Chapter 7:

Interface Design

Objectives

✦ Understand key user interface design principles.

✦ Understand the different interaction styles and understand when these styles are most appropriate.

✦ Understand when to use graphical and textual presentation of information

Chapter 16 in the Sommerville textbook

Why is interface design important?

✦ Link between system functions & users

✦ Critical for system dependability

    ✦ "User errors" → user interfaces do not consider the capabilities of real users and the context of use

Human Factors Engineering

✦ The integration of human characteristics into system definition, design, development, and evaluation to optimise human-machine performance under operational conditions.

✦ Human Factor → a physical or cognitive property of an individual or social behavior which can influence interacting with technological systems.

Activity
Short -Term Memory

Take a look at these images for 15 seconds..

Short -Term Memory

On a piece of paper write down what you remember.

How many items did you remember?

Average = 7+/-2

Human factors in interface design

- ✦ **Limited short-term memory**
  - ✦ People can instantaneously remember about 7 items of information. If you present more than this, they are more liable to make mistakes.
- ✦ **People make mistakes**
  - ✦ When people make mistakes and systems go wrong, inappropriate alarms and messages can increase stress and hence the likelihood of more mistakes.
- ✦ **People are different**
  - ✦ People have a wide range of physical capabilities. Designers should not just design for their own capabilities.
- ✦ **People have different interaction preferences**
  - ✦ Some like pictures, some like text.

What do you think makes a good interface?

Examine the interfaces in your handout; share your thoughts with the class..
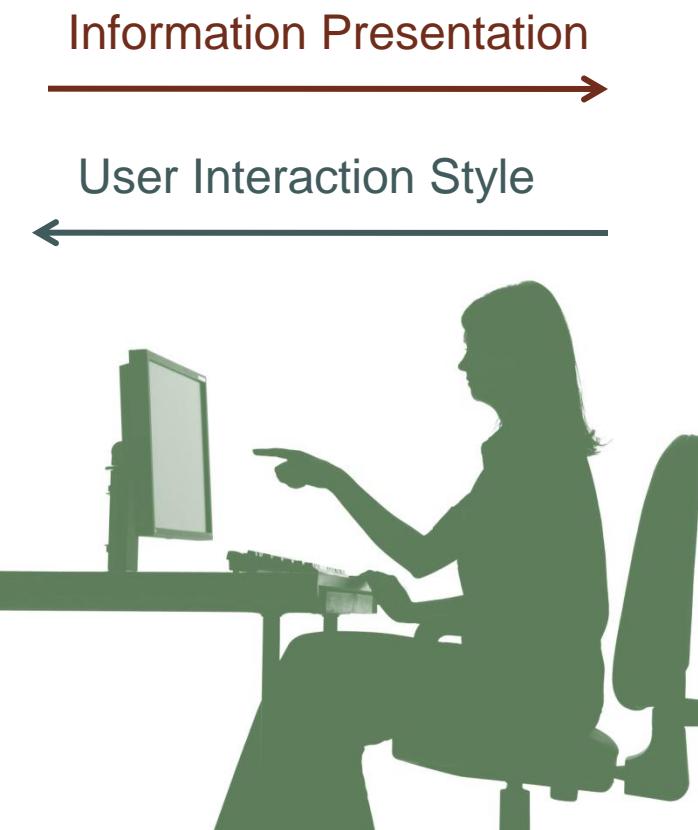
User Interface Design Principles

Principle	Description
User familiarity	The interface should use terms and concepts which are drawn from the experience of the people who will make most use of the system.
Consistency	The interface should be consistent in that, wherever possible, comparable operations should be activated in the same way.
Minimal surprise	Users should never be surprised by the behaviour of a system.
Recoverability	The interface should include mechanisms to allow users to recover from errors. 1. Confirmation of destructive actions 2. Undo 3. Check-pointing
User guidance	The interface should provide meaningful feedback when errors occur and provide context-sensitive user help facilities.
User diversity	The interface should provide appropriate interaction facilities for different types of system user.

Design Issues

Designers of user interfaces are faced with two key questions:

✦ How should the user interact with the system?

