Chapter 15. Meeting 15, Approaches: Mapping, Sonification, and Data Bending

15.1. Announcements

- Musical Design Report 3 due 6 April
- Schedule meetings with me over the next two weeks
- Sonic system draft due: 27 April

15.2. Quiz

- 10 Minutes

15.3. Mapping

- Mapping is the conversion of one form or range of data to another
- Most mappings are one to one, and may involve scaling
- Some mappings may be dynamic or procedural
- Sonification refers to mappings of data to musical parameters where perception of the original data is valued
- Data bending refers to mappings of data to musical parameters where the musical output is most valued
- Mappings are often more important than what is being mapped

15.4. Reading: Ben-Tal, O. and J. Berger, Creative Aspects of Sonification

- Ben-Tal, O. and J. Berger. 2004. "Creative Aspects of Sonification." *Leonardo Music Journal* 37(3): 229-232.
- How do the authors describe the difference between musical listening and sonification listening?
- What data sources, and what parameters, do they describe using as source material?
- What arguments support the use of vowel-like synthesized tones? Specifically, how do they parameterize these sounds?

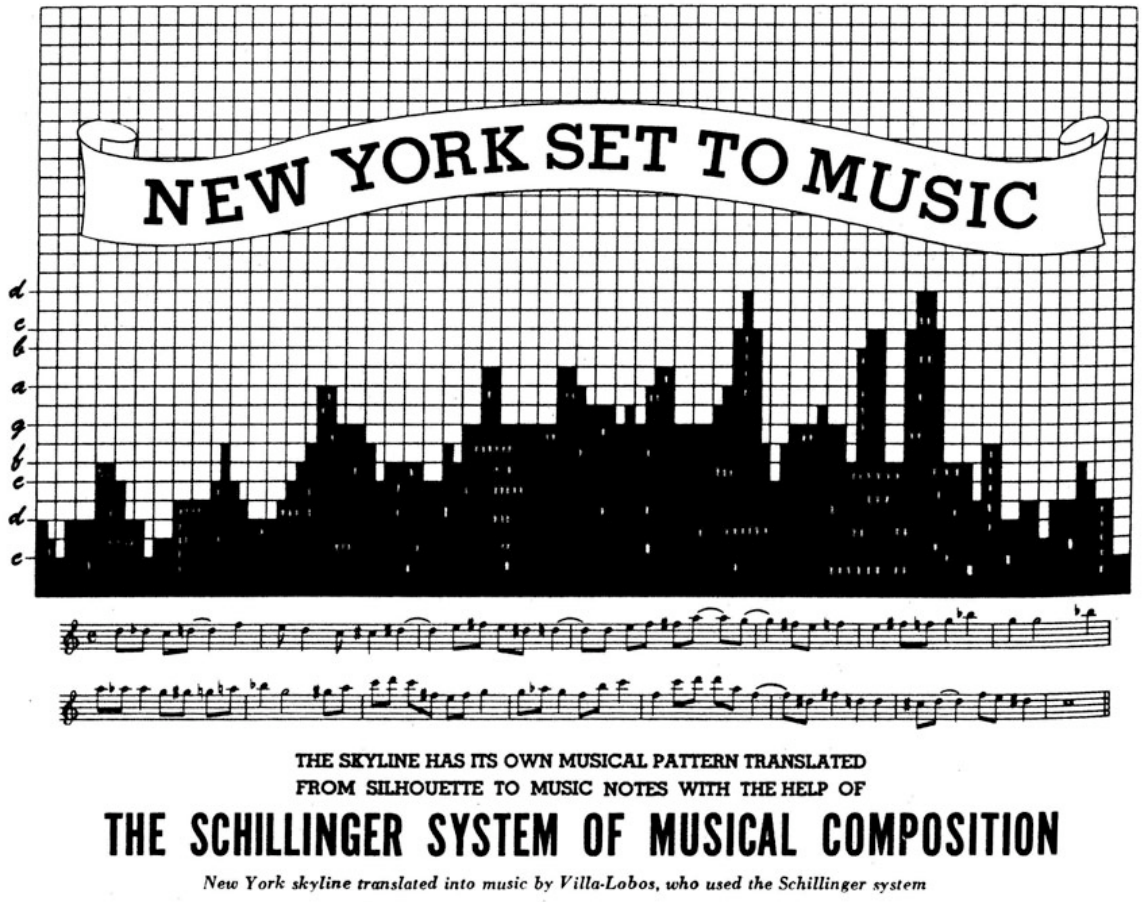
- What advantages do sonification, as type of auditory display, have over visual displays?

