

HCI 558 X

Lecture 11:

Mar. 27, 2007

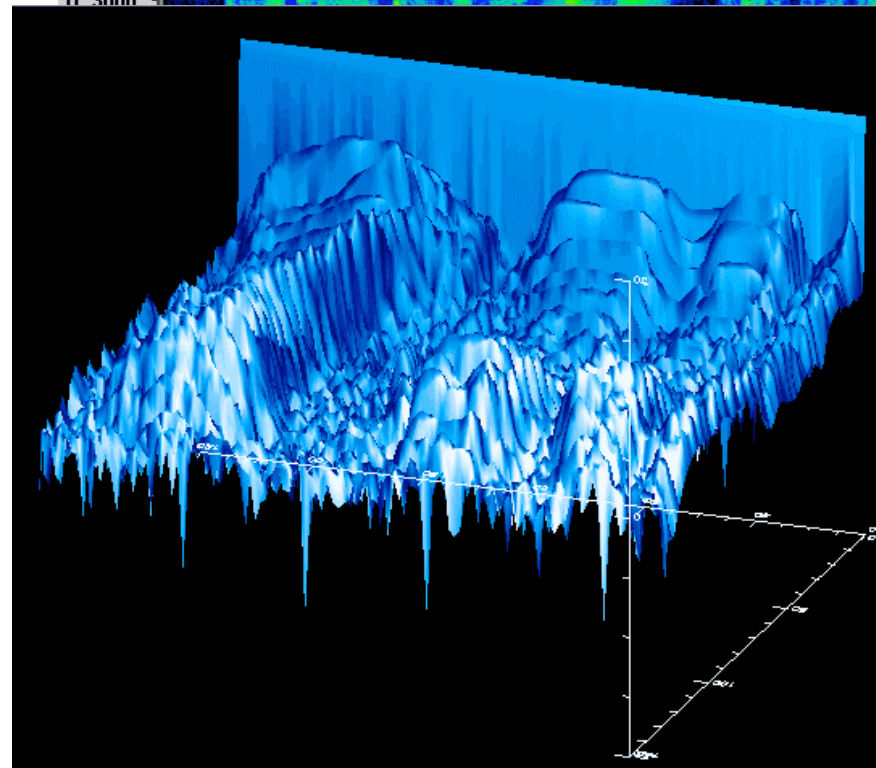
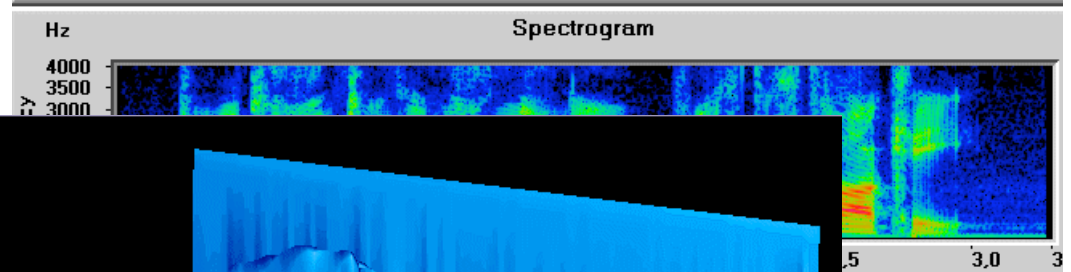
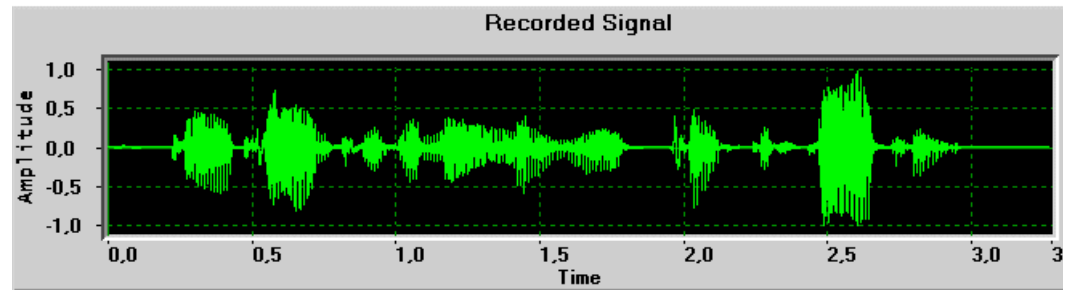
- Quiz 3 (10 min)
- 3 talks (10 min each)
- “Visualization” using sound (30 min)

Sound = Information?

- Think of examples where sound carries information (What kind of information?)
 - Speech
 - Alarms (wake-up, temp. rising), empty-wastebasket signal (status info)
 - Water boiling, car RPM, material thickness
 - geiger counter, sonar
 - footsteps behind you
 - (Movies, Music)

Visualizing sound

- Waves (Amplitude) over time
- Spectrum: Change of frequencies (overtones) over time
- 3D (rubbersheet) spectrograms
- Always: time component!



Sound from Data: Sonification

- Express data with non-speech audio signals
- Visual sense dominates perception, why is sonification useful?
- Visual impairment
- Auditory perception superior to visual translation (signal processing of sound wrt repeats, car) (???)
- Add-on: eyes are occupied (Data, User-interface)

Types of sonifications

- sound files (mp3) vs. interactive
- recorded (real world) sounds vs. real-time synthesis
- natural sounds (as metaphors)
- musical (instrumental) sounds
- artificial sounds (from synthesis: simple sine wave, additive, granular, FM, MIDI, ...)

