Sonification - Sound of Science
VU, WS 2013

Lecture 8 - Parameter Mapping

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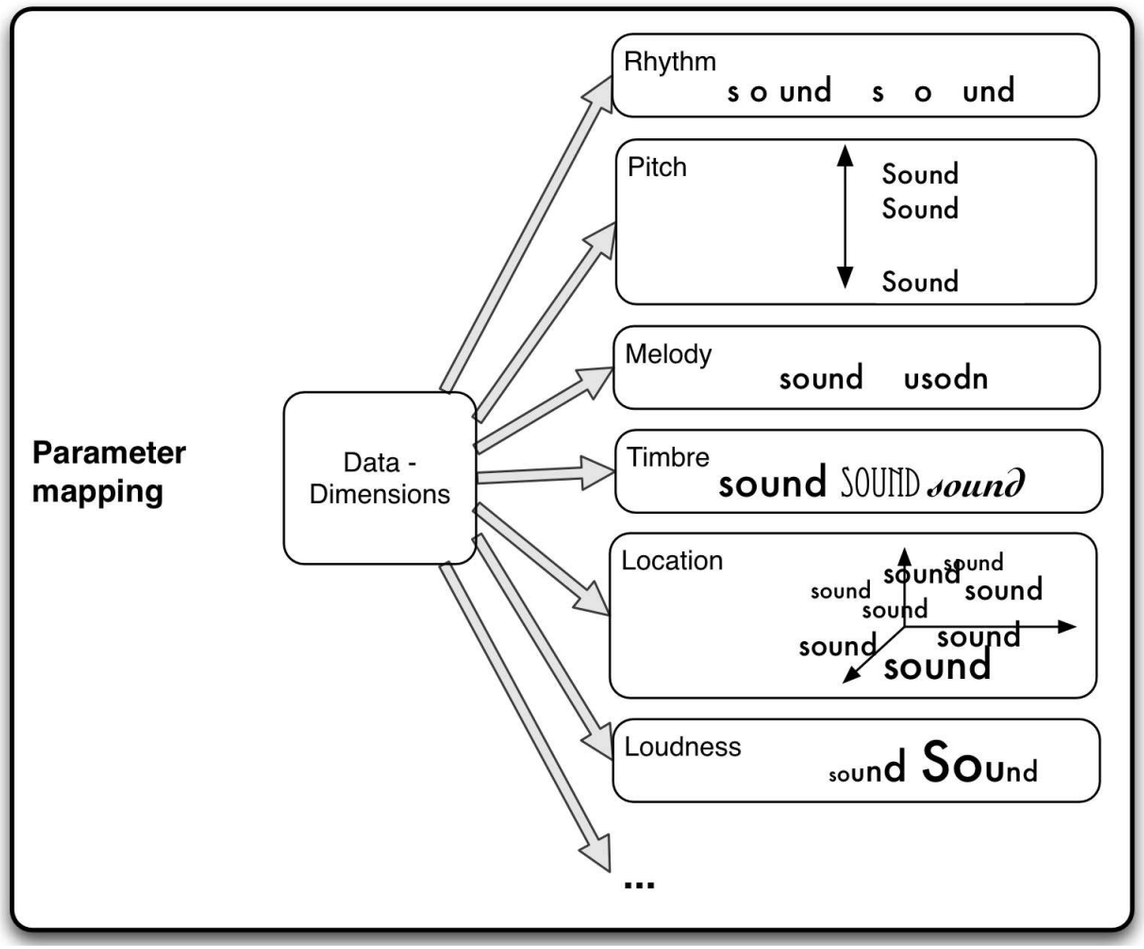
Parameter Mapping Sonification



Parameter Mapping

Auditory Dimension: the ***subjective perceptual experience*** of ***particular physical characteristic*** of an auditory stimulus.
[Neuhoff, Sonification Handbook, p. 64]

Continuous vs. Categorical dimension

Mapping, Scaling, Polarity

Mapping: Pitch

- Logarithmic
- Hearable range: 20 - 20kHz (theoretically!), bearable range: 100 - 6000 Hz.
- JND (Just Noticeable Difference)- for each tone 1% (1/6th half tone), in bearable range 400 different steps
- Polarity?
  - high temperature - high frequencies (Flowers et al. 2001)
  - Increasing frequency - decreasing size (Walker. 2002)

