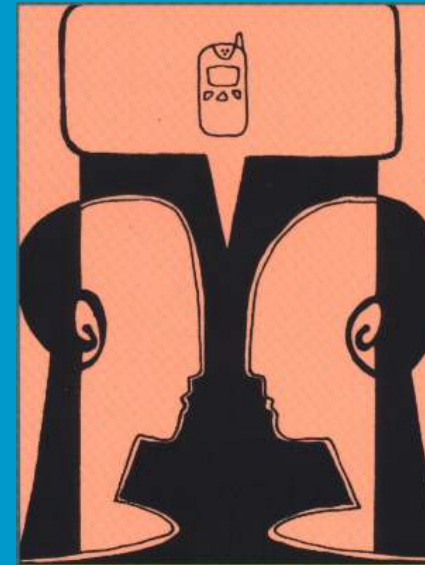


MKT project 1 & Mens-Machine-Interactie

slides chapter 2 Dix et al.

Charles van der Mast



The Computer

a computer system is made up of various elements

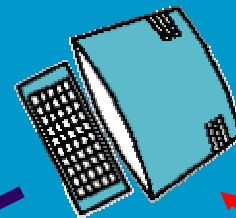
each of these elements affects the interaction

- **input devices** – text entry and pointing
- **output devices** – screen (small&large), digital paper
- **virtual reality** – special interaction and display devices
- **physical interaction** – e.g. sound, haptic, bio-sensing
- **paper** – as output (print) and input (scan)
- **memory** – RAM & permanent media, capacity & access
- **processing** – speed of processing, networks

Interacting with computers

to understand human–*computer* interaction
... need to understand computers!

what goes in and out
devices, paper,
sensors, etc.



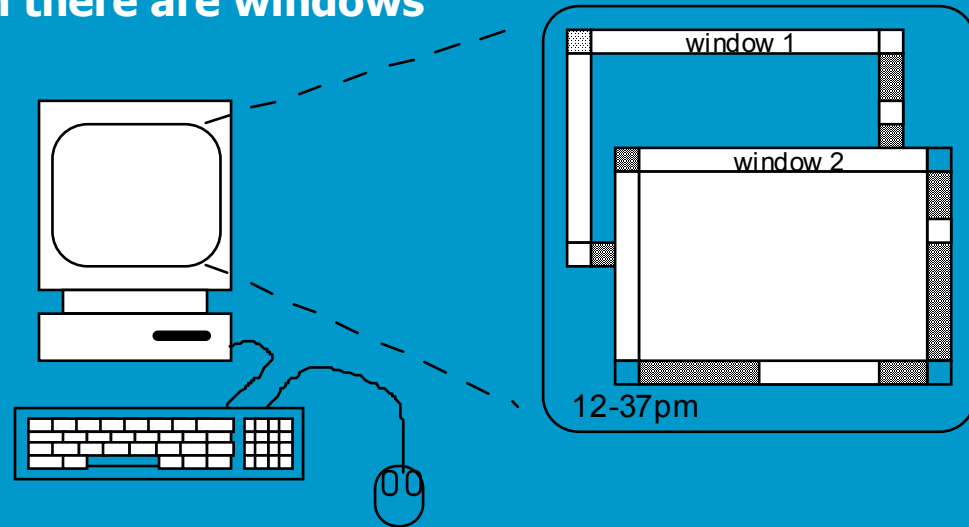
what can it do?
memory, processing,
networks

A 'typical' computer system



- screen, or monitor, on which there are windows
- keyboard
- mouse/trackpad

- variations
 - desktop
 - laptop
 - PDA



the devices dictate the styles of interaction that the system supports
If we use different devices, then the interface will support a different style of interaction

Interactivity?

