21M.380 Music and Technology
Sound Design

Lecture №9
Shaping sound with Pd

Wednesday, March 2, 2016

1 [vline~] **syntax**

2 **Signal arithmetic**

- Scaling $x \cdot a$

- Shifting $x + a$

- Inverse $-x$

- Complement $1 - x$

- Reciprocal $\frac{1}{x}$

- Min and max

3 **Advanced audio oscillators**

Waveform archetypes

- Square

- Triangle

- Sawtooth (up- and downwards slope)

Can be implemented in two ways:

- by wave shaping

- as bandlimited wavetable oscillators (prevents aliasing)

4 **Other wave shaping techniques**

- Squaring and roots, curved envelopes

- Wrapping ranges

- Cosine of a phasor
  - More flexible than [osc~] ('explicit' phase)
  - One [phasor~] might drive multiple processes

- Polynomials and [expr~] external

5   Time-dependent signal shaping

- Delay lines

  - [delwrite~] writes to delay line
  - [delread~] reads from delay line
  - [vd~] reads from delay line with variable delay time

6   Volume fader

- Scaling default slider range from 0…127 to 0…1

- [dbtorms] for logarithmic fader

- Smoothen fader via [sig~] -> [lop~ 1] (or with [line~])

- Mute button

7   Panning

- Exercise: Implement a linear panner in Pd, where a control value from 0…1 controls movement from R…L (sic). Corresponds to Farnell's fig. 14.7

- Exercise: Derive a linear panning law that expresses loudspeaker gains g_L, g_R as a function of desired phantom source direction θ and off-center loudspeaker angle θ_0.

- Exercise: Turn your linear panpot law into a quarter sine one and implement it in Pd

8   PD3 assignment

- Mixer channel strip (how does it work?)

- Combine indicated patches from textbook according to specifications

9   Crossfades

- Similar shapes (linear, square root, quarter cosine, half cosine)

- Similar implementations in Pd

10 Demultiplex

11 Audio file tools

- Table-based sampler: `[tabwrite~]`,`[tabplay~]`,`[tabread~]`,`[tabread4~]`

- File-based sampler: `[writesf~]`,`[readsf~]`,`[makefilename]`

- List-based sequencers: `[list]`

- Textfile-based sequencers: `[textfle]`

12 Effects

- Chorus

- Schroeder reverb

References and further reading

Farnell, Andy (2010). "Shaping sound." In: *Designing Sound*. Cambridge, MA and London: MIT Press. Chap. 13, pp. 205–17. isbn: 978-0-262-01441-0. mit library: 001782567. Hardcopy and electronic resource.

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