15.5. Data Bending

- Mapping of arbitrary data to musical parameters
- Data sonification
- Macro: can be applied to note-level parameters
- Micro: can be applied at the sample level
- Always requires some sort of mapping

15.6. Macro Data Bending: Joseph Schillinger

- Joseph Schillinger (1895-1943): Russian immigrant to the US
- Schillinger, J. 1941. *The Schillinger System of Musical Composition*. New York: Carl Fischer.
- Schillinger, J. 1948. *The Mathematical Basis of the Arts*. New York: Carl Fischer.
- Explored relationships of musical composition to mathematics
- Explored approaches to generating musical parameters



15.7. Macro Data Bending: Natural Data

- Audio: Charles Dodge: "Earth's Magnetic Fields", 1970
- Musical setting of values produced by an index of the effect of the sun's radiation on the magnetic field that surrounds the Earth
- Larry Austin: Canadian Coastlines
- Tracings of outlines of Canadian bodies of water to choose musical parameters such as pitch, rhythm, timbre, and duration

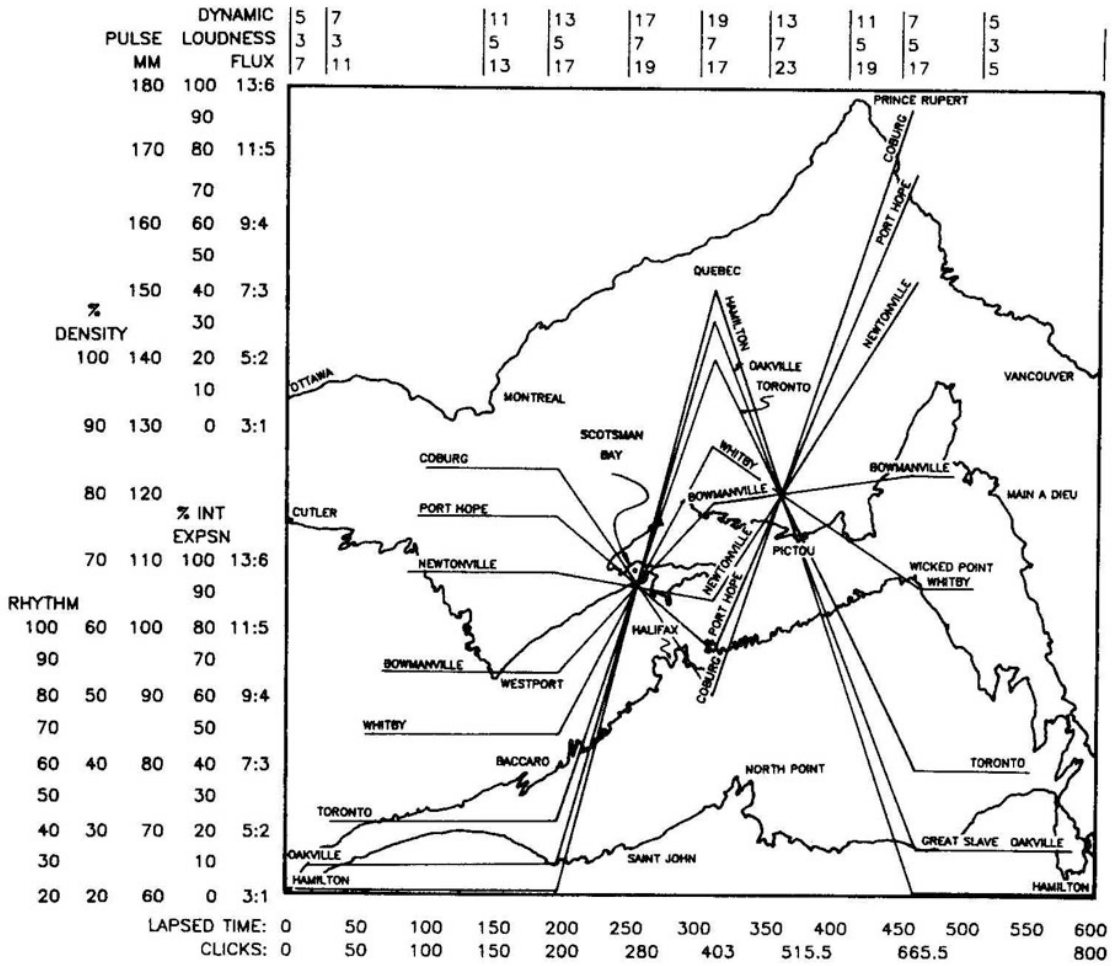


FIGURE 11.21 Chart used by Larry Austin in the composition of *Canadian Coastlines*. *(Reprinted with permission of Larry Austin.)*