Long ago in a galaxy far away ... *batch* processing

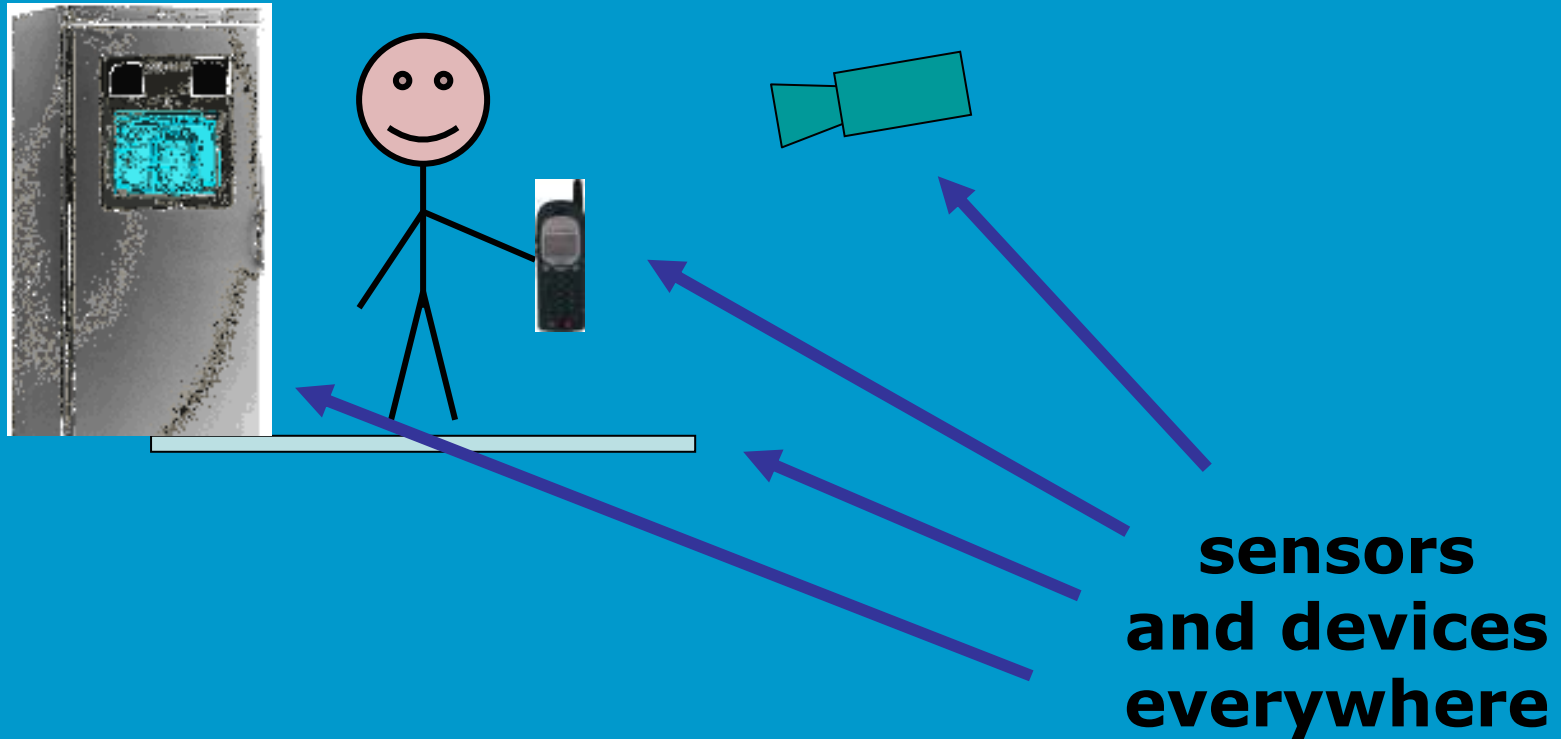
- punched card stacks or large data files prepared
 - long wait
 - line printer output
- ... and if it is not right ...

Now most computing is interactive

- rapid feedback
- the user in control (most of the time)
- doing rather than thinking ...

Is faster always better?

Richer interaction



Keyboards

- Most common text input device
- Allows rapid entry of text by experienced users
- Keypress closes connection, causing a character code to be sent
- Usually connected by cable, but can be wireless

phone pad and T9 entry

- use numeric keys with multiple presses

2 - a b c 6 - m n o

3 - d e f 7 - p q r s

4 - g h i 8 - t u v

5 - j k l 9 - w x y z

hello = 4433555[pause]555666

surprisingly fast!

- T9 predictive entry
 - type as if single key for each letter
 - use dictionary to 'guess' the right word
 - hello = 43556 ...
 - but 26 -> menu 'am' or 'an'



Handwriting recognition

- **Text can be input into the computer, using a pen and a digitizing tablet**
 - **natural interaction**
- **Technical problems:**
 - **capturing all useful information - stroke path, pressure, etc. in a natural manner**
 - **segmenting joined up writing into individual letters**
 - **interpreting individual letters**
 - **coping with different styles of handwriting**
- **Used in PDAs, and tablet computers ...
... leave the keyboard on the desk!**

Speech recognition

- **Improving rapidly**
- **Most successful when:**
 - **single user – initial training and learns peculiarities**
 - **limited vocabulary systems**
- **Problems with**
 - **external noise interfering**
 - **imprecision of pronunciation**
 - **large vocabularies**
 - **different speakers**

positioning, pointing and drawing

mouse, touchpad
trackballs, joysticks etc.
touch screens, tablets
eyegaze, cursors

Trackball and thumbwheels

Trackball

- **ball is rotated inside static housing**
 - **like an upside down mouse!**
- **relative motion moves cursor**
- **indirect device, fairly accurate**
- **separate buttons for picking**
- **very fast for gaming**
- **used in some portable and notebook computers.**

Thumbwheels ...

