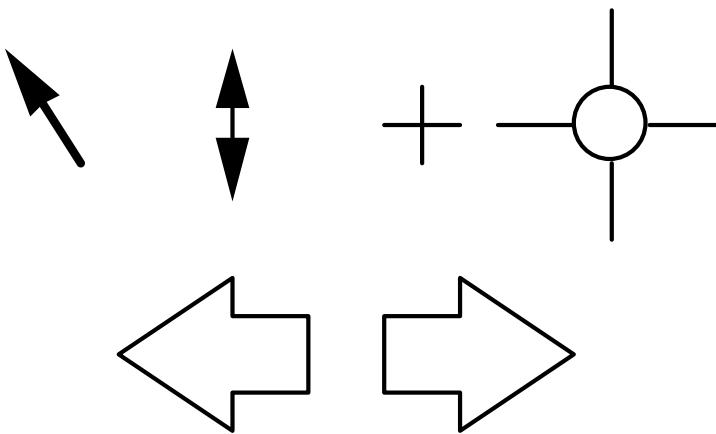
# Icons

- small picture or image
- represents some object in the interface
  - often a window or action
- windows can be closed down (iconised)
  - small representation for many accessible windows
- icons can be many and various
  - highly stylized
  - realistic representations.



# Pointers

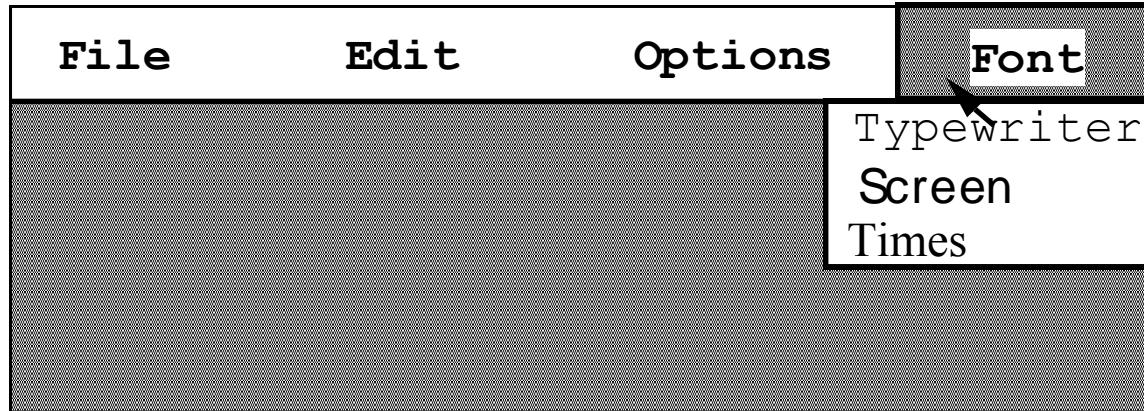
- important component
  - WIMP style relies on pointing and selecting things
- uses mouse, trackpad, joystick, trackball, cursor keys or keyboard shortcuts
- wide variety of graphical images





# Menus

- Choice of operations or services offered on the screen
- Required option selected with pointer



problem – take a lot of screen space

solution – pop-up: menu appears when needed



# Kinds of Menus

- Menu Bar at top of screen (normally), menu drags down
  - pull-down menu - mouse hold and drag down menu
  - drop-down menu - mouse click reveals menu
  - fall-down menus - mouse just moves over bar!
- Contextual menu appears where you are
  - pop-up menus - actions for selected object
  - pie menus - arranged in a circle
    - easier to select item (larger target area)
    - quicker (same distance to any option)
      - ... but not widely used!



# Menus extras

- Cascading menus
  - hierarchical menu structure
  - menu selection opens new menu
  - and so in ad infinitum
- Keyboard accelerators
  - key combinations - same effect as menu item
  - two kinds
    - active when menu open – usually first letter
    - active when menu closed – usually Ctrl + letter
  - usually different !!!



# Menus design issues

- which kind to use
- what to include in menus at all
- words to use (action or description)
- how to group items
- choice of keyboard accelerators



# Buttons

- individual and isolated regions within a display that can be selected to invoke an action

Gender:  Male  Female

Interests:  web development  user interfaces  music

**Submit**

- Special kinds
  - radio buttons
    - set of mutually exclusive choices
  - check boxes
    - set of non-exclusive choices



# Toolbars

- long lines of icons ...  
... but what do they do?
- fast access to common actions
- often customizable:
  - choose *which* toolbars to see
  - choose *what* options are on it



# Palettes and tear-off menus

- Problem
  - menu not there when you want it
- Solution
  - palettes – little windows of actions
    - shown/hidden via menu option
      - e.g. available shapes in drawing package
  - tear-off and pin-up menus
    - menu ‘tears off’ to become palette



# Dialogue boxes

- information windows that pop up to inform of an important event or request information.
  - e.g: when saving a file, a dialogue box is displayed to allow the user to specify the filename and location. Once the file is saved, the box disappears.



# interactivity

easy to focus on look  
what about feel?



# Look and ... feel

- WIMP systems have the same elements:  
windows, icons., menus, pointers, buttons, etc.
- but different window systems  
... *behave* differently
  - e.g. MacOS vs Windows menus

appearance + behaviour = look and feel



# Physical design

- many constraints:
  - ergonomic – minimum button size
  - physical – high-voltage switches are big
  - legal and safety – high cooker controls
  - context and environment – easy to clean
  - aesthetic – must look good
  - economic – ... and not cost too much!



# Design trade-offs

constraints are contradictory ... need trade-offs

within categories:

- e.g. safety – cooker controls
  - front panel – safer for adult
  - rear panel – safer for child

between categories

- e.g. ergonomics vs. physical – MiniDisc remote
  - ergonomics – controls need to be bigger
  - physical – no room!
  - solution – multifunction controls & reduced functionality



# Managing value

people use something

**ONLY IF**

it has perceived value

**AND**

value exceeds cost

## **BUT NOTE**

- exceptions (e.g. habit)
- value **NOT** necessarily personal gain or money



# Weighing up value

## value

- helps me get my work done
- fun
- good for others

## cost

- download time
- money £, \$, €
- learning effort



# General lesson ...

if you want someone to do something ...

- make it easy for them!
- understand their values