✦ How should information from the computer system be presented to the user?
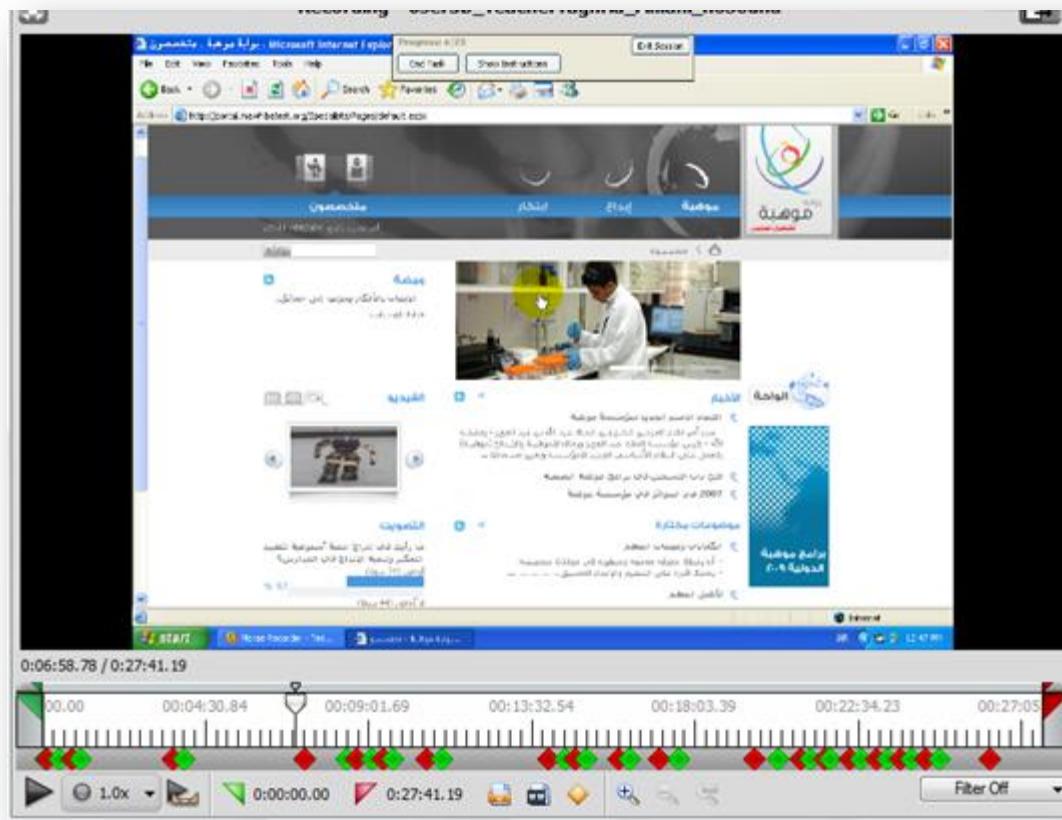
→ *Read pg 366-376 in your textbook*

Information Presentation

User Interaction Style

Interaction Styles

User Interaction Style

All the ways that users can interact with computers..

Interaction Design

HCI Video: Mouse movements, Eye movements, Facial expressions, In-Session user feedback on the design

Interaction Styles

All the ways that users can interact with computers..

- ✦ Command language
- ✦ Menu selection
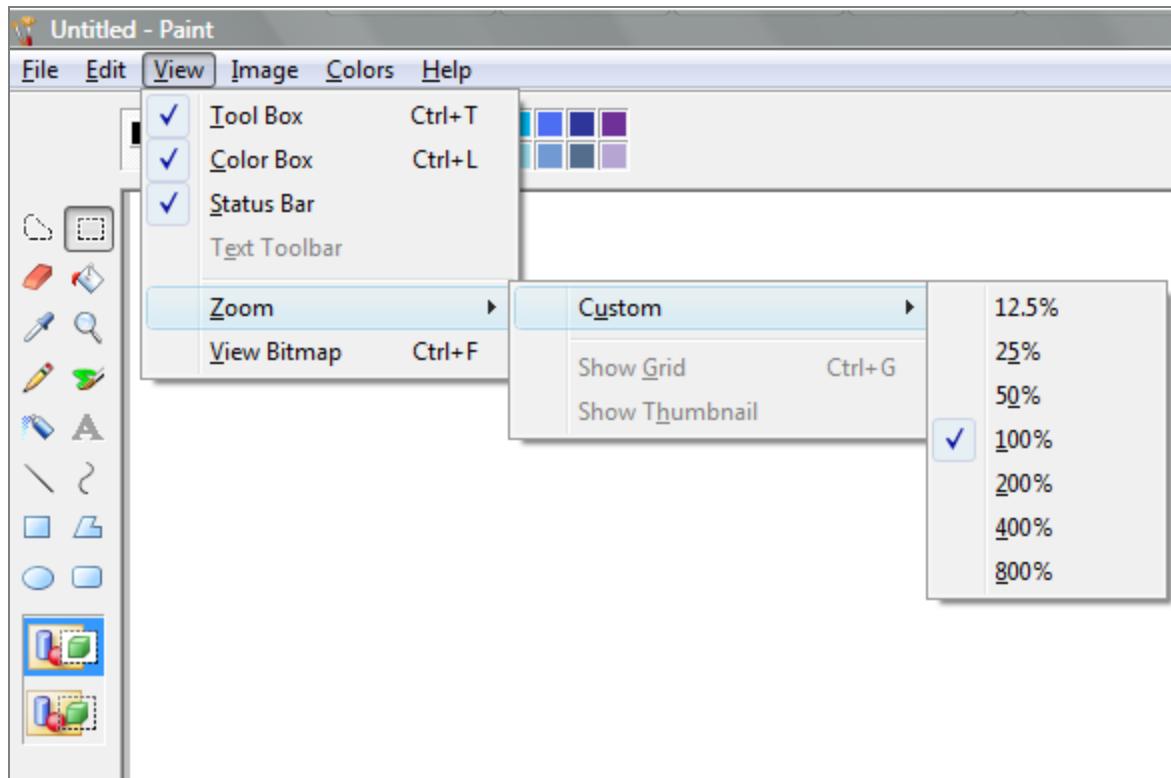- ✦ Form fill-in
- ✦ Direct manipulation
- ✦ Natural language

Designers & Developers: Time/effort

Users: Ease of use\Learnability
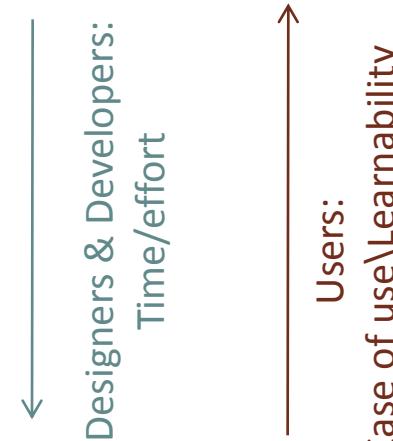
What do you think are the advantages and disadvantages of each method?
Take a look at the following examples..

