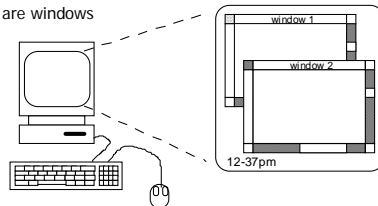## The Computer

- Input devices
- Output devices
- VR
- Memory
- Processing

What is a UI?

- Input devices?

- Output devices?

- Controls?

A 'typical' computer system

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

- variations
  - desktop
  - laptop
  - PDA

window 1

window 2

12-37pm

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

How many ...

- computers in your house?
  - hands up, ...
    ... none, 1, 2 , 3, more!!

- computers in your pockets?

are you thinking ...
... PC, laptop, PDA ??

How many computers …

in your house?

- PC
- TV, VCR, DVD, HiFi, cable/satellite TV
- microwave, cooker, washing machine
- refrigerator
- security system

in your pockets?

- PDA
- phone, camera
- smart card, card with magnetic strip?
- electronic car key
- USB memory

try your pockets and bags

•Embedded systems actually far outnumber traditional PCs

Text entry devices

- Keyboards
- Chord keyboards
- Phone pad and T9 entry
- Handwriting recognition
- Speech recognition

Positioning, pointing and drawing

- The mouse
- Touchpad
- Trackball and thumbwheel
- Joystick and keyboard nipple
- Touch-sensitive screens
- Stylus and light pen
- Digitizing tablet
- Eyegaze
- Cursor keys and discrete positioning
- Spaceball

Discrete positioning controls

- in phones, TV controls etc.
  - cursor pads or mini-joysticks
  - discrete left-right, up-down
  - mainly for menu selection

Game controllers

- Integrate a package of controls
  - Relatively universal and more specialized (flight, driving, etc.)
  - Often emulate (*or are emulated by*) 'real' controller technology in aircraft, automotive and military applications

Display devices

- Bitmap displays
- CRT and LCD
- Large and situated displays

Devices for VR and 3D interaction

- Positioning in 3D space
  - 3D mouse, dataglove, VR helmet, whole-body tracking
- 3D displays
  - Seeing in 3D, VR motion sickness, simulators and VR caves

Physical controls, sensors and special devices

- Special displays (LEDs, gauges, etc)
- Sound output
- Touch, feel and smell
- Physical controls
- Environment and bio-sensing
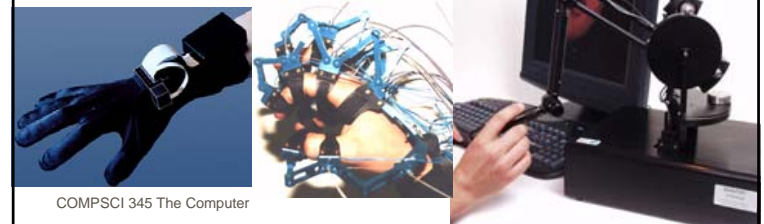
Paper: printing and scanning

- Printing
- Fonts and page description
  - Fixed   vs   variable and serif   vs sans-serif
  - `courier`   tahoma   times roman   arial
- Screen and page (WYSIWYG)
- Scanners and optical character recognition
  - Now so affordable! (often thrown in with a printer)

Memory

- RAM and short term memory
- Disks and long term memory
- Flash
- Understanding speed and capacity
- Compression
- Storage formats and standards
  - ASCII, UNICODE, RTF, SGML
- Methods of access
  - Index, Soundex, free text retrieval

Processing and networks

- Effects of finite processor speed
  - Interaction and reaction
  - E.g., buffered events
- Limitations on interactive performance
  - Computation bound
  - Storage channel bound
  - Graphics bound
- Networked computing
- Internet – always connected?
  - Social consequences

Moore's law

- computers get faster and faster!
- 1965 …
  - Gordon Moore, co-founder of Intel, noticed a pattern
  - processor speed doubles every 18 months
  - PC … 1987: 1.5 Mhz, 2002: 1.5 GHz
- similar pattern for memory
  - but doubles every 12 months!!
  - hard disk … 1991: 20Mbyte : 2002: 30 Gbyte
- baby born today
  - record all sound and vision
  - by 70 all life's memories stored in a grain of dust!

So computers keep getting better!

- With more computing power, we can have more...
  - Multimedia
  - Signal processing
    - Like real-time gesture recognition
    - Reasonably good speech input
  - Realistic rendering of avatars
- More network bandwidth would still be nice
  - But short-range networks (infrared, BlueTooth, 802.11) are really giving us ubiquitous inter-device communications
- The result is a lot more options for the UI designer!