Courtesy of Larry Austin. Used with permission.

15.8. Macro Data Bending: Natural Data

- DNA, amino acid sequences in protein, and other natural data sets have frequently been used as a source material for procedural compositions
- Often, claims of aesthetic value are attributed due only to the source data; mapping is incorrectly treated as neutral
- Mary Ann Clark

  Numerous examples created with ArtWonk software from Algorithmic Arts

  http://www.whozoo.org/mac/Music/samples.htm
- Linda Long: Music of the Plants

http://www.molecularmusic.com

15.9. Micro Data Bending

- Mapping non-musical data to audio-rate data
- Can map to an arbitrary binary data representation
- Can map to positions of individual amplitude points

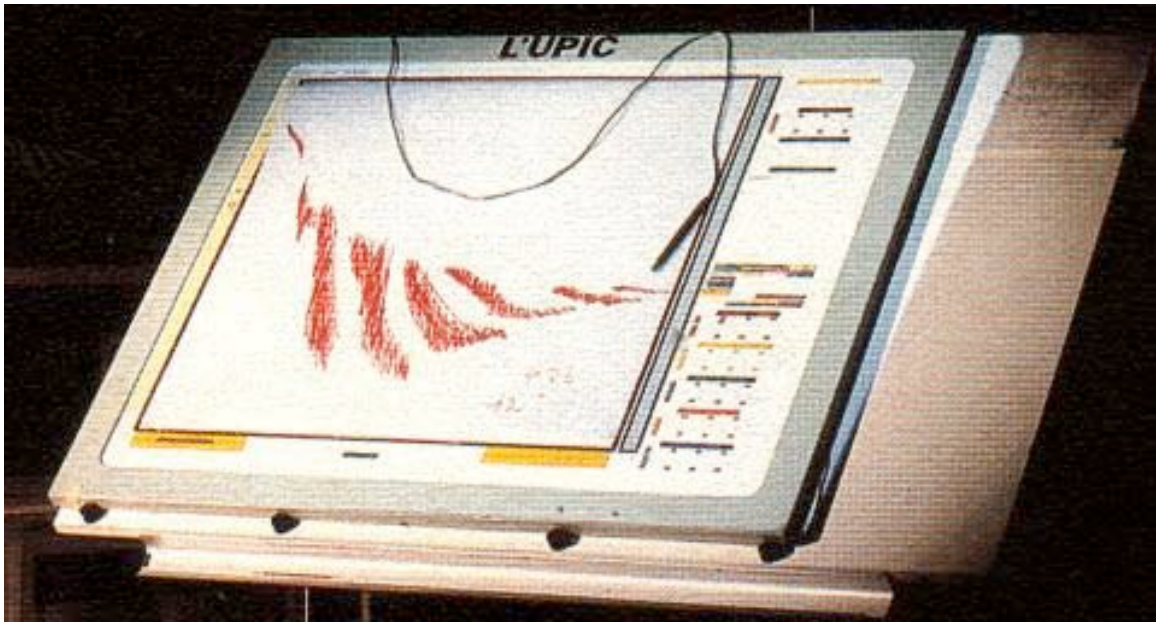
15.10. Micro Data Bending: Arbitrary Data as Audio File