Interaction Styles: Direct Manipulation
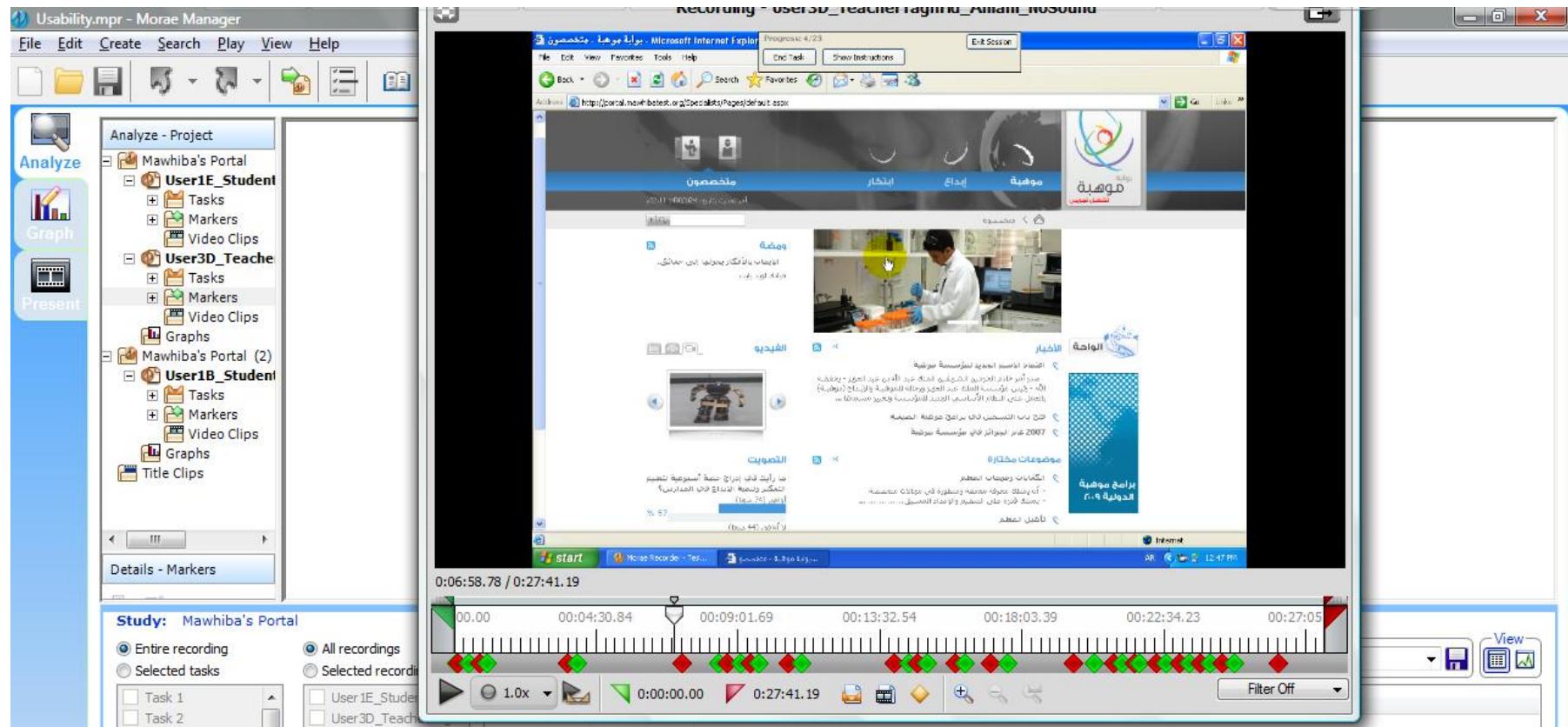
Interaction Styles: Menu Selection

Interaction Styles: Form Fill-in

Interaction Styles: Command Language

Interaction Styles: Natural Language

✦ Writing commands in natural language, such as '*print the file named abc.doc*'

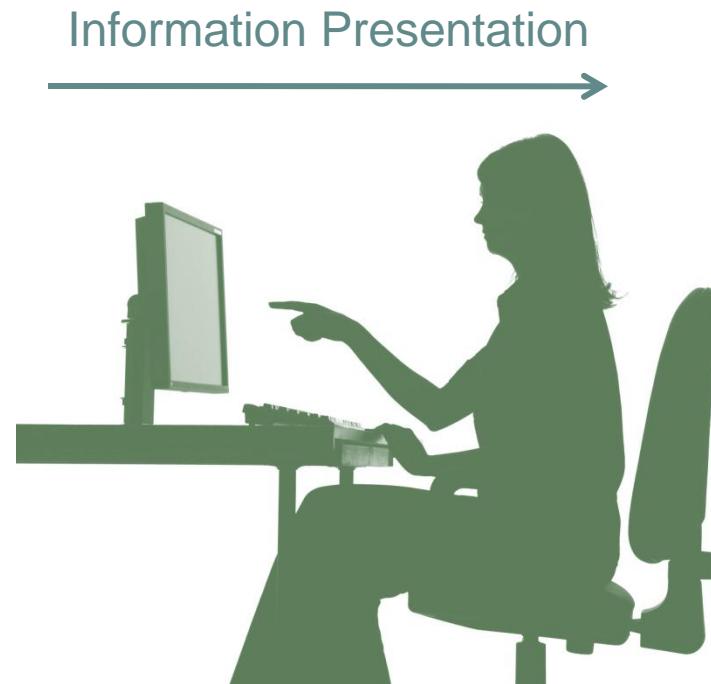✦ Vocal input (e.g. Dragon Naturally Speaking)
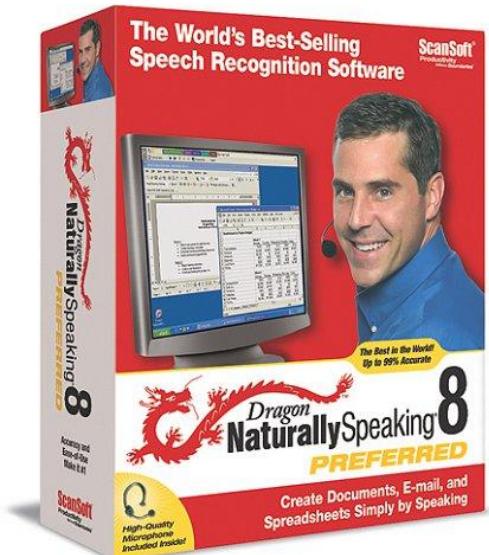
Interaction Styles

