Chapter 22. Meeting 22, Discussion and Workshop

22.1. Announcements

- Sonic System Project Report due Thursday, 3 December

- Quiz this Thursday

- Download fresh martingale now:

  http://code.google.com/p/martingale

- Download this audio file:

  http://bit.ly/7ZkobO

22.2. Listening: Ariza

- An exploration in rhythm, time, and texture

- Christopher Ariza: *onomatopoeticized*

22.3. The Vocoder: Concept

- Extending the concept of envelope following

- Analyze a signal with a narrow-band filter

- Smooth the energy in that filter to get a control signal proportional to the amplitude (envelope following)

- Use that control signal as an envelope

- Use the envelope to shape a simple sound source (sine or noise) at the analysis frequency

- Can remap energy from one frequency range to another

22.4. The Vocoder: History

- 1928: invented at Bell Labs by Homer Dudley

- 1935: Vocoder patented

- 1940s: SIGSALY (secure speech communication) system used Dudley's vocoder

  Voice signal first vocoded into 10 bands to reduce information, then encrypted

Image: Public domain, U.S. NSA.

- 1977: EMS Vocoder 3000

  16 bands each with independent level control

Vocoder 3000

- 1979: Moog 16 channel Vocoder released

  16 bands from 50 to 5080 Hz
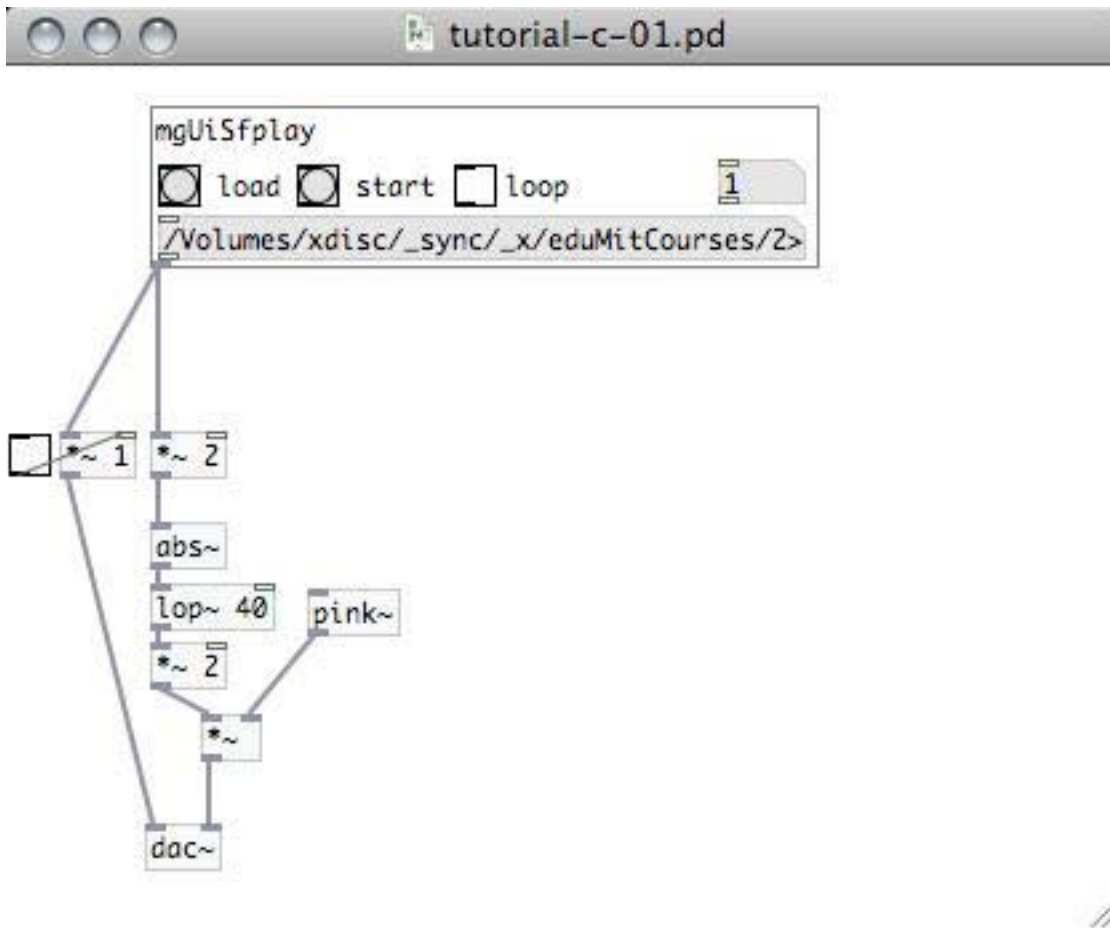
- 1978-1982: Korg VC-10 Vocoder

  20 bands

- 1980s: robot voices, Transformers (Soundwave), Cylons (Battlestar Galactica), et cetera

- Soundwave (the original)

Image removed due to copyright restrictions.
"Soundwave" Transformers toy.

