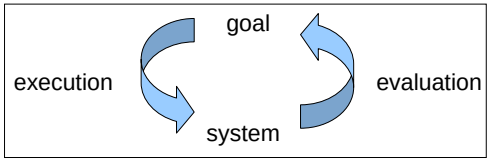
The Interaction

- Interaction models
- Ergonomics
- Interaction styles

Donald Norman's model of interaction



- Seven stages
  - user establishes the goal
  - formulates intention
  - specifies actions at interface
  - executes action
  - perceives system state
  - interprets system state
  - evaluates system state with respect to goal
- Norman's model concentrates on user's view of the interface
- What problem solving strategy is this?

Using Norman's model

- Some systems are harder to use than others
- Gulf of Execution
  - user's formulation of actions ≠ actions allowed by the system
- Gulf of Evaluation
  - user's expectation of changed system state ≠ actual presentation of this state

Human error - slips and mistakes

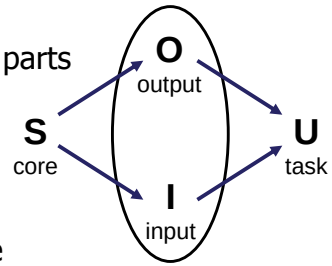
slip
- understand system and goal
- correct formulation of action
- incorrect action

mistake
- may not even have right goal!

Fixing things?
- slip – better interface design
- mistake – better understanding of system

Abowd and Beale framework

- extension of Norman…
- their interaction framework has 4 parts
  - user
  - input
  - system
  - output
- each has its own unique language



interaction ⇒ translation between languages

- problems in interaction = problems in translation

Using Abowd & Beale's model

- user intentions
  → translated into actions at the interface
  → translated into alterations of system state
  → reflected in the output display
  → interpreted by the user
- general framework for understanding interaction
  - not restricted to electronic computer systems
  - identifies all major components involved in interaction
  - allows comparative assessment of systems
  - an abstraction

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.

Industrial interfaces

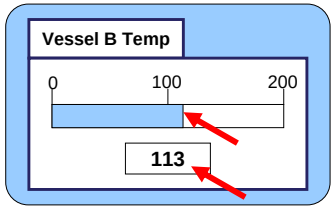
Office interface vs. industrial interface?

Context matters!

	office	industrial
type of data	textual	numeric
rate of change	slow	fast
environment	clean	dirty

Glass interfaces ?

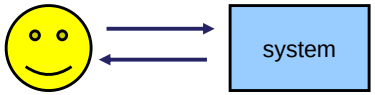
- industrial interface:
  - traditional … dials and knobs
  - now … screens and keypads
- glass interface (computer screen)
  - cheaper, more flexible, multiple representations, precise values
  - not physically located, loss of context, complex interfaces
- may need both
- Analogue/digital



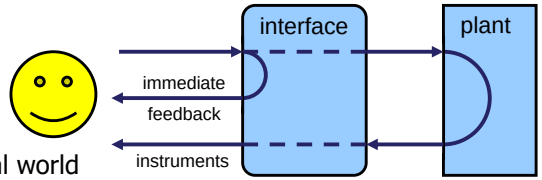
multiple representations of same information

Indirect manipulation

- office– direct manipulation
  - user interacts with artificial world

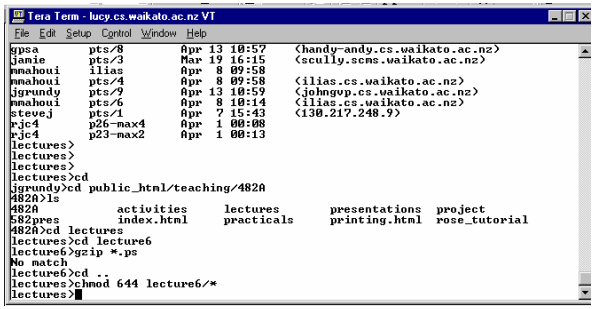


- industrial – indirect manipulation
  - user interacts *with* real world *through* interface
- issues ..
  - feedback
  - Delays
- Things HAPPEN in real world