Interaction style	Main advantages	Main disadvantages	Application examples
Direct manipulation	Fast and intuitive interaction Easy to learn	May be hard to implement. Only suitable where there is a visual metaphor for tasks and objects.	Video games CAD systems
Menu selection	Avoids user error Little typing required	Slow for experienced users. Can become complex if many menu options.	Most general-purpose systems
Form fill-in	Simple data entry Easy to learn Checkable	Takes up a lot of screen space. Causes problems where user options do not match the form fields.	Stock control, Personal loan processing
Command language	Powerful and flexible	Hard to learn. Poor error management.	Operating systems, Command and control systems
Natural language	Accessible to casual users Easily extended	Requires more typing. Natural language understanding systems are unreliable.	Information retrieval systems

Interaction Styles: Web-based Interfaces

✦ What user interaction elements might you see on a web-based interface?

Information presentation

Information Presentation

All the ways that users can view information.

Information display factors

✦ Is the user interested in precise information or data relationships?

✦ How quickly do information values change? Must the change be indicated immediately?

✦ Must the user take some action in response to a change?

✦ Is there a direct manipulation interface?

✦ Is the information textual or numeric? Are relative values important?

Data Visualisation

✦ Concerned with techniques for displaying large amounts of information.

✦ Visualisation can reveal relationships between entities and trends in the data.

Data Visualisation

✦ Visualisation can reveal trends in user behaviour in interacting with systems.

Eyetracking revealed that users did not see target links
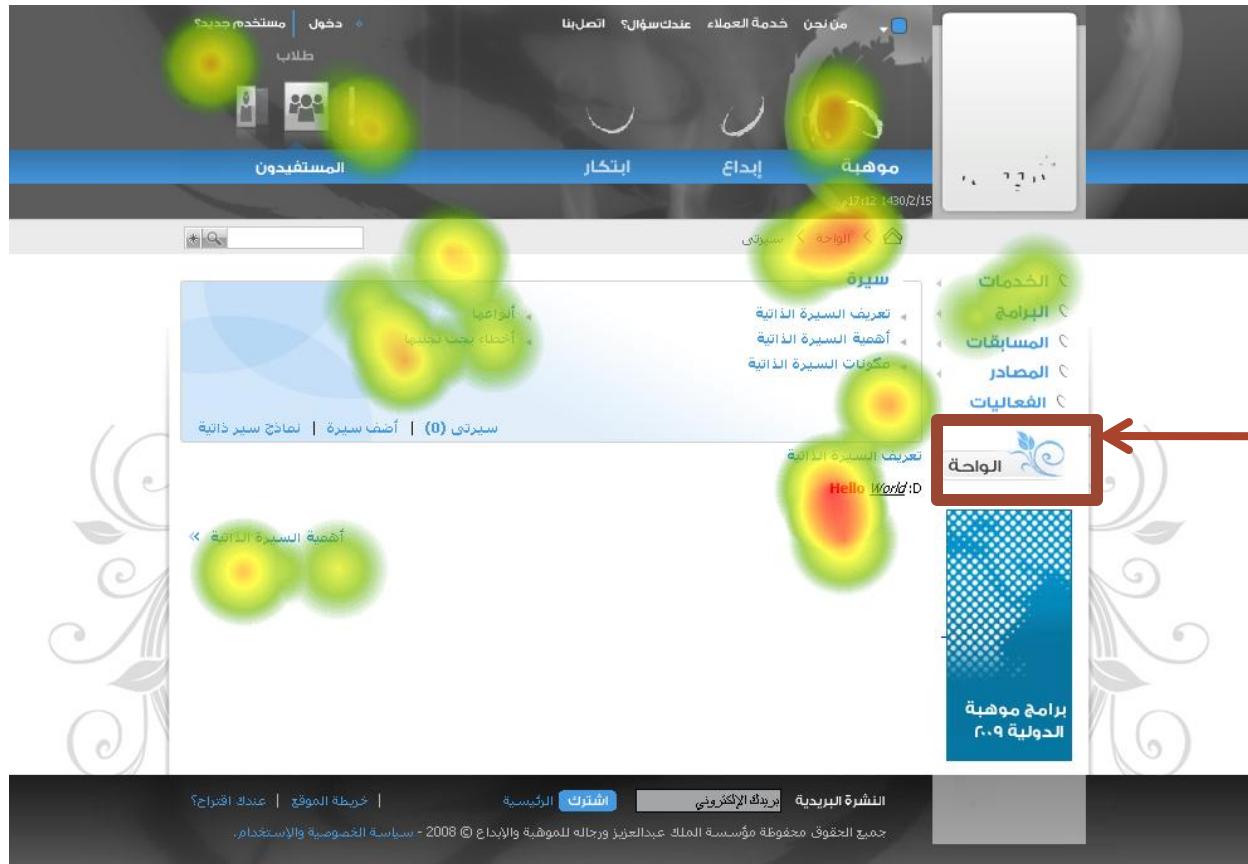
Data Visualisation

