Chapter 2
What is HCI?
Overview

- 2.1 The Human
- 2.2 The Computer
- 2.3 The Interaction
  - Models of Interaction
  - Interaction Styles
  - Elements of the WIMP Interface
Models of Interaction

- **What is interaction?**
  - Communication user ↔ system

- **Terms of interaction (traditional)**
  - **Domain**
    - Area of work under study
    - Example: graphic design
  - **Goal**
    - What you want to achieve
    - Example: create a solid red triangle
  - **Task**
    - How you go about doing it
    - Ultimately in terms of operations or actions
    - Example: select fill tool, click over triangle
Models of Interaction

- Donald Norman’s model (7 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

- Model concentrates on user’s view of interface
Models of Interaction

- 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 errors
  - Slip
    - User understands system and goal, correct formulation of action
    - But: incorrect action
  - Mistake
    - User may not even have right goal!
- Fixing things?
  - Slip – better interface design
  - Mistake – better understanding of system
Abowd and Beale’s framework
- Extension of Norman’s model
- Interaction framework has four parts
  - User
  - Input
  - System
  - Output

Each has its own unique language
- Interaction = translation between languages
- Problems in interaction = problems in translation
Interaction Styles

- 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
Interaction Styles

- **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
Interaction Styles

- 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
    - Requires some expertise
Interaction Styles

- Form-fills
  - Primarily for data entry or data retrieval
  - Screen like a paper form
  - Data put in relevant place
  - Requires
    - Good design
    - Obvious correction facilities
Interaction Styles

- **WIMP Interface**
  - Windows, Icons, Menus, Pointers
  - Or: Windows, Icons, Mice, 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
  - Goal: minimal typing
Interaction Styles

- Three-dimensional interfaces
  - ‘Ordinary’ window systems
    - Highlighting
    - Visual affordance
    - Indiscriminate use just confusing!
  - Virtual reality / 3D workspaces
    - Use for extra virtual space
    - 3D effects on 2D display
      - Light and occlusion give depth
      - Distance effects
      - Usually named as 2.5D
    - “Real 3D” on stereoscopic displays
Elements of the WIMP Interface

- **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
    - 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
Elements of the WIMP Interface

- **Icons**
  - Small picture or image
  - Represents some object in the interface
    - Often a window or action
  - Windows can be closed down (iconized)
    - Small representation for many accessible windows
  - Icons can be many and various
    - Highly stylized
    - Realistic representations
Elements of the WIMP Interface

- **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
Elements of the WIMP Interface

- Widgets
  - Bits that make the GUI
  - Individual items on a GUI screen ...
    - Checkboxes, menus, toolbars, buttons etc.
  - Three aspects:
    - Appearance – what they look like
    - Interaction – how they behave
    - Semantics – what they mean
  - Think separately:
    - Meaning first – what you want it to do
    - Then appearance – how you do it
Elements of the WIMP Interface

- Widgets – Appearance
  - Verbs
    - Action words
    - Examples: quit, exit, embolden, italicize
  - Adjectives
    - Description/state words
    - Examples: bold, italic
  - Nouns
    - Usually as a form of description
    - Examples: Times New Roman, US Letter
  - Beware of mixes
    - Example: embolden + italic
Elements of the WIMP Interface

- Widgets – Behavior
  - Some bits the toolkit does for you
    - But is it right?
  - Some you control
    - E.g. drawing, interactions between widgets
  - Beware timing issues
    - E.g. large selections under Windows apps

Click + hold mouse button ⇒ highlights
Move mouse off target, button still down ⇒ highlight removed
Release button ⇒ nothing happens
Elements of the WIMP Interface

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

  ![Menu Diagram]

  - Problem – take a lot of screen space
  - Solution – pop-up: menu appears when needed

**File** | **Edit** | **Options** | **Font**
---|---|---|---
| | | Typewriter | Screen Times

HCI – 2.3.18
Elements of the WIMP Interface

- **Menus (cont.)**
  - 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
Elements of the WIMP Interface

- **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!
Elements of the WIMP Interface

- Menu “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; but: usually different !!!
Elements of the WIMP Interface

- **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
      - One of several options
    - **Check boxes**
      - Set of non-exclusive choices
      - Zero, one or more options
Elements of the WIMP Interface

- 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
Elements of the WIMP Interface

- **Dialogue boxes**
  - Information windows that pop up to inform of an important event or request information
  - Example: 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.