User Input
Keyboard

- read modes
  - synchronous - wait for keypress, return
  - asynchronous - return immediately, with info about keys pressed
Mouse

- X, Y
  - absolute or relative
- Buttons
Joysticks

- simple - 4 buttons
- analog - continuous, 2 values
Response Curves

• used to filter raw joystick position data
• joysticks 'jitter'
• often used with a 'dead zone' around 0
Hardware Abstraction

- want **device independence**
- remap controls from **physical device** to **logical device**
- map to game oriented values
  - walk, jump, et.
- can be done in OS, eg. DirectX 'action mapping'
Force Feedback

- many game controllers contain a motor
  - only vibrates: on/off, frequency
- a true haptic controller can provide a vector force (magnitude and direction)
  - complex, expensive
- ex)sensible.com "phantom" controller
  - ex) OMFG google 'haptic cow'
Cameras

- cameras are cheap, everywhere
- ex) PS2 EyeToy ~$40 - 640x480@60Hz
- point at anything
Cameras for silhouette detection

- collision $==$ object has one or more black silhouette pixels on it
Cameras: silhouette detection

- controlled illumination - eg, backlight
- capture image and threshold it
- can use IR light and camera
- unobtrusive
- can combine with projected images without crosstalk
Cameras: silhouette detection

- chroma key
- background = green
- foreground = not green
Cameras: silhouette detection

- background subtraction
  - use an image of background (without person)
  - pixels not matching background are foreground.
- problems: holes, colors, dynamic backgrounds

flickr.com/photos/shokai/473709334/
Cameras: Motion Detection

- for magnitude only:
  - count no. of pixels that changed color/intensity by more than some amount
  - may be good enough for 'activity' level, eg, for running game

- for direction: can use frame differencing
  - pixels that are different than last frame are in regions of moving objects
  - compute centroid of moving pixels
  - vector difference between centroid positions in consecutive frames = direction of motion
Cameras: multitouch displays

- one technique: FTIR - Frustrated Total Internal Reflection
  - use IR light (LEDs) for finger detection
  - use visible light for display
- http://www.cs.nyu.edu/~jhan/ftirtouch/

[Diagram of multitouch display setup]

Monday, April 27, 2009
Other sensors

- Pressure - ex) Dance Dance Revolution
- Ultrasonic - ex) Mattel PowerGlove
  - 3 beacons emit "chirps"
  - sensor(mic) on tracked object
  - inter-arrival delays at mic used to derive position
- Knobs, sliders - ex) MIDI controllers
- Strain gauge - resistance changes as it bends
- Accelerometer - gives tilt (gravitational accel)
  - can integrate accelerations twice to get position