80% of the U.S. population lives in a metropolitan area. Top five population centers are numbered

Population density per square mile (2.6 sq km)
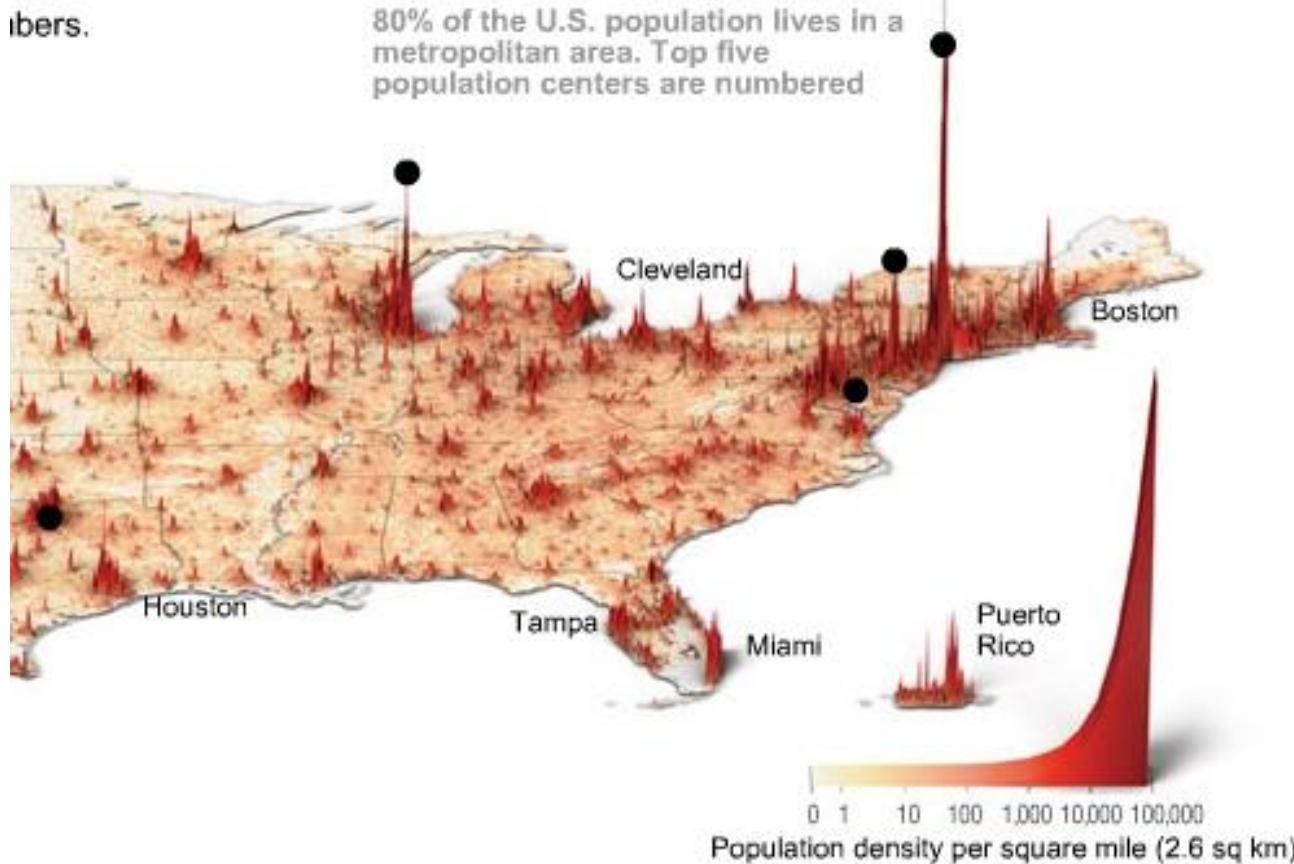
Data Visualisation

- Gapminder
  - http://www.gapminder.org
- Web pages as graph
  - http://www.aharef.info/static/htmlgraph/
- CrazyEgg
  - http://crazyegg.com/
- Time magazine
  - http://www.time.com/time/covers/20061030/where_we_live/

Data Visualisation

✦ Bonus assignment:

