Graphics Input Devices

How We Tell the Computer What We Want

Computer Graphics Devices

Output devices: Monitors
Printers and plotters
3D output devices
other output devices

Input devices: Keyboards
Tablet, Digitizer
Mouse, Cursor control devices
Scanners and video digitizers
Virtual reality devices
other interactive devices

Graphics Input Devices

Keyboards
Interaction devices
cursor controlling 2D positioning devices
tablet, digitizer, light pen, finger, mouse, trackball,
joystick, ...
other devices
spaceball, 3D digitizer
Image input devices
scanner, still video devices, video digitizer
Scanners

“New” Input Devices

- Incremental
- Force/torque sensors
- Specification of movements rather than precise position
- Spaceball, Spacemouse

- Absolute
- Position/orientation trackers
- Direct correspondence between real and virtual motion
- Speech Recognition

Incremental 3D-Input Devices

- Spaceball
  - Metaphor
    - Ball is the manipulated object
  - 6 DOF control
    - Forces and torques are applied to the ball
    - Interpretation to translate device data into motion specification
Absolute 3D-Input Devices

- Position/orientation tracker
  - Acoustic
  - Magnetic
  - Optical
  - Mechanical

Hand Input Devices

- Dataglove
  - Flex sensors
  - Up to 24 DOF
  - Trackers for position and orientation
  - Gesture recognition

Haptic Devices

- Force-feedback devices
- User ‘feels’ the object
- 6 degree-of-freedom (DOF) movement
- 3 or 6 DOF force-feedback
Speech Recognition
Analyzes voice to infer words/sentences.
Today’s technology can recognize (% reliability after ‘training’)
- single words: 99%+
- grammar based utterances: 95-99%
- free speech: 75-90%
Speech understanding requires also knowledge representation!
Spoken English ? written English! Written English is invariably more precise and follows the ‘rules’.

Classification of Input Devices
Classification according to task
- Position
  - Coordinate system mapping, resolution, grids, feedback (numeric, proximity)
- Select
  - by naming, by pointing
- Text Interaction
- Quantification (valuator)
- 3D Interaction

3D Interaction with 2D Devices
One solution: Modes (buttons)/dials (sliders)/... to specify how to manipulate
- E.g. mode for movement, mode for rotation
Arcball technique for 3D rotation

Another solution: use constraints of objects to map input to manipulation
- E.g. table moves only on floor