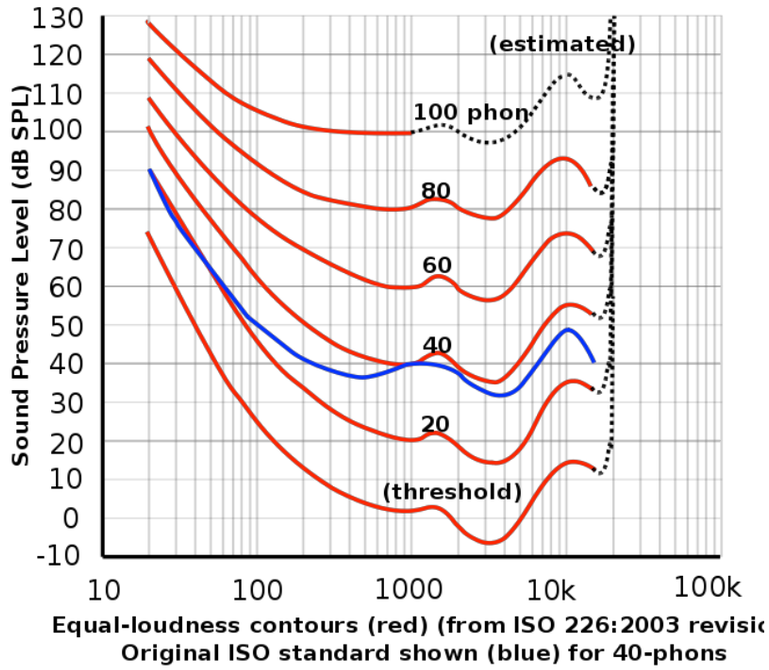
Mapping: Loudness

- Useful range: from 50 dB, (JND) - 0,5 - 1 dB
- Generally not a good auditory dimension:
    - Lack of good resolution comp. to frequencies
    - Memory for loudness is poor

- Background noise and sound reproduction equipment play a huge role
-> sonification of continuous variables using loudness change is difficult
[flowers]

- Interaction with other perceptual dimensions such as pitch and timbre

Amplitude Compensation
equal loudness curve



- Loudness and Pitch are not orthogonal
- In SC : classes AmpComp and AmpComA

Mapping: Spacialization

direction and distance

HRTF (head related transfer function)

Binaural speakers

Mapping: Timbre

- Different Instruments (similar timbres can lead to confusing results due to perceptual grouping [flowers,2005])

- Specific attributes of sound such as attack, decay, ...

- Formants (vocals) (Speech class in SC)

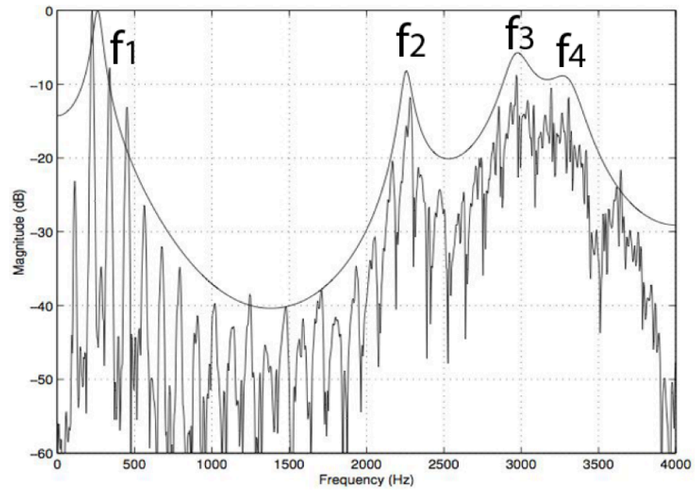


Figure 15.5: Spectrum of vocal utterance of the vowel /i/ as in 'team'. The smooth line enveloping the lower spectrum corresponds to the vocal tract transfer function. The resonant peaks (f_1, ..., f_4) of this curve are called formants.