Watch Hans Rosling's TED presentation and write a review/summary of your thoughts on data visualisation.
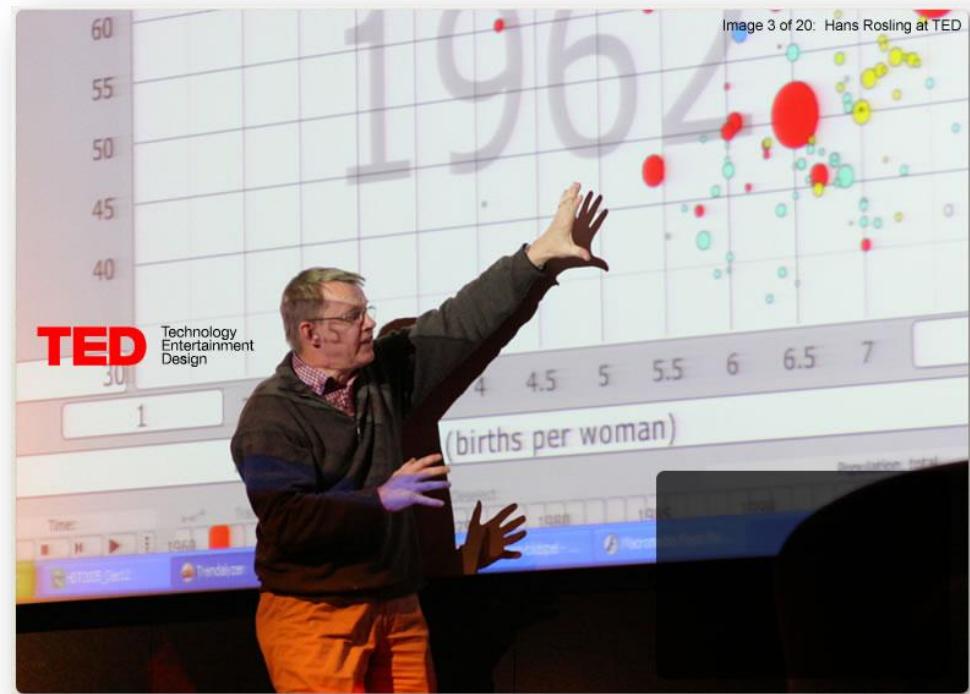
http://www.ted.com/talks/hans_rosling_shows_the_best_stats_you_ve_ever_seen.html

Data Visualisation
Presentation methods
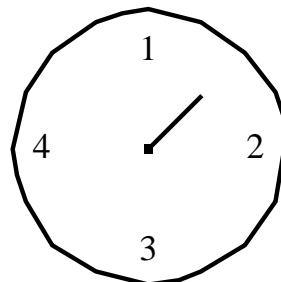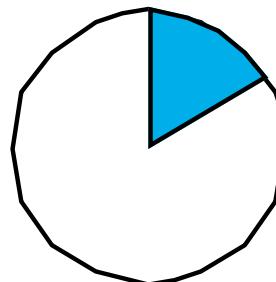
Dial with needle   Pie chart   Thermometer   Horizontal bar
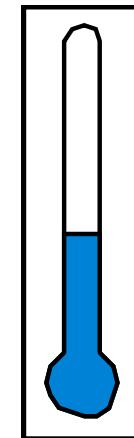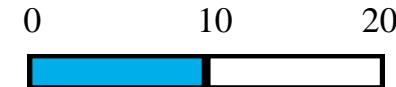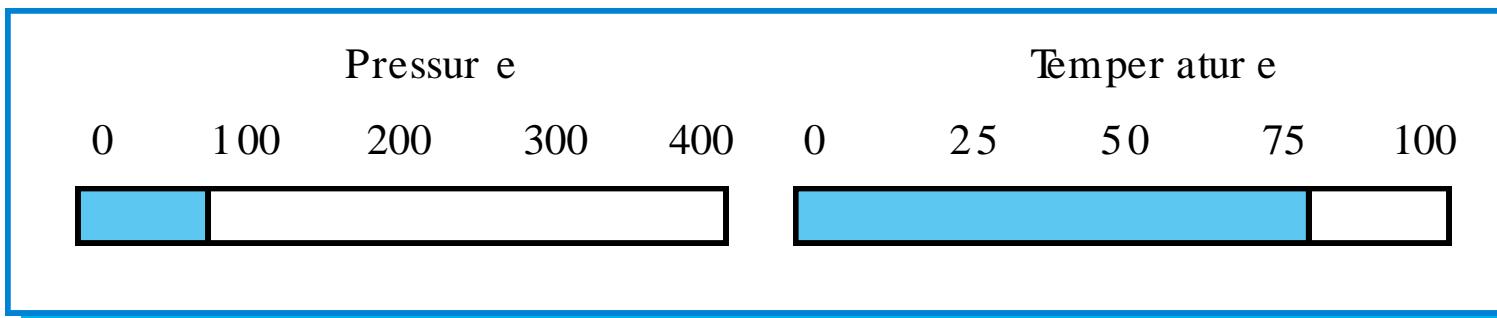
Interface Design: Colors

✦ Colour adds an extra dimension to an interface and can help the user understand complex information structures.

✦ Colour can be used to highlight exceptional events.

Green stop sign?
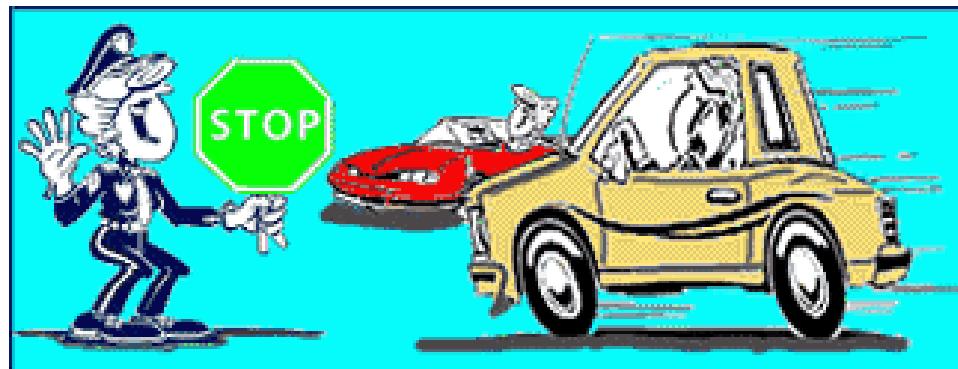
Interface Design: Colors

✦ Common mistakes in the use of colour in interface design is the over-use of colour in the display.