YouTube (http://youtube.com/watch?v=OWb43IB3W-c)

22.5. Workshop: A Vocoder: Envelope Following

- Smoothing a bipolar signal by taking the absolute value and low-pass filtering into a control signal; apply this control signal to the amplitude of pink noise

tutorial-c-01.pd

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mgUiSfplay
[ ] load  [ ] start  [ ] loop          1
/Volumes/xdisc/_sync/_x/eduMitCourses/2>
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*~ 1   *~ 2

abs~

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22.6. Workshop: A Vocoder: Controlling Band-Filtered Noise

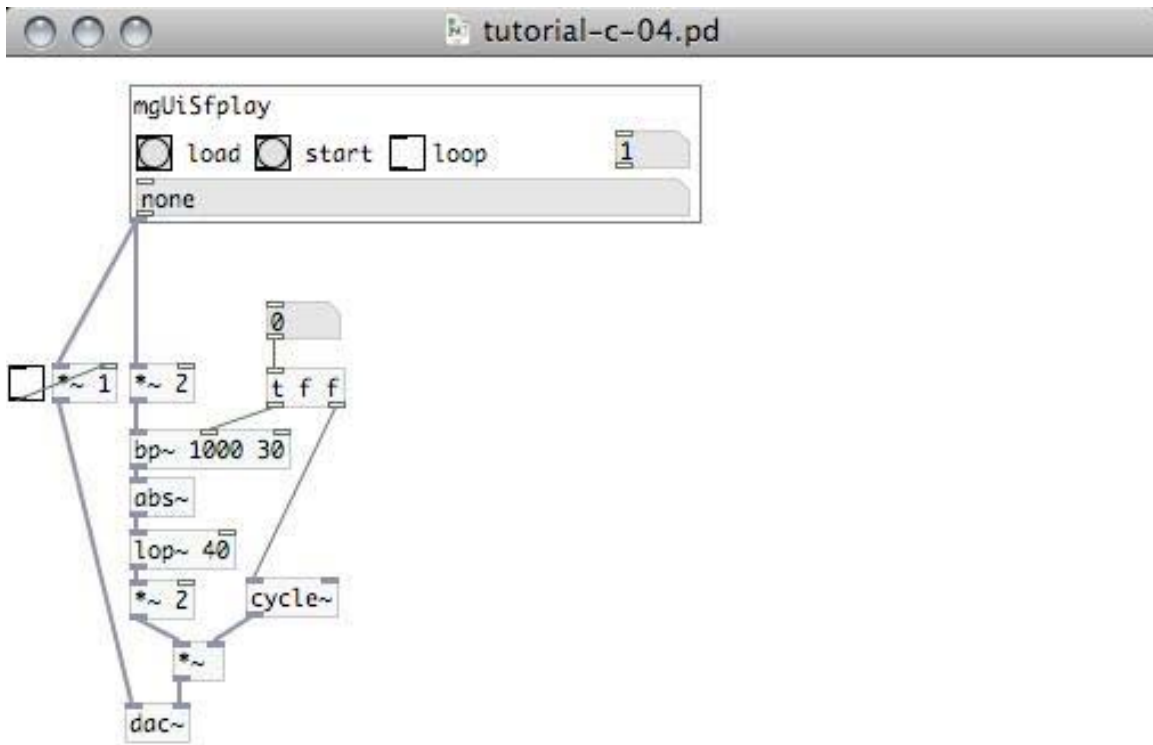• Applying the control signal to band-pass filtered white noise
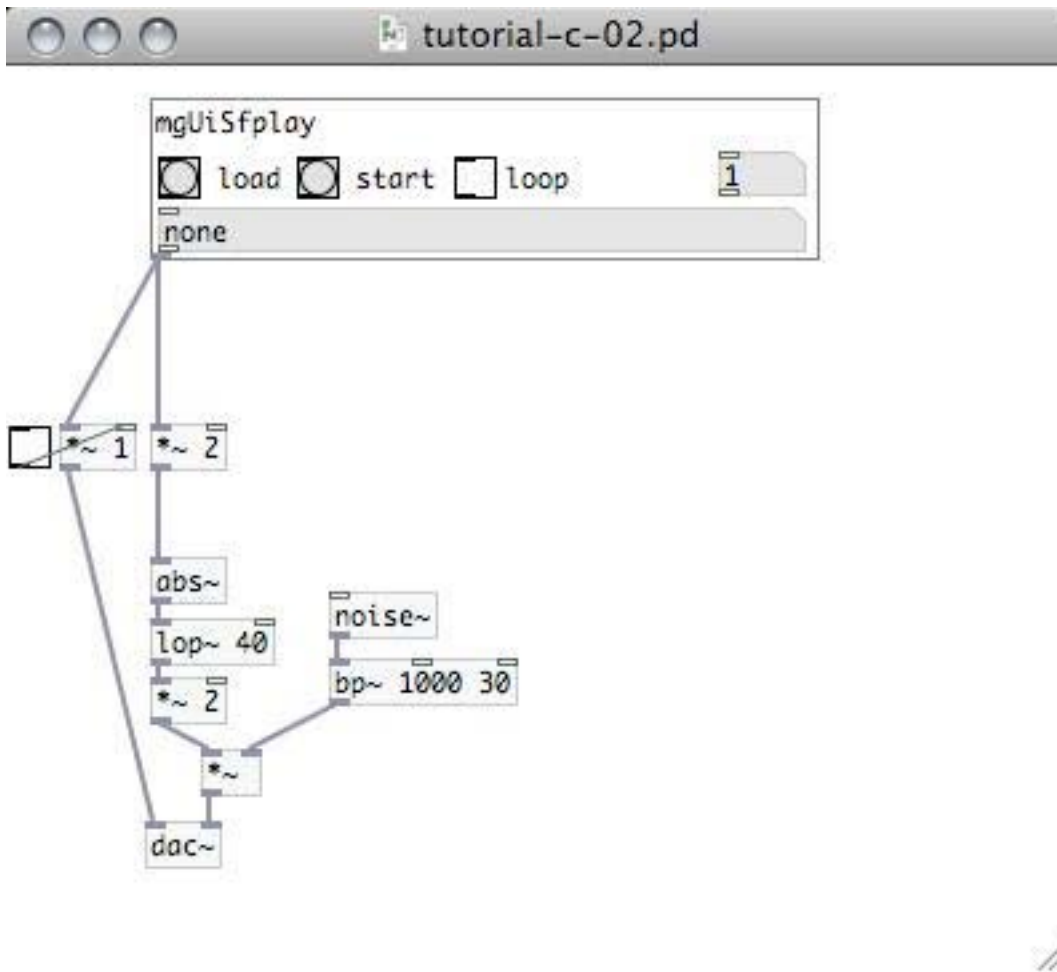
22.7. Workshop: A Vocoder: Analyzing and Generating a Signal