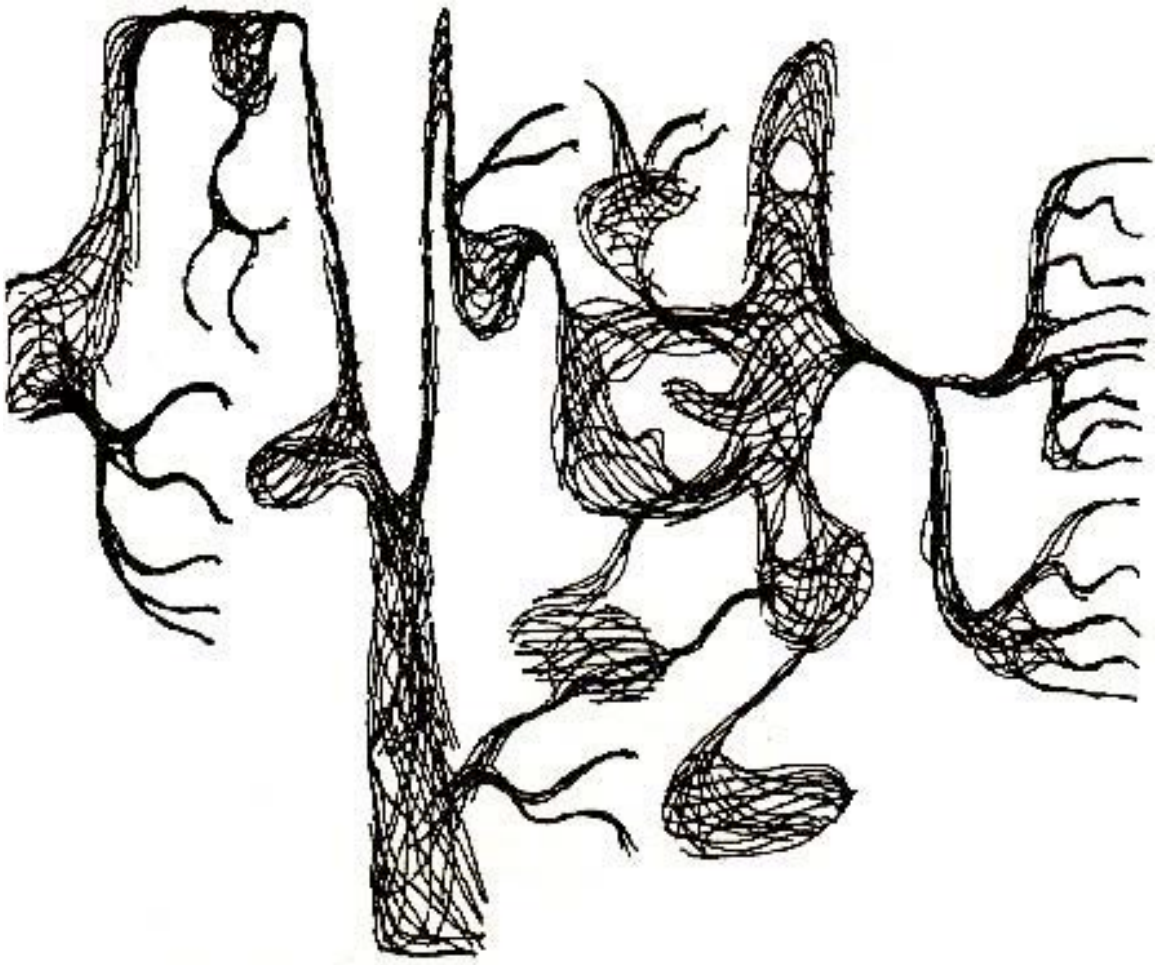
- Read images other file types as audio data: UPIC, MetaSynth
- Import arbitrary data as audio data
- Audacity: Project: Import Raw Data...

  Example: AN0008-amesRetrospect.pdf

15.11. UPIC

- Unité Polyagogique Informatique du CEMAMu (UPIC),
- Users draw waveforms, envelopes, and textures
- Integrated hardware system





- Audio: "Mycenae-Alpha," 1978
- Mycenae-Alpha visualization synchronized to the score

  Video: YouTube (http://www.youtube.com/watch?v=yztoaNakKok)
- "Children may draw a fish or a house and listen to what they have made and correct it. They can learn, progressively through designing, to think musical composition without being tormented by solfège or by incomplete mastery of a musical instrument.... But as they are led to construct rhythms, scales, and more complex things, they are also forced to combine arithmetic and geometric forms: music. From whence comes an interdisciplinary pedagogy through playing." (Xenakis 1985).

15.12. Reading: Marino, G. and M. Serra, J. Raczinski, The UPIC System: Origins and Innovations

- Marino, G. and M. Serra, J. Raczinski. 1993. "The UPIC System: Origins and Innovations." *Perspectives of New Music* 31(1): 258-269.

