Additive Synthese

Kreatives Programmieren 1

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Sinusfunktion

$$f(t) = A \cdot sin(2 \cdot \pi \cdot f \cdot t + \phi) + B$$

- A - Amplitude (streckt/staucht entlang y-Achse)
- $2 \cdot \pi \cdot f$ - Ein Wellenzyklus (streckt/staucht entlang x-Achse)
- ø - Phase: verschiebt links/rechts
- B - verschiebt oben/unten

Classical Waveforms and Spectra

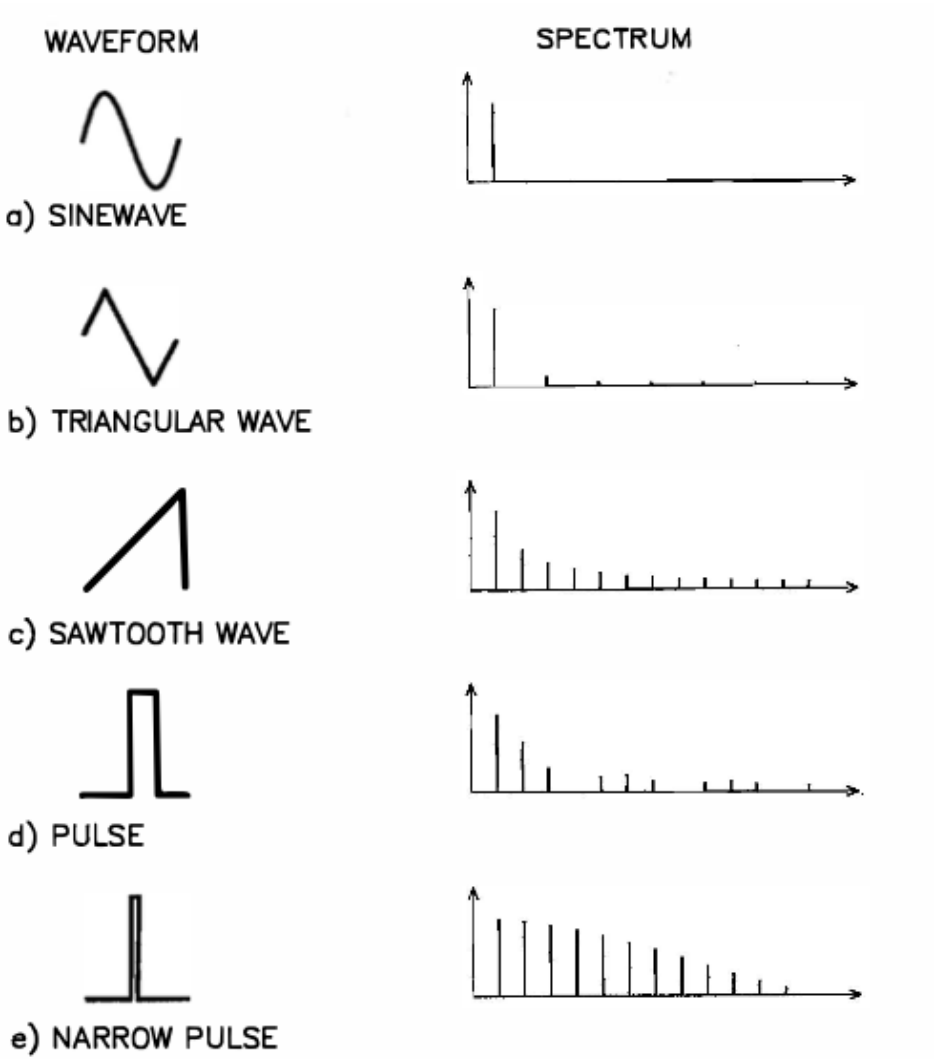


FIGURE 2.25 The spectra of some simple waveforms.

