Introduction to
Human-Computer Interaction

www.informatics.sussex.ac.uk/ users/johnhall/HCI.lecture.1.ppt

In this lecture we will...

- Look at what HCI is
- Ask why it is important
- Look at some bad design
- Understand some usability principles, and their implications for design

What is human-computer interaction?

- the study of *interaction between people and computer-based systems*

- concern with the *physical, psychological and theoretical aspects of this process*
  [Dix et al, p3]

Why do human-computer interaction?

- *to enable us to design interactive products to support people in their everyday and working lives*
  [Rogers et al, preface, v]

- Develop usable products:
  - easy to learn
  - effective to use
  - provide an enjoyable experience

Why is human-computer interaction important?

- There is a lot of design about that can cause problems for users

- Good design involves understanding how users interact with computers, and enabling them to do so effectively

Some problematic designs

- How fast am I going?

[www.baddesigns.com]

Some problematic designs (2)

- How do I get out of the lift?

[www.baddesigns.com]

Some problematic designs (3)

- Where does the mouse go?

[www.baddesigns.com]

To avoid problematic design we need to...

- ## Take into account
  - who the users are
  - what activities are being carried out
  - where the interaction is taking place

- ## Optimise the interactions users have with a product
  - such that they match users' activities and needs

Usability (1)

- Usability goals
  - Effectiveness
  - Efficiency
  - Safety
  - Utility
  - Learnability
  - Memorability

  [Rogers at al, pp14-18]

Usability (2)

- Design principles
  - Visibility
  - Feedback
  - Constraints
  - Mapping
  - Consistency
  - Affordance

[Don Norman: The Design of Everyday Things]

Visibility

- This is a control panel for an elevator.
- How does it work?
- Push a button for the floor you want?
- Nothing happens. Push any other button? Still nothing. What do you need to do?
- It's not *visible*

Visibility (2)

- You need to insert your room key – a card – into the slot by the buttons
- How would you make this action more visible?

Feedback

- Sending information back to the user about what has been done

- Includes sound, highlighting, animation and combinations of these

  - e.g. when screen button clicked on provides sound or red highlight feedback:
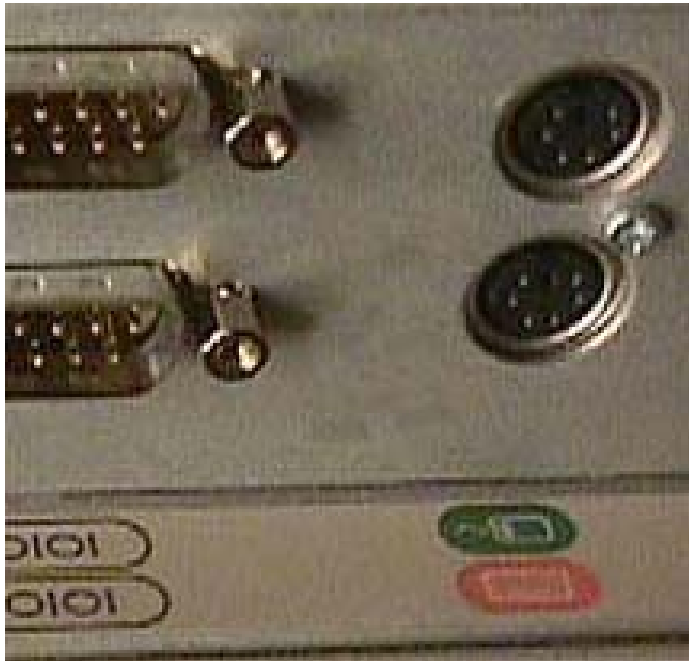
Previous   "clickkk"

Previous   Previous

Constraints

- Restricting the possible actions that can be performed

- Helps prevent user from selecting incorrect options

- Three main types
  - physical
  - cultural
  - logical

Physical constraints

- Refer to the way physical objects restrict the movement of things

  - E.g. design only one way to insert a mouse connection; and only one way to insert a keyboard connection, and make them different