Command Line Interfaces

- Scripting/macro language (typically textual)
- Command name + args
- Feedback from invoking command
- Sometimes "batch" style processing



Advantages: Disadvantages:

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 Interaction

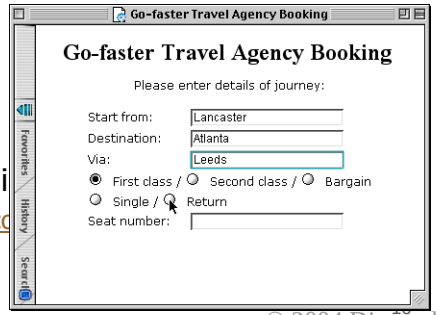
- Natural language queries
- Speech recognition
- Handwriting recognition & pen interaction (next lecture)
- Problems
  - vague
  - ambiguous
  - hard to do well!
- Solutions
  - try to understand a subset
  - pick on key words

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
- Examples?

Form-fills

- Primarily for data entry or data retrieval
- Screen like paper form
- Data put in relevant place
- Requires
  - good design
  - obvious correction facilities
- Excellent reference – Caroli
  - http://www.formsthatwork.co



Spreadsheets

- 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 Interfaces

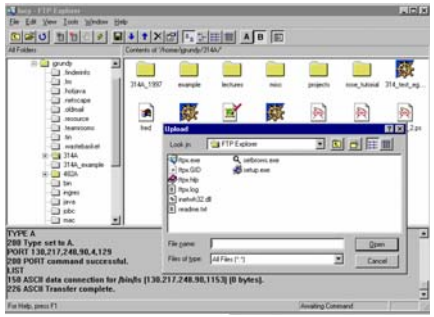
Windows
Icons
Menus
Pointers

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

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

WIMP Interfaces

- Iconic
- Direct manipulation/graphical interactors
- Visual/audio feedback
- Windows, menus, buttons, etc.
- Incremental process invocation
- Point and Click interface



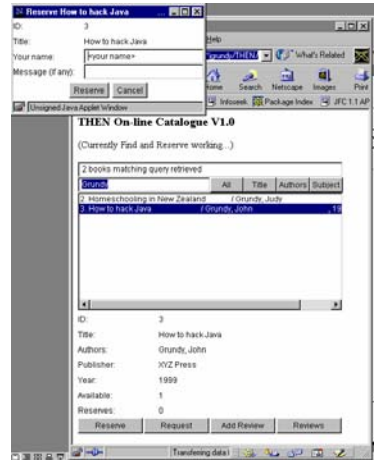
Advantages: Disadvantages:

WWW-based Interfaces

- Usual GUI elements
- Usually form-based metaphors
- Uses web browser interface capabilities
- HTML, Java, Plug-ins

Advantages: Disadvantages:

- Comparing browsers "Beyond IE Four Alternatives" http://www.nzherald.co.nz/storydisplay.cfm?thesection=technology&thesubsection=&storyID=3581149



RealThings (IBM) – Design Style

- Simulate the real world
- Interface is familiar
- Interaction is more natural

Advantages:

Disadvantages:

RealPlaces (IBM) - 3D/VR Environments

- Interact with an "immersive world"
- Complex geometrical visualisation/interaction
- Navigation is complex
- Interact with objects in world

Advantages:

Disadvantages:

Augmented Reality Interfaces

- "wear" computer/hold computer/computer built into everyday things
- May be groupware/distributed
- Interact with in (un)"natural" ways

Advantages:

Disadvantages:

Interactivity

- Remember the context of the interaction
- Support an experience
- Allow user engagement
- Manage personal values
  - Offer gains, e.g., Net present value
- General lesson
  - If you want someone to do something
    - Make it easy for them
    - Understand their values