

MTE 1001

Fundamentals of Sound Synthesis

Topic Area:

Unit Generators

Readings:

(Previously, Chapt 3, pp 90-98)

New: nothing

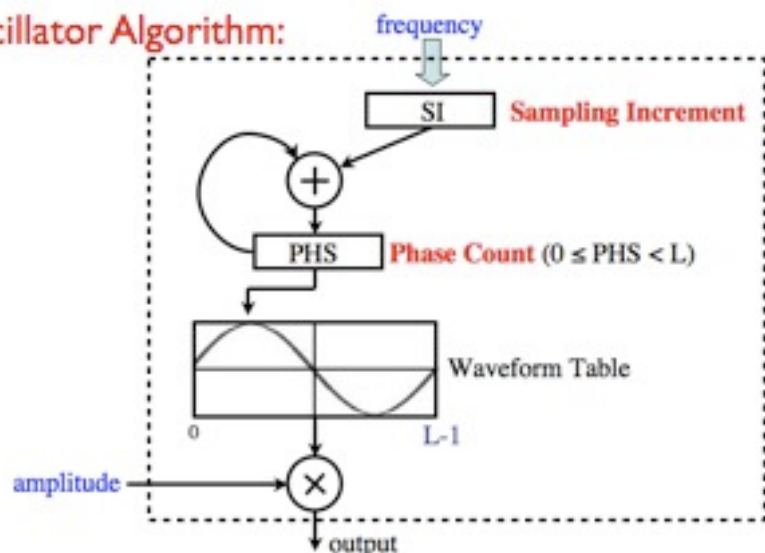
Notebooks due Monday, Nov. 22

Criteria

- Complete
(topics, readings, music, etc.) *double weight!*
- Well Organized
(logic of sections, headings, subheadings, etc.)
- Depth and Accuracy
(level of detail vs generality)
- Prose Well Written
(sentences & paragraphs)

Review

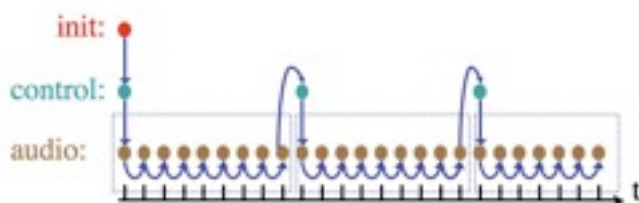
Oscillator Algorithm:



Review

Internal Order of Digital Audio Software

Control Rates:
Max/Msp: 1000 Hz
SuperCollider: 689 Hz

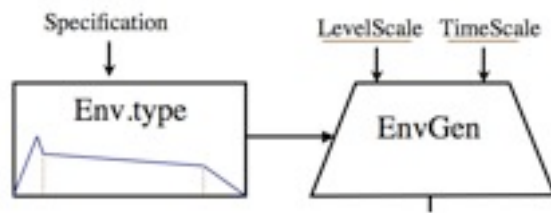


Audio rate operations are typically performed in blocks.

Envelopes

Another Important Algorithm:

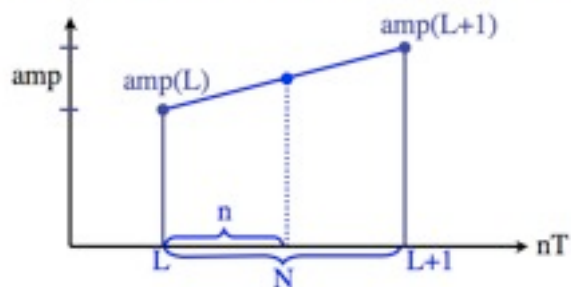
Envelope Algorithm



Envelope Algorithm Details

How does it really work?