Interface Design: Colors
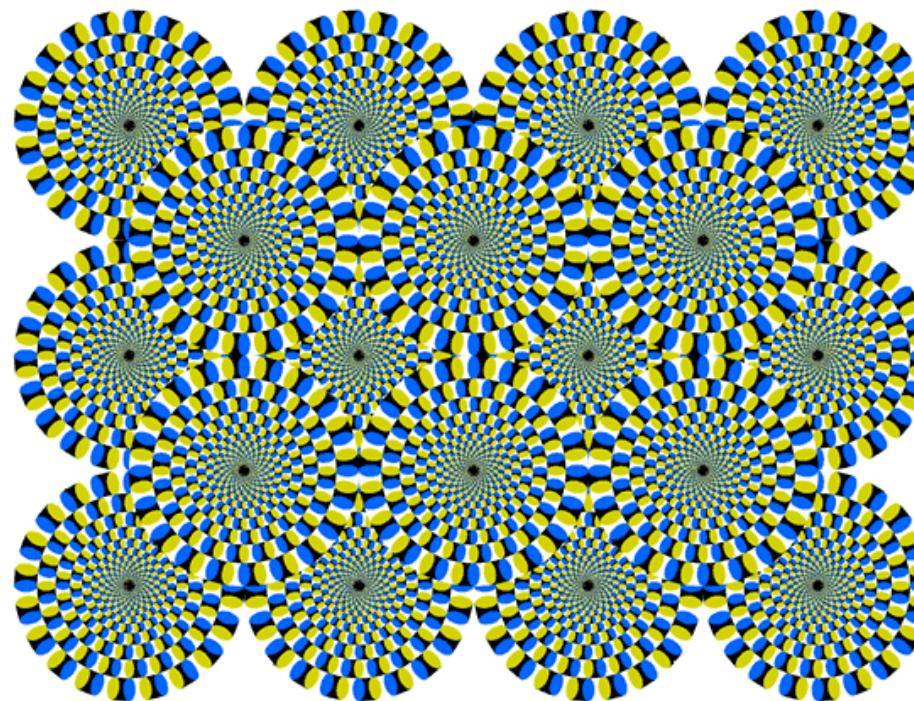
Akiyoshi Kitaoka, *Rotating Snakes* (2003).
This picture by Kitaoka appears to move due to the luminance contrast between the black, blue, white, and yellow.

Interface Design: Colors

✦ Limit the number of colours used and be conservative in their use.

✦ Use colour change to show a change in system status.

✦ Use colour coding to support the task that users are trying to perform.

✦ Be careful about colour pairings.

Interface Design: Colors

✦ Use colour coding in a thoughtful and consistent way.
✦ Individual preferences vary; allow users more control over the interface colors.

Example: MS Windows Accessibility features or the toolbar on http://www.dyslexia-parent.com/

Interface Design: Colors

✦ Colour Matters
- ✦ http://www.colormatters.com/

✦ Colour combinations:
- ✦ http://www.webdevelopersnotes.com/design/color_combinations.php3