Logical constraints

- Exploit people's reasoning about relationships between objects in the world

(A)

relationship between picture and object it represents means 'it goes here'
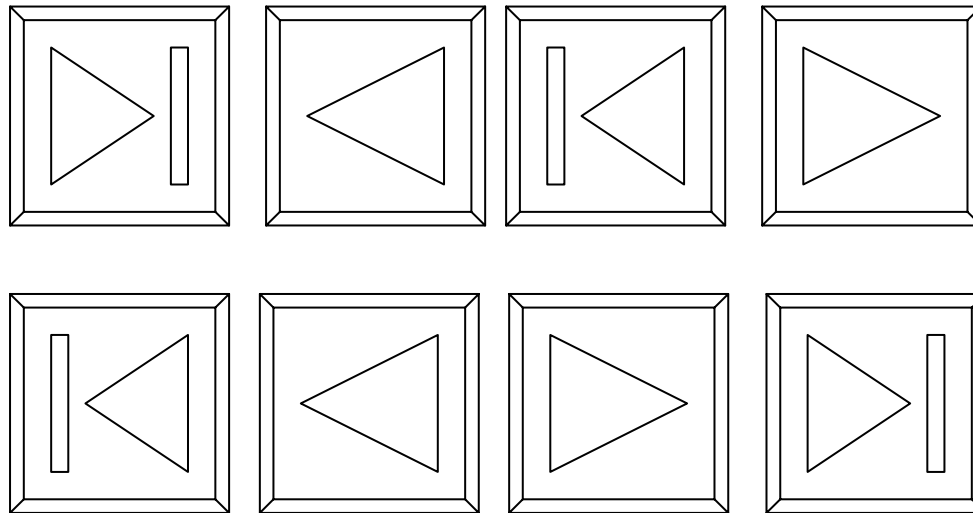
(B)

as A, but with an extra step: colour-coding

Cultural constraints

- Learned arbitrary conventions which help us use technologies
- Can apply in a number of ways
  - Icons, menus
  - Keyboards, number pads

Mapping

- Relationship between controls and their movements and the results in the world
- Which is the better mapping?

Mapping (2)

- Which is the better mapping, and why?

A   B   C   D

Consistency

- Design interfaces to have similar operations and use similar elements for similar tasks
- For example:
  – always use ctrl key plus first initial of the command for an operation – ctrl+C, ctrl+S, ctrl+O
- Main benefit is consistent interfaces are easier to learn and use

Consistency breakdowns

- What happens if there is more than one command starting with the same letter?
  - e.g. save, spelling, select, style
- Have to find other initials or combinations of keys, thereby breaking the consistency rule
  - E.g. ctrl+S, ctrl+Sp, ctrl+shift+L
- Increases learning burden on user, making them more prone to errors

Internal and external consistency

- Internal consistency refers to designing operations to behave the same within an application
  - Difficult to achieve with complex interfaces
- External consistency refers to designing operations, interfaces, etc., to be the same across applications and devices
  - Very rarely the case, based on different designers' preference

External inconsistency

(a) phones, remote controls

1	2	3
4	5	6
7	8	9
	0	

(b) calculators, computer keypads

7	8	9
4	5	6
1	2	3
0		

Affordances

- Refers to an attribute of an object that allows people to know how to use it

  - e.g. a mouse button invites pushing, a door handle affords pulling

- Norman (1988) used the term to discuss the design of everyday objects

- Since has been much popularised in interaction design to discuss how to design interface objects

  - e.g. scrollbars to afford moving up and down, icons to afford clicking on
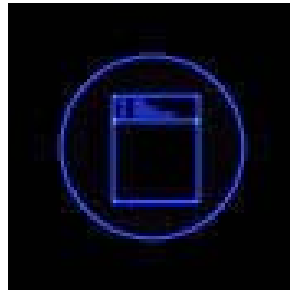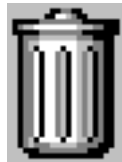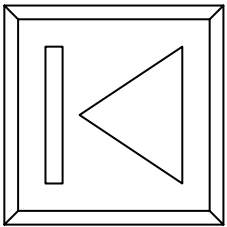
Affordances (2)

- Physical affordances
  - What do the following physical objects afford? Are the affordance obvious?

Affordances (3)

– Virtual affordances

- How do the following screen objects afford?
- What if you were a novice user?
- Would you know what to do with them?

Up Arrow →

Elevator Button

Down Arrow →

Relationships between usability principles

- – Visibility
- – Feedback
- – Constraints
- – Mapping
- – Consistency
- – Affordance

- Principles are not mutually exclusive
- What are the ways they can relate to each other?

Summary

- In Lecture 1 we looked at:
  - definitions of HCI

  - the importance of HCI

  - examples of bad design

  - the concept of usability

  - usability principles and their relationships

- In Lecture 2 we will overview User-centred design: how to design for usability.