- A narrow frequency region is analyzed with a band-pass filter; filtered noise, tuned to the same frequency, is used for generation
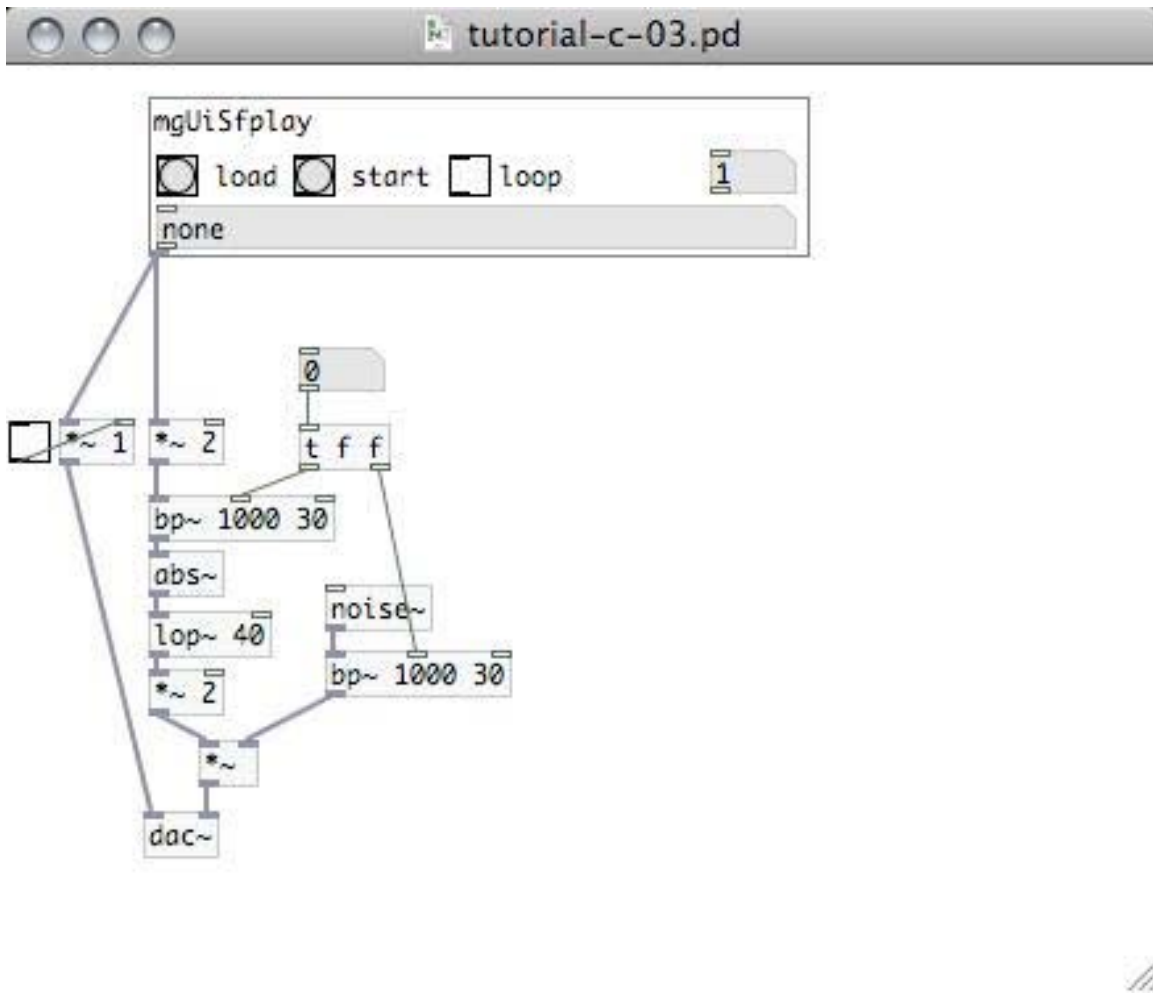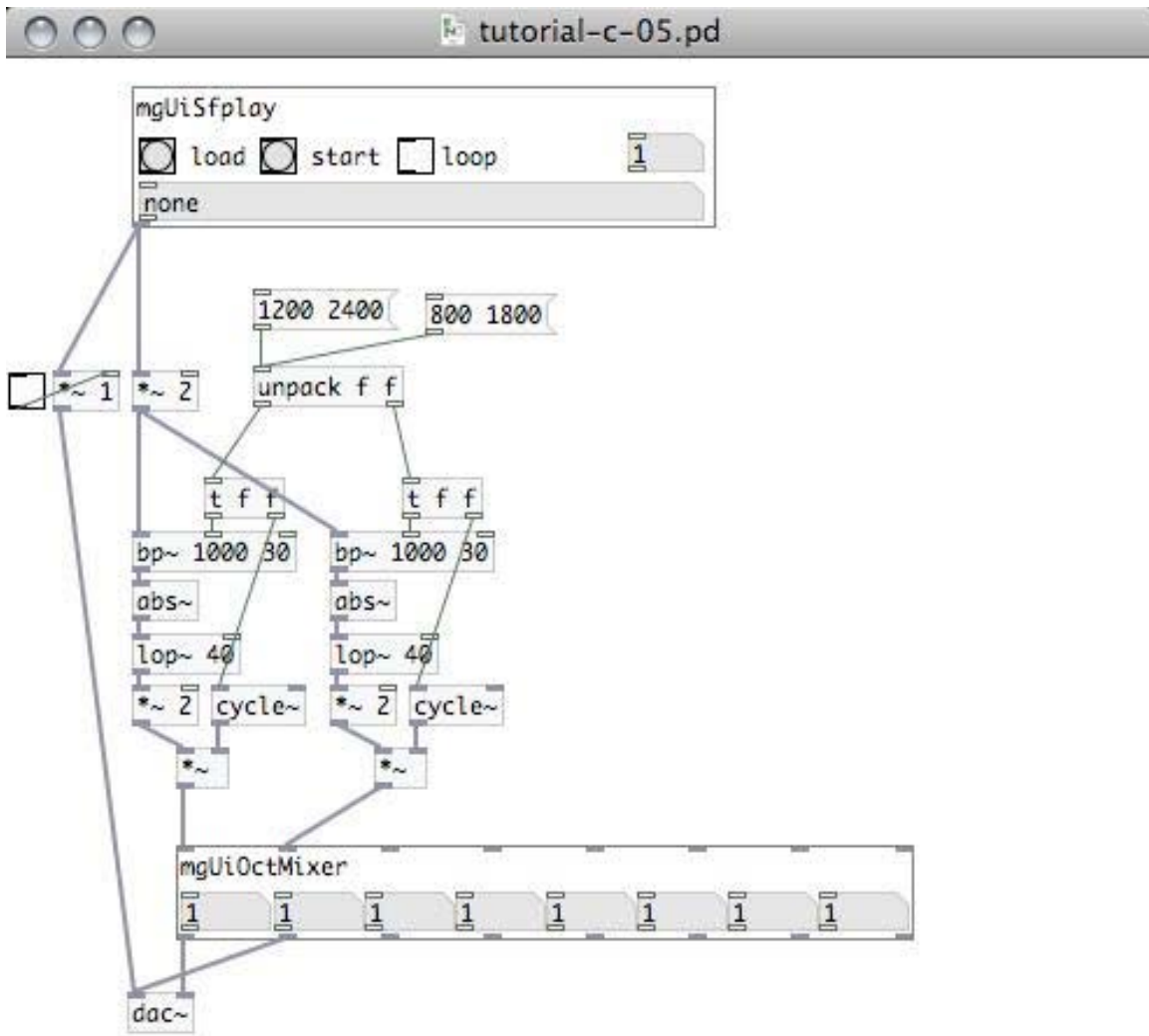
22.8. Workshop: A Vocoder: Sine Wave Generation

