



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

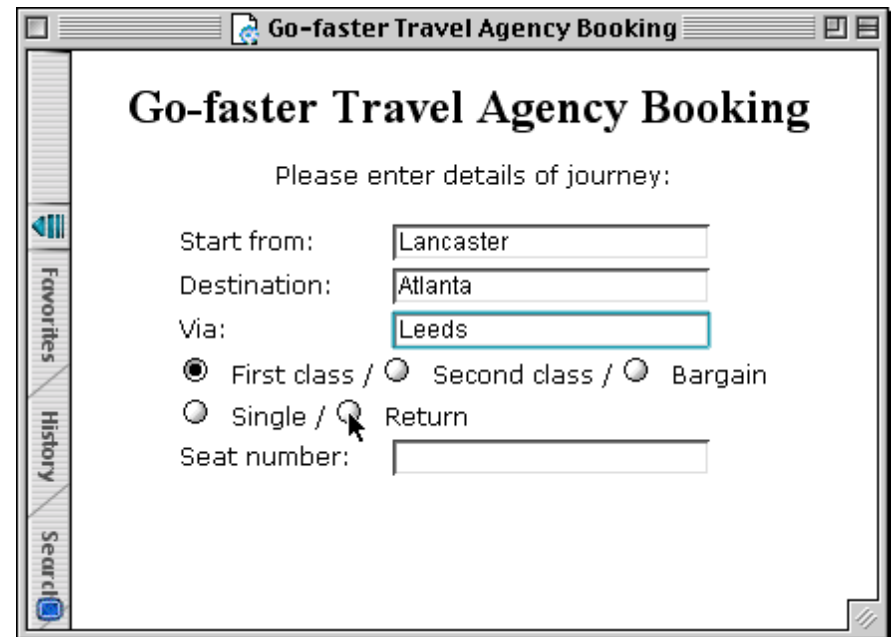
- Familiar to user
- speech recognition or typed natural language
- Problems
 - vague
 - ambiguous
 - hard to do well!
- Solutions
 - try to understand a subset
 - pick on key words

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 web browser window titled "Go-faster Travel Agency Booking". The page content includes the title "Go-faster Travel Agency Booking" and the instruction "Please enter details of journey:". Below this, there are several input fields and radio buttons. The "Start from:" field contains "Lancaster", the "Destination:" field contains "Atlanta", and the "Via:" field contains "Leeds". There are three radio buttons for "First class / Second class / Bargain", with "First class" selected. There are two radio buttons for "Single / Return", with "Return" selected. A "Seat number:" field is empty. On the left side of the browser window, there is a vertical sidebar with buttons for "Favourites", "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!

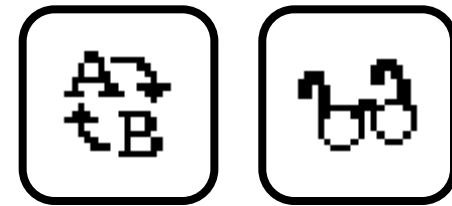
- default style for majority of interactive computer systems, especially PCs and desktop machines

Point and click interfaces

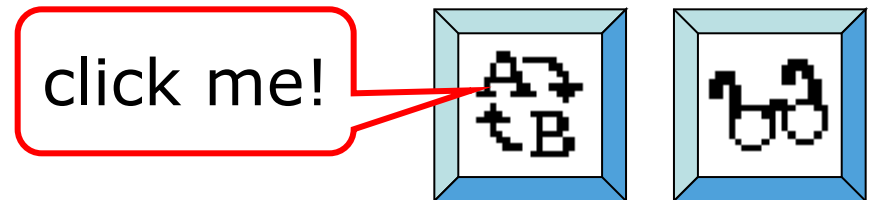
- used in ..
 - multimedia
 - web browsers
 - hypertext
- just click something!
 - icons, text links or location on map
- minimal typing