Simple Additive Instrument

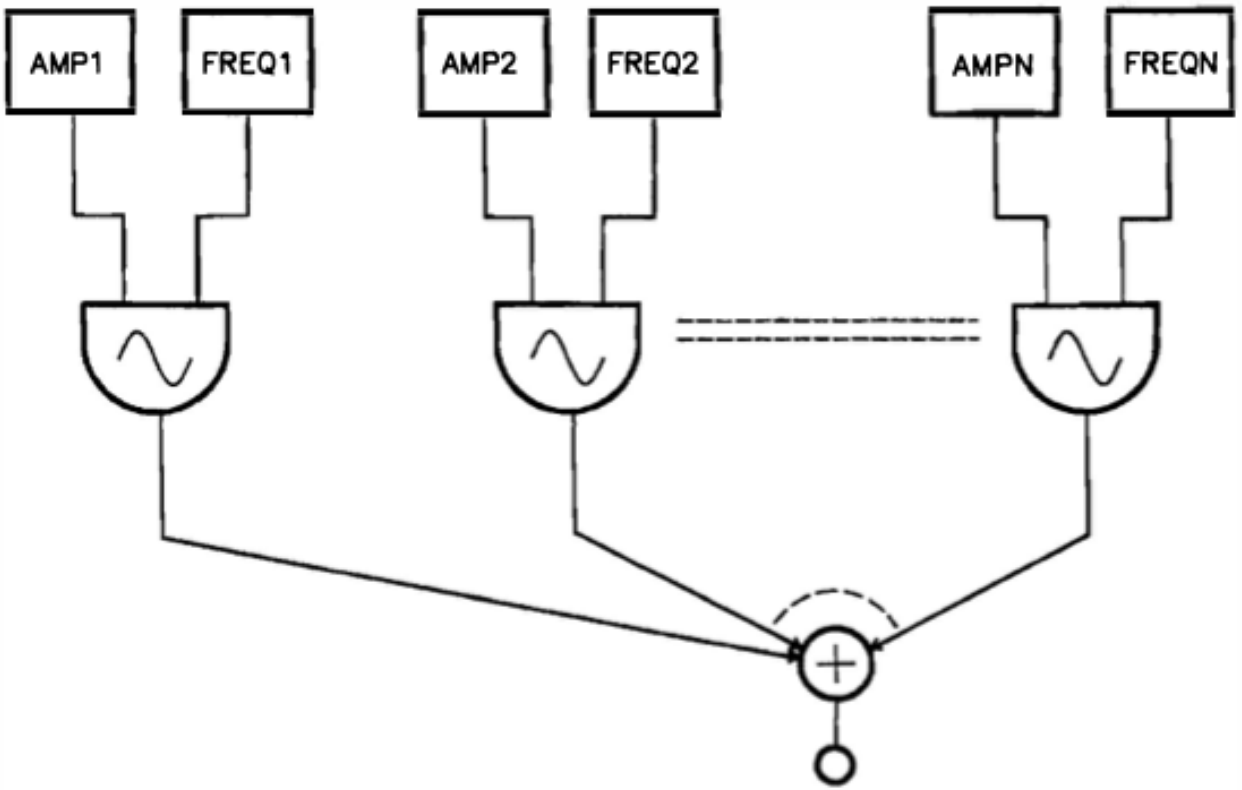


FIGURE 4.12 Basic configuration for additive synthesis. The amplitude and frequency inputs of each oscillator derive from independent function generators, which usually take the form of envelope generators or oscillators.