• Instead of filtered noise, the generated sound can be a sine tone tuned to the same frequency

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tutorial-c-04.pd

mgUiSfplay
◯ load ◯ start ☐ loop        1
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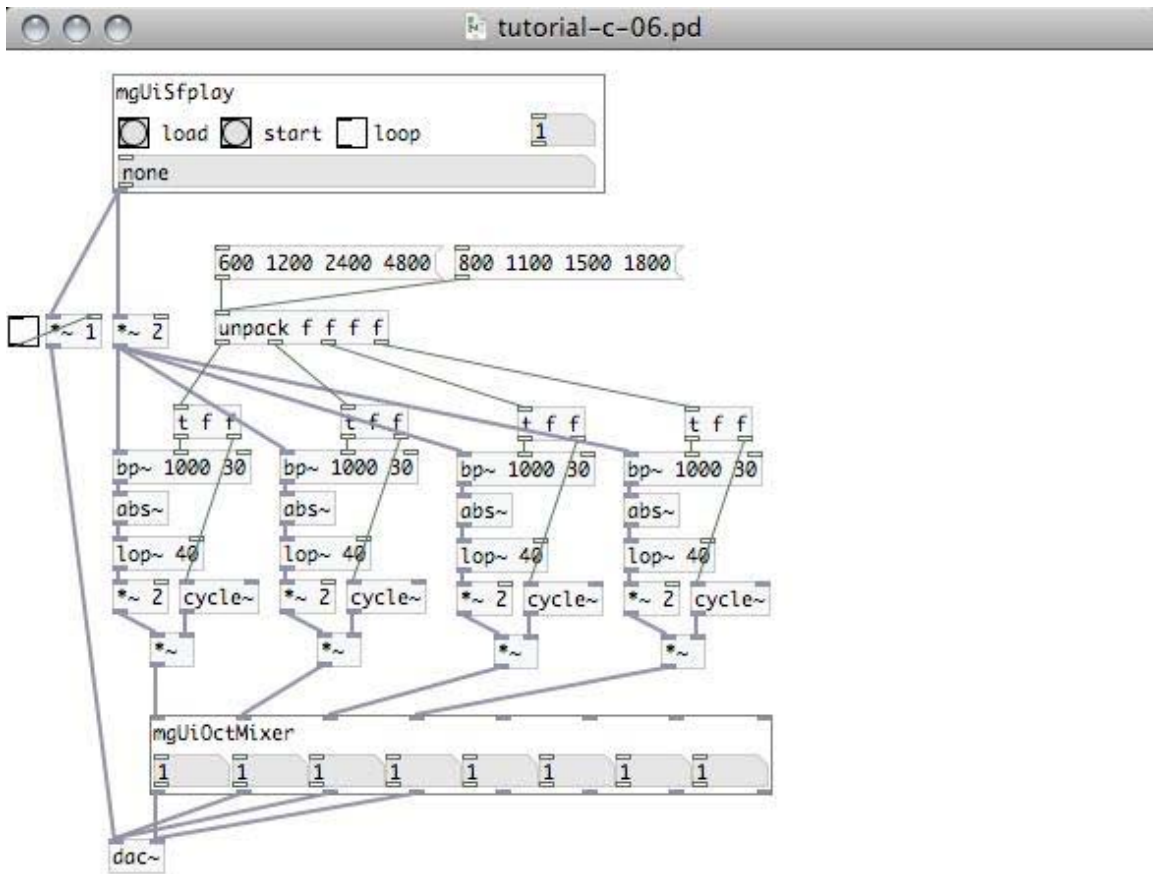
22.9. Workshop: A Vocoder: Two Bands with Sine Wave Generation