- Evaluate this idea and claim: "Another idea was to let the composer control and create all aspects of the composition: sound, symbols, syntax, and so forth. This means that the system should not impose predefined sounds, predefined compositional process, predefined structures, and so on. It is essential for the creative mind that ideas not go through theories or limitations that might not suit the composer."

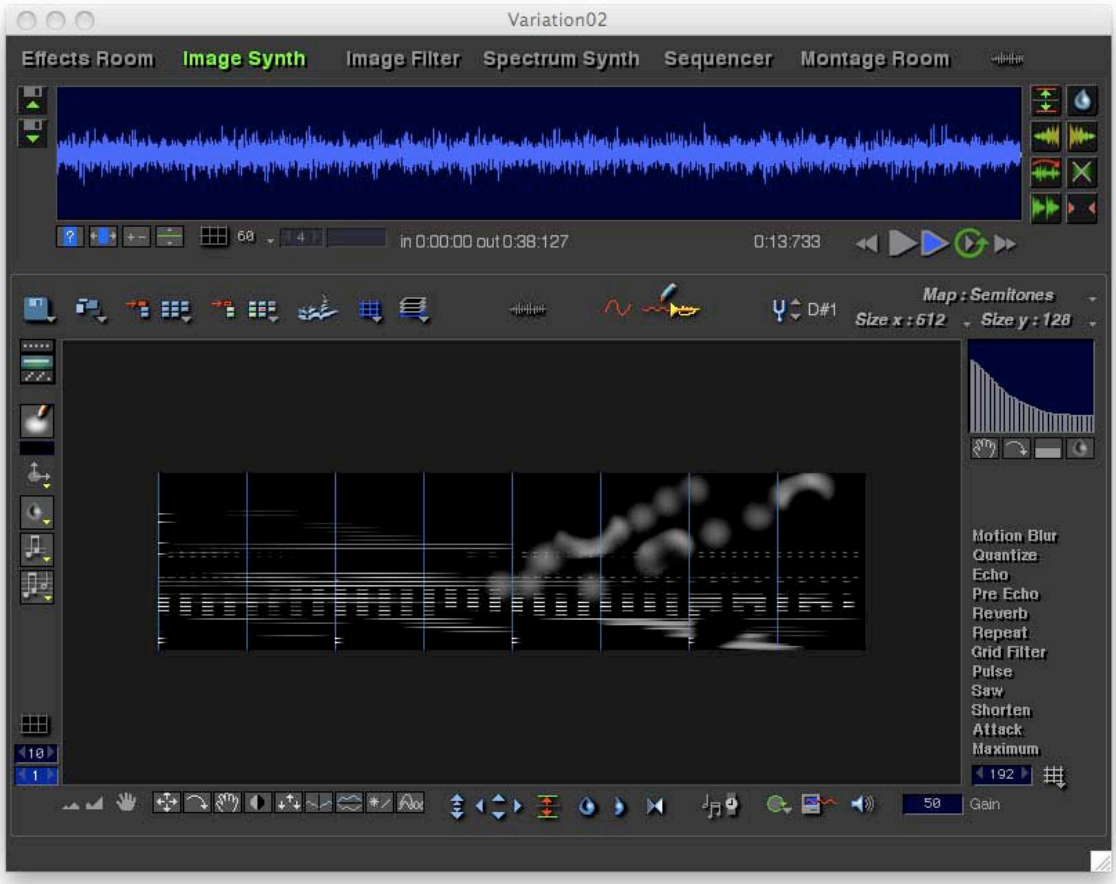
- What are some of the technical features of this version of UPIC?

- Where (on what machine components) does the signal processing occur?

- What opportunities exist for non-sinusoidal sounds?

15.13. Contemporary UPIC Variants

- MetaSynth (Mac; commercial)



http://www.uisoftware.com/MetaSynth

- HighC: (Windows, Mac, Unix; commercial)

  http://highc.org

- SPEAR (Windows, Mac; free)

  Designed for audio analysis and resynthesis; permits drawing spectra

  http://www.klingbeil.com/spear/

- HyperScore: Anyone Can Compose Music

  A note-event (not synthesis) approach to writing common practice (tonal, pitched) music

  http://www.hyperscore.com

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