- **for accurate CAD – two dials for X-Y cursor position**
- **for fast scrolling – single dial on mouse**

Joystick and keyboard nipple

Joystick

- indirect
pressure of stick = velocity of movement
- buttons for selection
on top or on front like a trigger
- often used for computer games
aircraft controls and 3D navigation

Keyboard nipple

- for laptop computers
- miniature joystick in the middle of the keyboard

Touch-sensitive screen

- **Detect the presence of finger or stylus on the screen.**
 - works by interrupting matrix of light beams, capacitance changes or ultrasonic reflections
 - *direct* pointing device
- **Advantages:**
 - fast, and requires no specialised pointer
 - good for menu selection
 - suitable for use in hostile environment: clean and safe from damage.
- **Disadvantages:**
 - finger can mark screen
 - imprecise (finger is a fairly blunt instrument!)
 - difficult to select small regions or perform accurate drawing
 - lifting arm can be tiring

Eyegaze

- **control interface by eye gaze direction**
 - e.g. look at a menu item to select it
- **uses laser beam reflected off retina**
 - ... a very low power laser!
- **mainly used for evaluation (ch x)**
- **potential for hands-free control**
- **high accuracy requires headset**
- **cheaper and lower accuracy devices available sit under the screen like a small webcam**

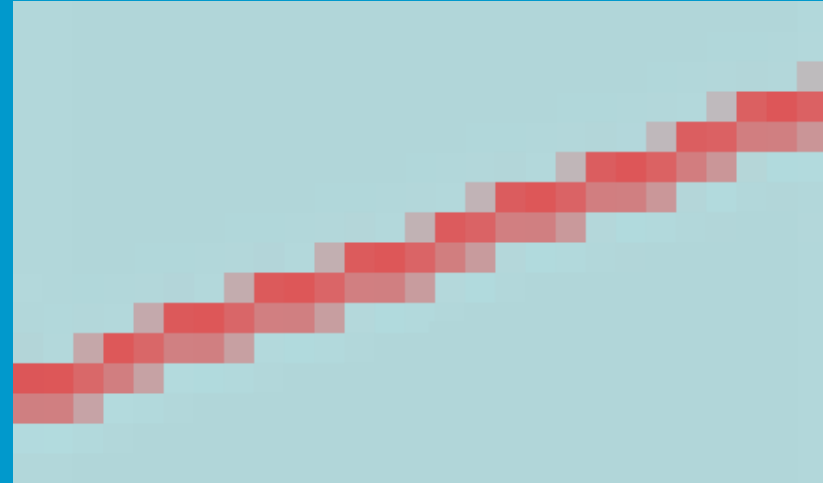
anti-aliasing

Jaggies

- diagonal lines that have discontinuities in due to horizontal raster scan process.

Anti-aliasing

- softens edges by using shades of line colour
- also used for text



Liquid crystal displays

- **Smaller, lighter, and ... no radiation problems.**
- **Found on PDAs, portables and notebooks,
... and increasingly on desktop and even for home TV**
- **also used in dedicted displays:
digital watches, mobile phones, HiFi controls**
- **How it works ...**
 - **Top plate transparent and polarised, bottom plate reflecting.**
 - **Light passes through top plate and crystal, and reflects back to eye.**
 - **Voltage applied to crystal changes polarisation and hence colour**
 - **N.B. light reflected not emitted => less eye strain**

large displays

- **used for meetings, lectures, etc.**
- **technology**
 - plasma** – usually wide screen
 - video walls** – lots of small screens together
 - projected** – RGB lights or LCD projector
 - hand/body obscures screen
 - may be solved by 2 projectors + clever software
 - back-projected**
 - frosted glass + projector behind

virtual reality and 3D interaction

positioning in 3D space
moving and grasping
seeing 3D (helmets and caves)

positioning in 3D space

- **cockpit and virtual controls**
 - **steering wheels, knobs and dials ... just like real!**
- **the 3D mouse**
 - **six-degrees of movement: x, y, z + roll, pitch, yaw**
- **data glove**
 - **fibre optics used to detect finger position**
- **VR helmets**
 - **detect head motion and possibly eye gaze**
- **whole body tracking**
 - **accelerometers strapped to limbs or reflective dots and video processing**

Sounds

- **beeps, bongs, clonks, whistles and whirrs**
- **used for error indications**
- **confirmation of actions e.g. keyclick**

also see chapter 10

Fonts

- **Font – the particular style of text**

Courier font

Helvetica font

Palatino font

Times Roman font

□ §'α≡↓℞ ⊗↓~ (special symbol)

- **Size of a font measured in points (1 pt about 1/72")
(vaguely) related to its height**

This is ten point Helvetica

This is twelve point

This is fourteen point

This is eighteen point

and this is twenty-four point

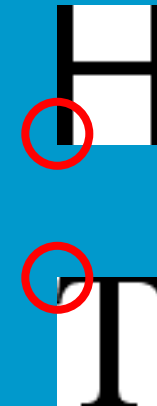
Fonts (ctd)

Pitch

- **fixed-pitch** – every character has the same width
e.g. `Courier`
- **variable-pitched** – some characters wider
e.g. Times Roman – compare the 'i' and the "m"

Serif or Sans-serif

- **sans-serif** – square-ended strokes
e.g. Helvetica
- **serif** – with splayed ends (such as)
e.g. Times Roman or Palatino



Readability of text

- **lowercase**
 - **easy to read shape of words**
- **UPPERCASE**
 - **better for individual letters and non-words**
e.g. flight numbers: BA793 vs. ba793
- **serif fonts**
 - **helps your eye on long lines of printed text**
 - **but sans serif often better on screen**