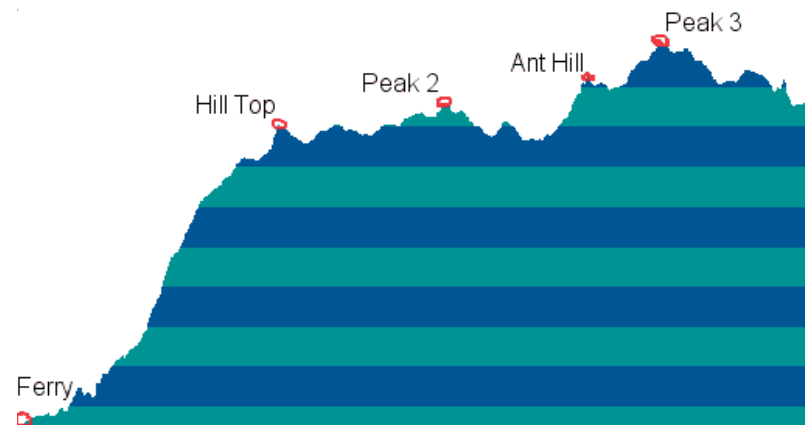
Natural sounds

- Metaphorical: find a metaphor (“symbol”) for the concept (data) expressed
- Auditory Icon: recorded, “crafted”
- Examples:
- Water, City, Forest

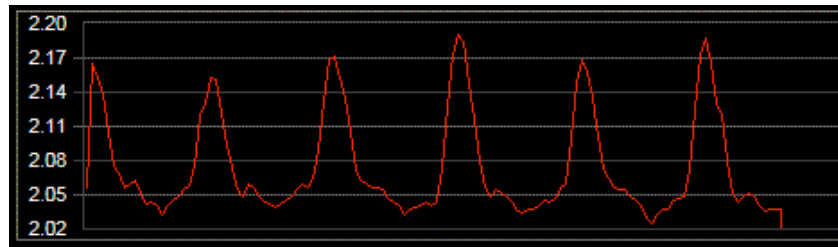
Music = Data?



- How would this “data” sound?
- Principle: use pitch (freq.) as giver of elevation
- How would you sonify this hill profile?
- General problem: how to compose music from data? (pitch, instrument, tempo)
- Needed transfer functions



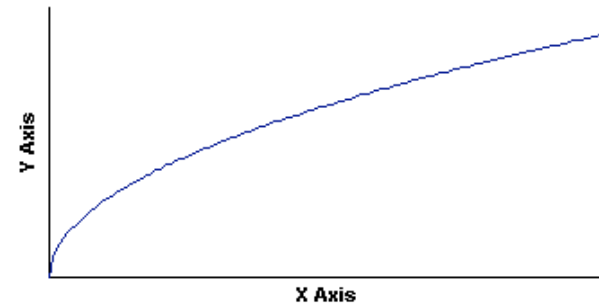
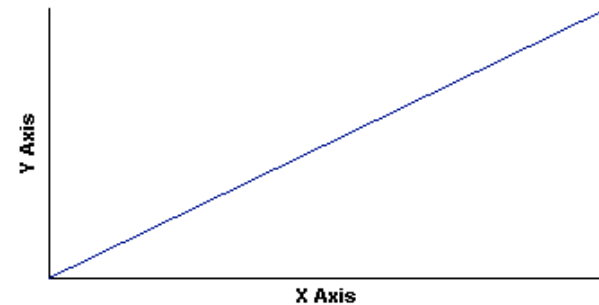
Example of “music” sonification



- uses MIDI synthesizer (“keyboard”)
- time varying data (one variable shown here)
- simple data to pitch translation:
- adding a second variable (how?):
- Advantages? Problems?

Auditory graphs

- Graph (curves, histograms) as sound
- example
- straight line
- example
- Square root (with curvature “drum”)
- pitch not good for absolute values (only relative rise or fall)

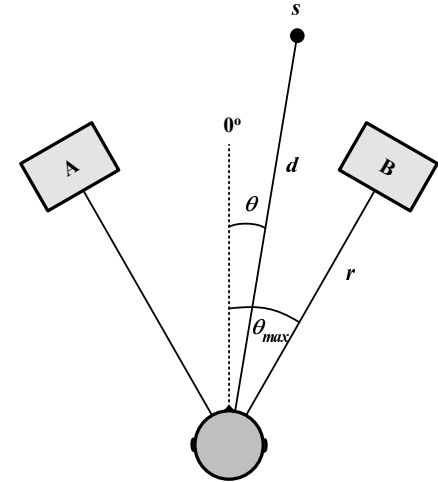


Use data to create non-music sounds

- Create any kind of wave forms from data (noise?)
- Example: Data from a ocean sensor

Spatial (3D) sound

- info about (change of) position
- sound “rendering” - make sound sources come from different directions (headphones, speakers)
- in reality: position and shape of ears create differences in sound
- differences: brain infers position of source
- Soundcard - need to simulate this process
- 2D Spatial audio surround sound: OK
- True 3D sound: still difficult (headphones)



- Fun stuff: Flash webpage with “sonification” :
<http://www.laps-design.com/>
- Questions?
- Lab this Thursday: Ch 10
- next lecture:
- Presentations: Wei, Valerie, Kevin
- python scripting
- HW: get python + Idle (IDE) running on your PC