The Interaction

Interaction = communication between user and system

- interaction models
- interaction styles
Models of interaction

Terms of interaction
Norman model
Some terms of interaction

**domain** – the area of work under study
  e.g. graphic design

**goal** – what you want to achieve
  e.g. create a solid red triangle

**task** – how you go about doing it
  – ultimately in terms of operations or actions
    e.g. ... select fill tool, click over triangle
Donald Norman’s model: the execution-evaluation cycle

- 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
execution/evaluation loop

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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
   can the user understand the feedback given by the system?
   can feedback be interpreted in terms of intentions and expectations?
Gulf of execution

- Gap between the mental model (task language) of the user’s goals and the system language

Ex: if a person wants to record a movie currently being shown on her VCR:

In user language
"Hit the record button"

In system language
1) Hit the record button.
2) Specify time of recording via the controls X, Y, and Z.
3) Select channel via the channel-up-down control.
4) Press the OK button.
In the VCR example, when recording, the 'record' control should signal that it is activated.
Human error - slips and mistakes

**slip**
- understand system and specify a valid goal
- correct formulation of action
- incorrect action

**mistake**
- may not even have right goal! Wrong mental model of the system

Fixing things?
- slip – better interface design
- mistake – better understanding of system
Human errors (cont’d)

- Example of slips:
  - intended action is replaced by another action with many features in common
    - pouring orange juice into your cereal

Lesson for interface design: avoid actions with very similar descriptions:
  - long rows with identical switches,
  - adjacent menu items that look similar
Human errors (cont’d)

- Example of mistakes:
  - Wrong user model
    - Sometimes harmless: electricity as water
    - Sometimes misleading: thermostat as a valve
Common interaction styles

- command language (command line interface)
- Menus and forms
- 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; breadth versus depth

How about audio menus? (ex.: banking by phone)
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
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
Example of spreadsheet
WIMP Interface

Windows
Icons
Menus
Pointers

- 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
elements of the wimp interface

windows, icons, menus, pointers
+++ buttons, toolbars, dialog boxes
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
What is the user’s conceptual model for a scrollbar?
From Apple Human Interface guidelines
Icons

- small picture or image
- represents some object in the interface
  - often a window or action
- windows can be closed down (iconised)
  - small representation: many windows are available at the same time
- icons can be either:
  - highly stylized or
  - realistic representations.
Icons: design issues

- Icons are meant to be handled
- They provide the benefit of direct manipulation:
  - afford for dragging and dropping (kinesthetic, non-verbal intellect)
  - dual-task processing (multitasking) is therefore possible
    - Ex: dragging a document to the Recycle Bin while talking to someone over the phone
A picture is worth a thousand words, but…

Exercise: write down the function of each of these icons.

Hint: all icons belong to an word processor toolbar
Make icons comprehensible

What is the main difference between the icons shown here and the icons shown on the previous slide?
Solution: attach actions to objects
Pointers

- important component
  - WIMP style relies on pointing and selecting things (such as icons)
- uses mouse, trackpad, joystick, trackball, cursor keys or keyboard shortcuts
- wide variety of graphical images
Pointers: design issues

Are the shapes above suitable to use as **pointers** to buttons or menu items? Redesign suggestions?
Menus

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

<table>
<thead>
<tr>
<th>File</th>
<th>Edit</th>
<th>Options</th>
<th>Font</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Typewriter</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Screen</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Times</td>
</tr>
</tbody>
</table>

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!
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
A Good Menu Example

- Logical grouping
- Visual separation of groups
- Disabled items “grayed out”
- Shortcuts shown
- ... indicates leads to dialogue
Buttons

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

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

- Show Buddy Pictures
- Show Audio Status
- Show Video Status
- Show Offline Buddies
- Show Groups
- Sort by Availability
- Sort by First Name
- Sort by Last Name
- Show Chat Participants
- Chat Options...
- Show as Text
- Show as Balloons
- Show Names
- Show Pictures
- Show Names and Pictures
- Set Chat Background...
- Clear Background
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
  - to what extent should toolbars be customizable?
Customizable toolbars

Dear Son,

Well, my arthritis has been acting up, so I haven’t been having such an easy time of using this new mouse device you got me. Do you think
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.
How to choose defaults

Are you sure you want to reset Safari?
Resetting Safari erases your browsing history, empties the cache, clears the Downloads window, and removes cookies. It also removes any saved names and passwords or other AutoFill text and clears Google search entries.
Widget pros and cons

Advantages
- Reuse of development effort
  - Coding, testing, debugging, maintenance
  - Iteration and evaluation
- External consistency

Disadvantages
- Constrain designer’s thinking
- Encourage menu & forms style, rather than richer direct manipulation paradigm
- May be used inappropriately