Case: calculating interpolation at sample rate

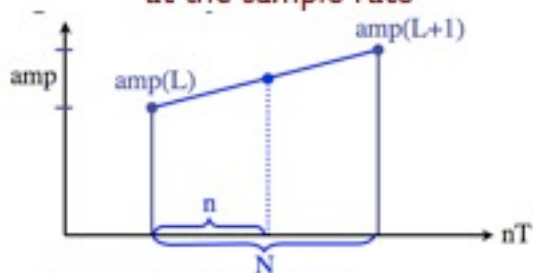


loop: $\text{amp} = \text{amp}(L) + \frac{n}{N} * (\text{amp}(L+1) - \text{amp}(L))$

operations count: $\frac{+}{1} = \frac{*}{1} / \frac{/}{1}$

Envelope Algorithm Details

Case: pre-calculating Δamp and doing as little as possible at the sample rate



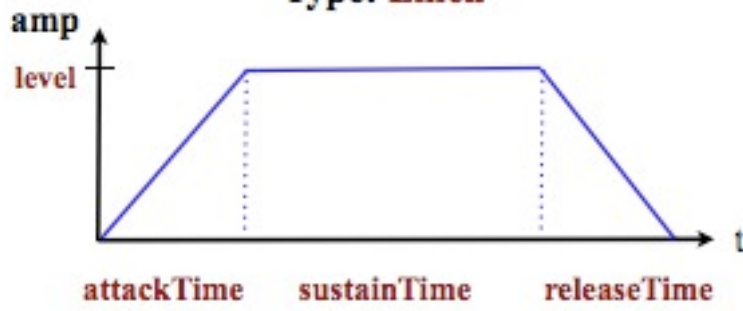
initialization: $\text{amp} = \text{amp}(L)$
 $\Delta\text{amp} = \frac{(\text{amp}(L+1) - \text{amp}(L))}{N}$

loop: $\text{amp} = \text{amp} + \Delta\text{amp}$ (N times!)

operations count: $\frac{+}{1} = \frac{*}{1} / \frac{/}{0}$

Trapezoid Envelope

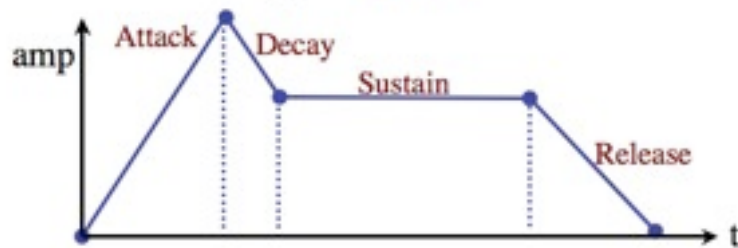
Type: **Linen**



Specification: 3 durations 1 amp level

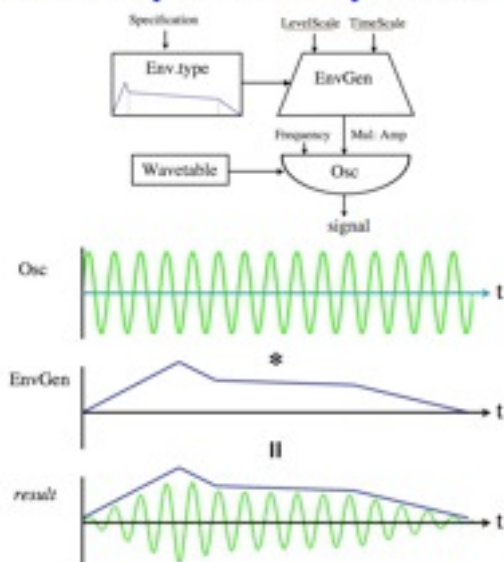
ADSR Envelope

Type: **ADSR**

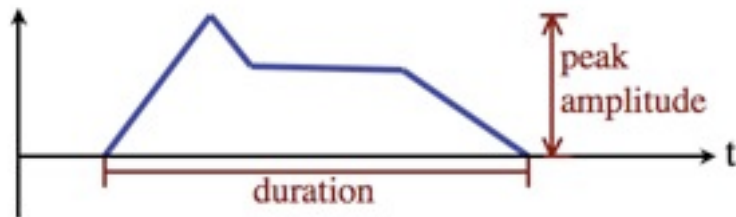


Specification: 4 durations 5 amp levels
 attackTime 0
 decayTime peakLevel
 sustainTime sustainLevel
 releaseTime sustainLevel
 0