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

elements of the wimp interface

windows, icons, menus, pointers

+++

buttons, toolbars,
palettes, dialog boxes

also see supplementary material
on choosing wimp elements

Windows

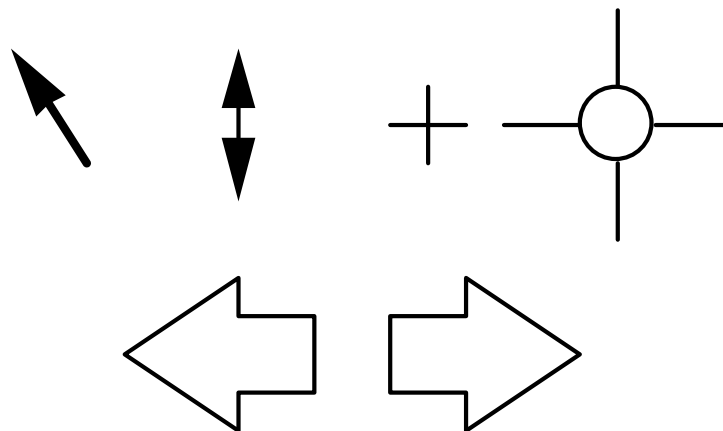
- Areas of the screen that behave as if they were independent
 - can contain text or graphics
 - can be moved or resized
 - can overlap and obscure each other, or can be laid out next to one another (tiled)
- scrollbars
 - allow the user to move the contents of the window up and down or from side to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

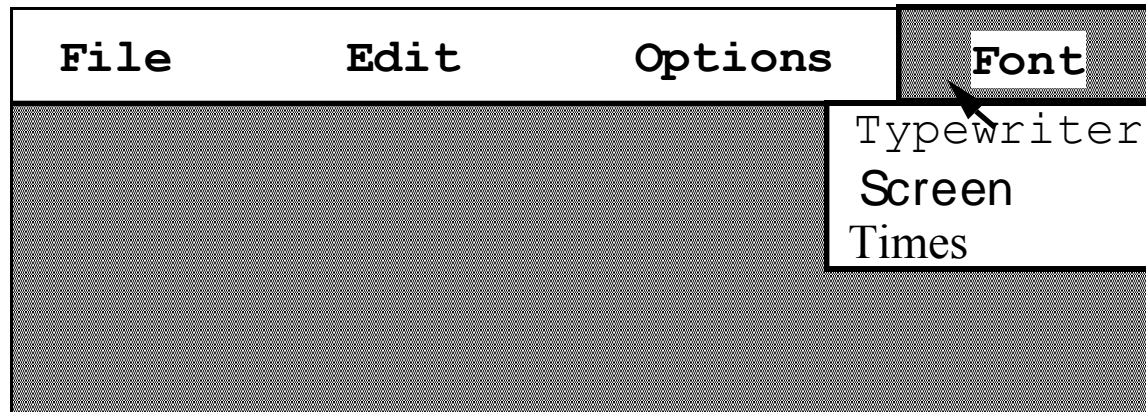
Pointers

- 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 Menu

- 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

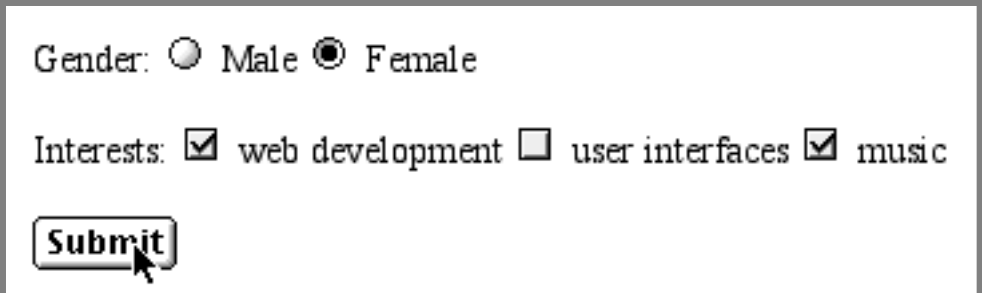
- Cascading menus
 - hierarchical menu structure
 - menu selection opens new menu
 - and so in ad infinitum
 - Keyboard accelerators
 - key combinations - same effect as menu item
 - two kinds
 - active when menu open – usually first letter
 - active when menu closed – usually Ctrl + letter
- usually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

Menu 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

- 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