Mapping: Timbre

Example: The Climate Symphony

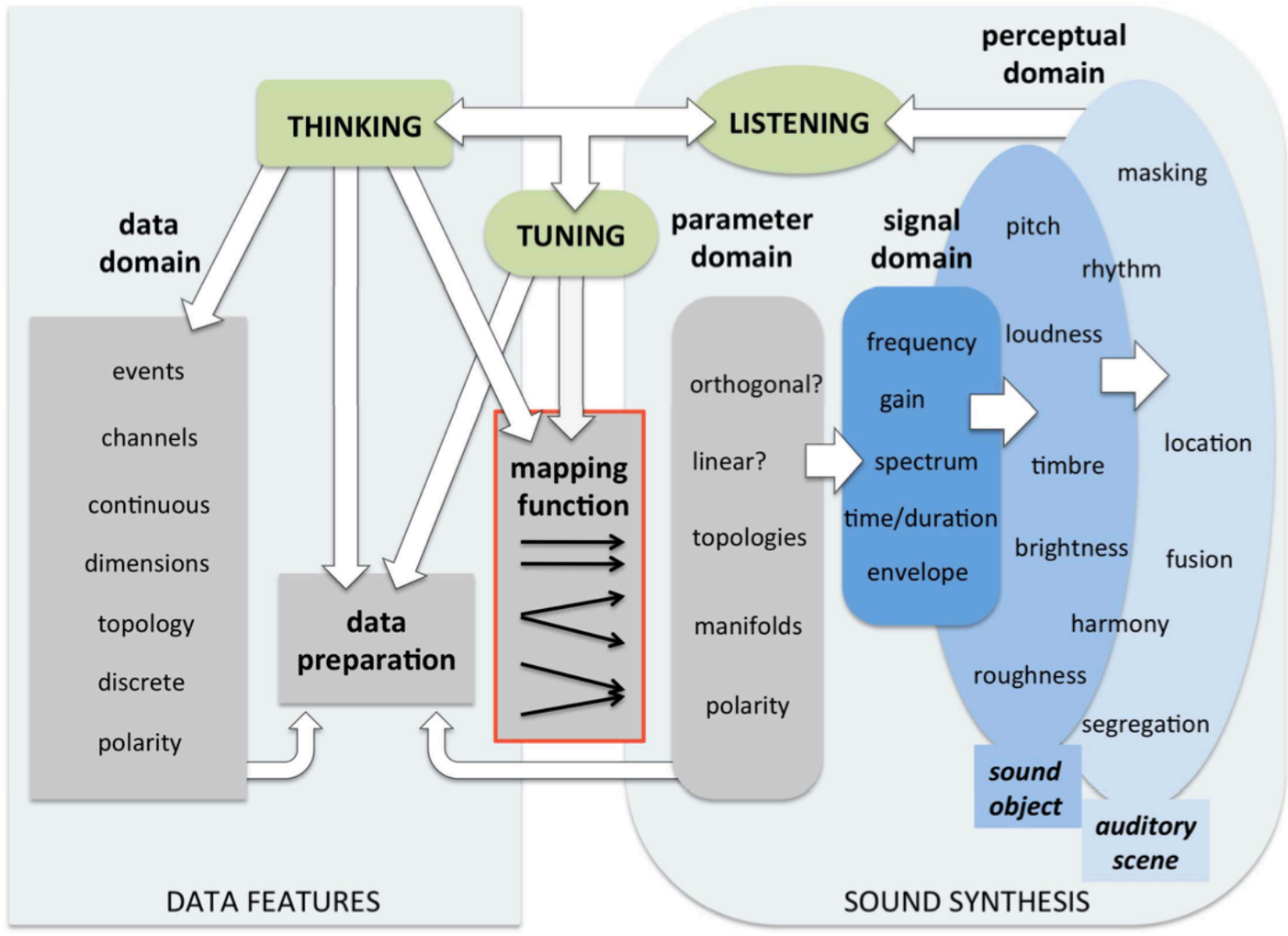
110,000 years history of climate from Greenland's ice core:

- PCA (principal component analysis) of time series from 8 series to 3
  - atmospheric circulation response to the growth and decay of the continental ice sheets
  - biological response of changing climate (recorded in the nitrate and ammonium series)
  - http://www.drsrl.com

Redundant Mapping

one - to - many (divergent mapping)	More sound parameters are controlled by one Data Parameter -> Psychoacoustic dependencies are minimized
one - to - one	Perceptual dimensions are not independent
many - to - one (convergent mapping)	More sound parameters influence one perceptual parameter. (e.g. gesture to sound)

PM Sonification Process



Assignment III due on Monday 25.11.2013 11:59:59 pm

1.Array manipulation:

a) Make a one-dimensional array of n entries, and fill it - by hand or using any function {}
b) Find its maximal and minimal value;
c) Go over all entries in the array (using ".do") and post the value in the post window
d) Map the values of the array linearly to the range of 200 to 1000 (which could later be used as, e.g., Hz)

2. Synth manipulation:

a) change some parameters in the SynthDef and/or play with the implemented UGens

3. Sonification/ Task manipulation:

a) Change the mapping somehow and play an example
b) Change the timing of the task - what is a good time for listening?!

4. Evaluation:

Play a mini-listening exercise to each other and find out what can be heard in a blind testing condition (polarity and magnitude estimation)