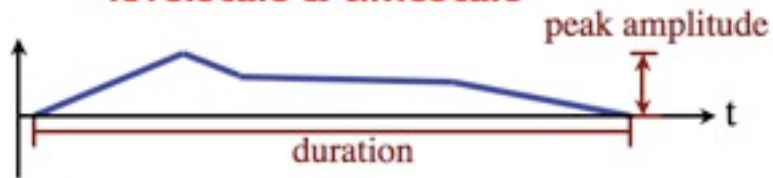
Envelope Multiplication



Envelope Scaling

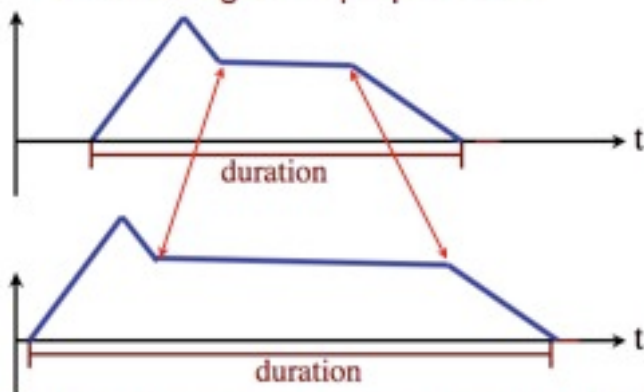


levelScale & timeScale



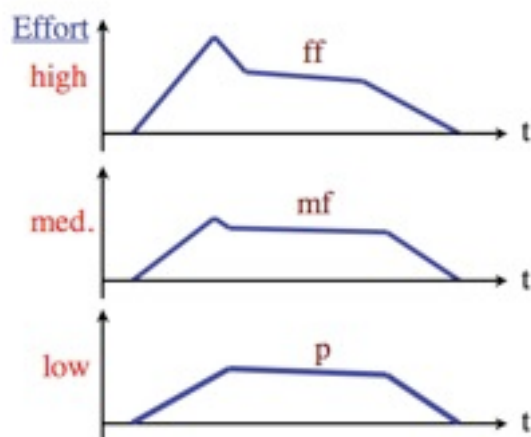
Approximating Real Envelopes

Time Scaling is not proportional!



The attack portion on most instruments remains fixed as the duration increases.

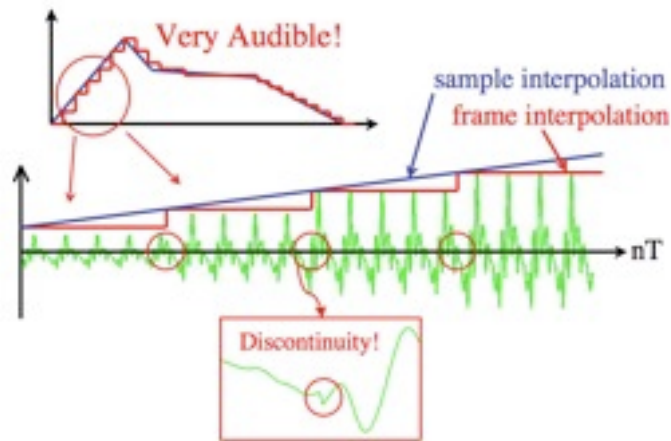
Approximating Real Envelopes



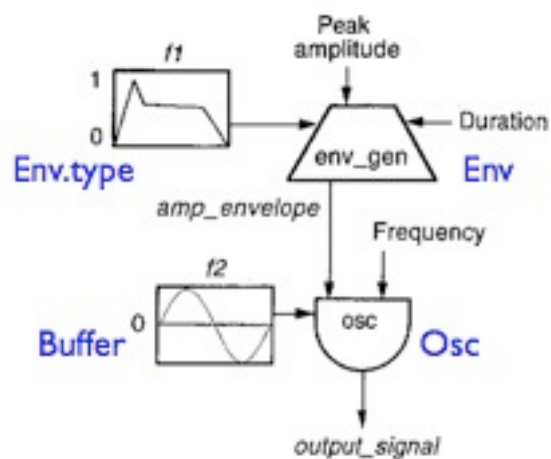
The envelope shape changes on most instruments when they play softer.

Potential Fidelity Problems

Envelopes with low control rate are noisy!



Generic Graphic Representations



Next Topic:
More on Real Instruments