Non-Speech Sounds

boings, bangs, squeaks, clicks etc.

- commonly used for warnings and alarms

- Evidence to show they are useful
  - fewer typing mistakes with key clicks
  - video games harder without sound

- Language/culture independent, unlike speech

Non-Speech Sounds: useful?

- Dual mode displays:
  - information presented along two different sensory channels
  - redundant presentation of information
  - resolution of ambiguity in one mode through information in another
- Sound good for
  - transient information
  - background status information

e.g. Sound can be used as a redundant mode in the Apple Macintosh; almost any user action (file selection, window active, disk insert, search error, copy complete, etc.) can have a different sound associated with it.
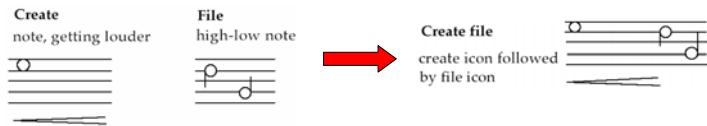
Auditory Icons

- Use natural sounds to represent different types of object or action
- Natural sounds have associated semantics which can be mapped onto similar meanings in the interaction
  - e.g. throwing something away
    - ~ the sound of smashing glass
- Problem: not all things have associated meanings

- Additional information can also be presented:
  - muffled sounds if object is obscured or action is in the background
  - use of stereo allows positional information to be added

SonicFinder for the Macintosh

- items and actions on the desktop have associated sounds

- folders have a papery noise

- moving files – dragging sound

- copying – a problem ...
  - sound of a liquid being poured into a receptacle rising pitch indicates the progress of the copy

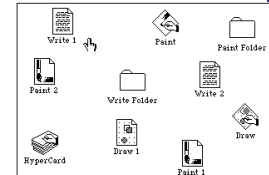- big files have louder sound than smaller ones

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Earcons

- Synthetic sounds used to convey information
- Structured combinations of notes (motives) represent actions and objects
- Motives combined to provide rich information
  - compound earcons
  - multiple motives combined to make one more complicated earcon

Create
note, getting louder

File
high-low note

Create file
create icon followed by file icon

Earcons (ctd)

- family earcons
  similar types of earcons represent similar classes of action or similar objects: the family of "errors" would contain syntax and operating system errors

Write 1   Paint   Paint Folder
Paint 2   Write Folder   Write 2
HyperCard   Draw 1   Draw   Paint 1

☺ Earcons easily grouped and refined due to compositional and hierarchical nature

☹ Harder to associate with the interface task since there is no natural mapping

touch

- haptic interaction
  - cutaneous perception
    - tactile sensation; vibrations on the skin
  - kinesthetics
    - movement and position; force feedback
- information on shape, texture, resistance, temperature, comparative spatial factors
- example technologies
  - electronic braille displays
  - force feedback devices e.g. Phantom
    - resistance, texture

Handwriting recognition

Handwriting is another communication mechanism which we are used to in day-to-day life

- Technology
  - Handwriting consists of complex strokes and spaces
  - Captured by digitising tablet
    - strokes transformed to sequence of dots
  - large tablets available
    - suitable for digitising maps and technical drawings
  - smaller devices, some incorporating thin screens to display the information
    - PDAs such as Palm Pilot
    - tablet PCs

Handwriting recognition (ctd)

- Problems
  - personal differences in letter formation
  - co-articulation effects

- Breakthroughs:
  - stroke not just bitmap
  - special 'alphabet' – Graffeti on PalmOS

- Current state:
  - usable – even without training
  - but many prefer keyboards!

gesture

- applications
  - gestural input - e.g. "put that there"
  - sign language

- technology
  - data glove
  - position sensing devices e.g MIT Media Room

- benefits
  - natural form of interaction - pointing
  - enhance communication between signing and non-signing users

- problems
  - user dependent, variable and issues of coarticulation

Users with disabilities

- visual impairment
  - screen readers, SonicFinder
- hearing impairment
  - text communication, gesture, captions
- physical impairment
  - speech I/O, eyegaze, gesture, predictive systems (e.g. Reactive keyboard)
- speech impairment
  - speech synthesis, text communication
- dyslexia
  - speech input, output
- autism
  - communication, education

… plus …

- age groups
  - older people e.g. disability aids, memory aids, communication tools to prevent social isolation
  - children e.g. appropriate input/output devices, involvement in design process

- cultural differences
  - influence of nationality, generation, gender, race, sexuality, class, religion, political persuasion etc. on interpretation of interface features
  - e.g. interpretation and acceptability of language, cultural symbols, gesture and colour

Concepts and colors

8% of men and 1% of women are color blind

Green	%	Red	%	Yellow	%	Black	%	White	%
Safe	62.2	Hot	31.1	Caution	44.8	Off	53.5	Cold	71.5
Go	44.7	Danger	64.7						
On	22.3	Stop	48.5						

% of Hong Kong Chinese who associate particular concepts and colors (Courtney 86)

Green	%	Red	%	Yellow	%	Blue	%
Safe	61.4	Hot	94.5	Caution	81.1	Cold	96.1
Go	99.2	Danger	89.8			Off	31.5
		Stop	100				

% of Americans who associate particular concepts and colors (Bergum&Bergum 81)