Interface Design:
Error Messages
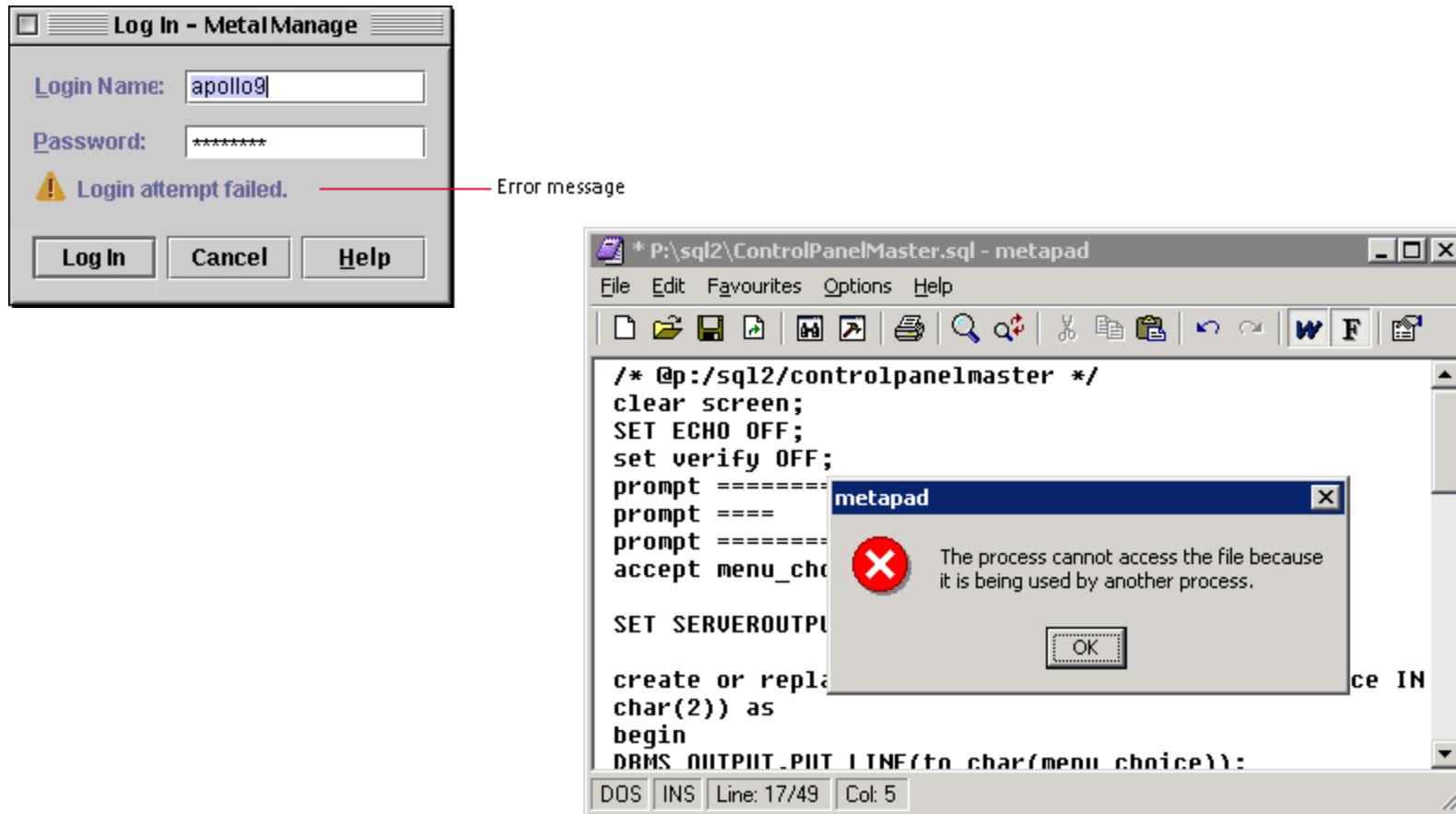
Error message

Interface Design:
Handling User Errors

Please type the patient's name in the bo   x then c lic k on OK

Patient's name

MacDonald, R.

OK   Cancel
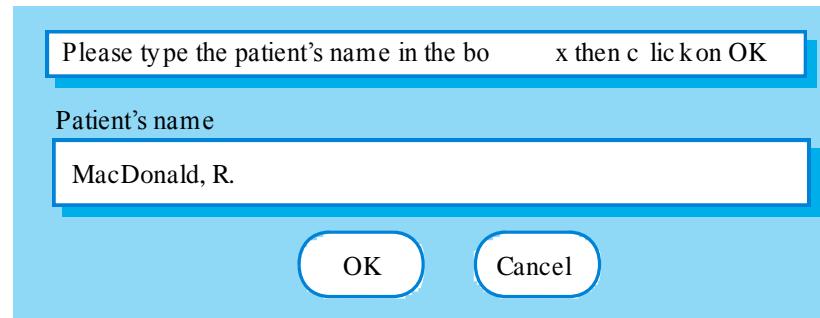
System-orient ed error message

?   Error #2 7

Invalid patient id

OK   Cancel

User-orient ed error message

R. MacDonald is not a reg   ist ered patient
Click on P atients f or a list of patients
Click on Retr y to re-input the patient's nam e
Click on Help f or m ore inf orm ation

Patients   Help   Retr y   Cancel
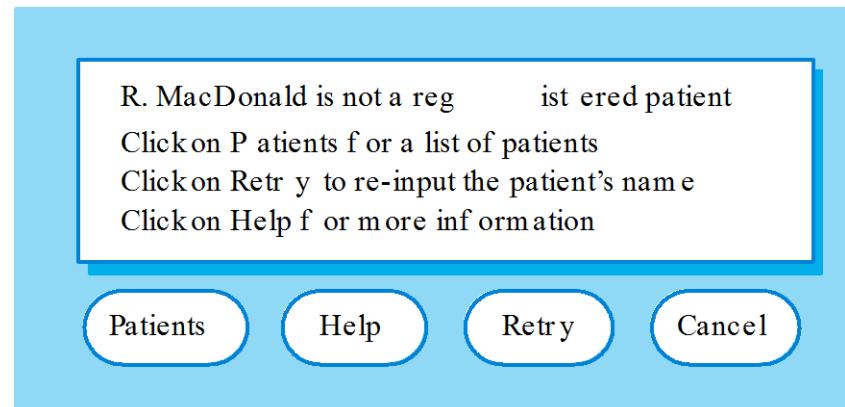
Interface Design:
Error Messages

Factor	Description
Context	Wherever possible, the messages generated by the system should reflect the current user context. As far as is possible, the system should be aware of what the user is doing and should generate messages that are relevant to their current activity.
Experience	As users become familiar with a system they become irritated by long, ÒmeaningfulÓ messages. However, beginners find it difficult to understand short terse statements of a problem. You should provide both types of message and allow the user to control message conciseness.
Skill level	Messages should be tailored to the userÕs skills as well as their experience. Messages for the different classes of user may be expressed in different ways depending on the terminology that is familiar to the reader.
Style	Messages should be positive rather than negative. They should use the active rather than the passive mode of address. They should never be insulting or try to be funny.
Culture	Wherever possible, the designer of messages should be familiar with the culture of the country where the system is sold. There are distinct cultural differences between Europe, Asia and America. A suitable message for one culture might be unacceptable in another.