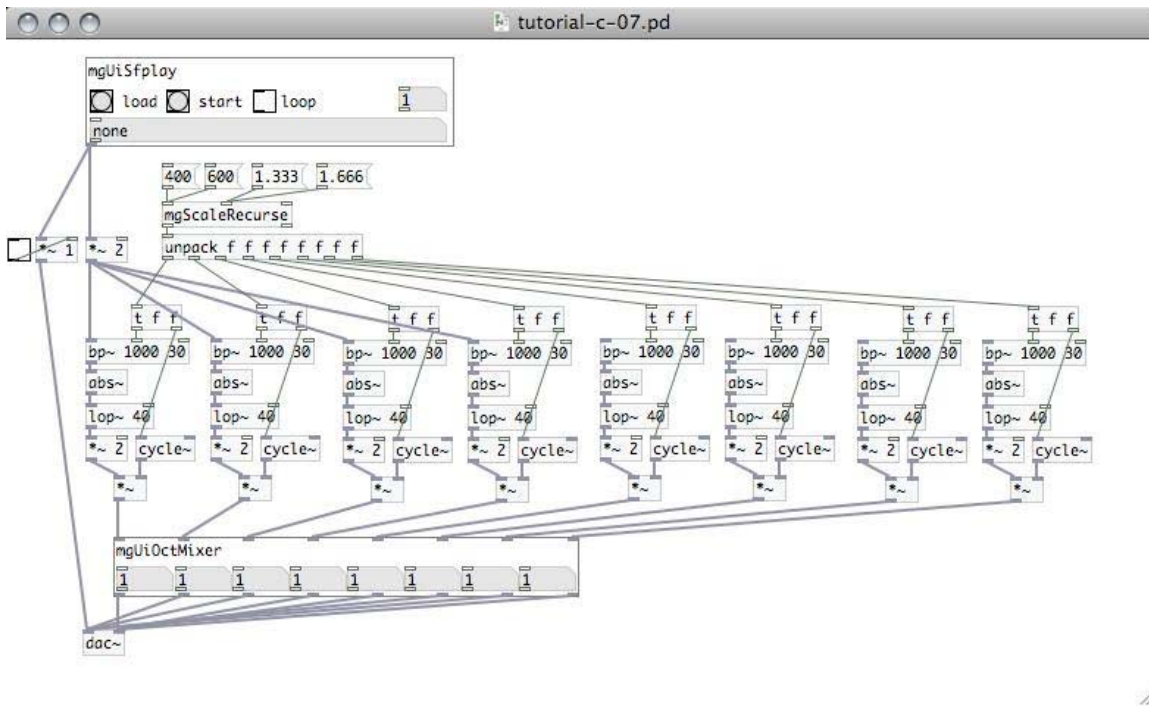• Tune simultaneous bands to different frequencies; mix on output

22.10. Workshop: A Vocoder: Four Bands

• Tuning for four simultaneous bands

22.11. Workshop: A Vocoder: Eight Bands

• Eight simultaneous bands with automatic frequency value generation

- Connecting different analysis envelopes to different generation signals permits creative remapping of spectral energy

21M.380 Music and Technology (Contemporary History and Aesthetics)
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