Spectrum of a trumpet

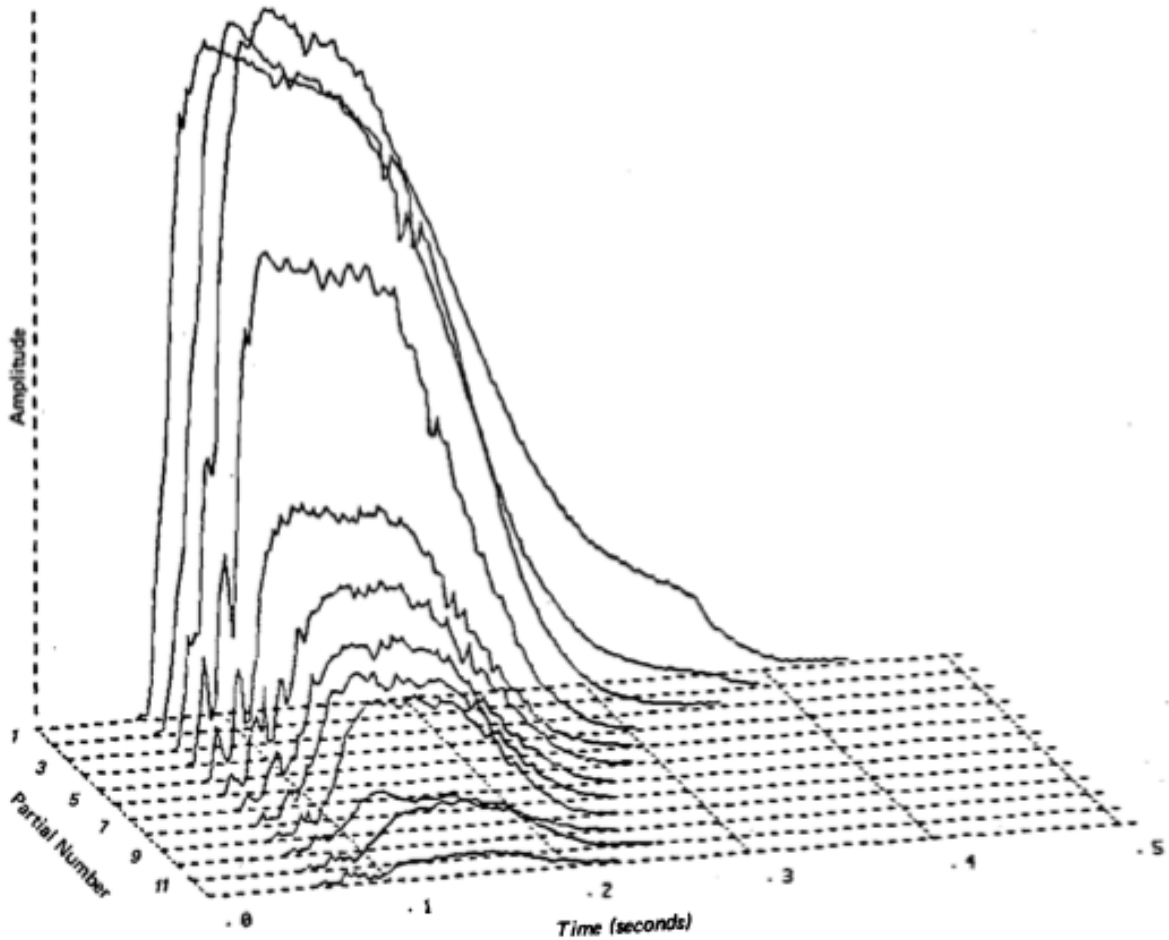


FIGURE 2.30 The amplitude progression of the partials of a trumpet tone as analyzed by Grey and Moorer. (*Reprinted with permission of* Computer Music Journal.)

Spectral Envelope

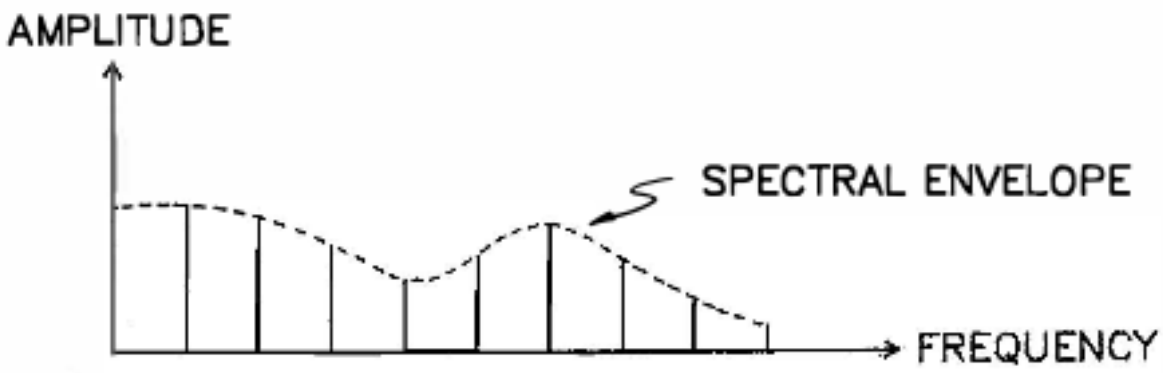
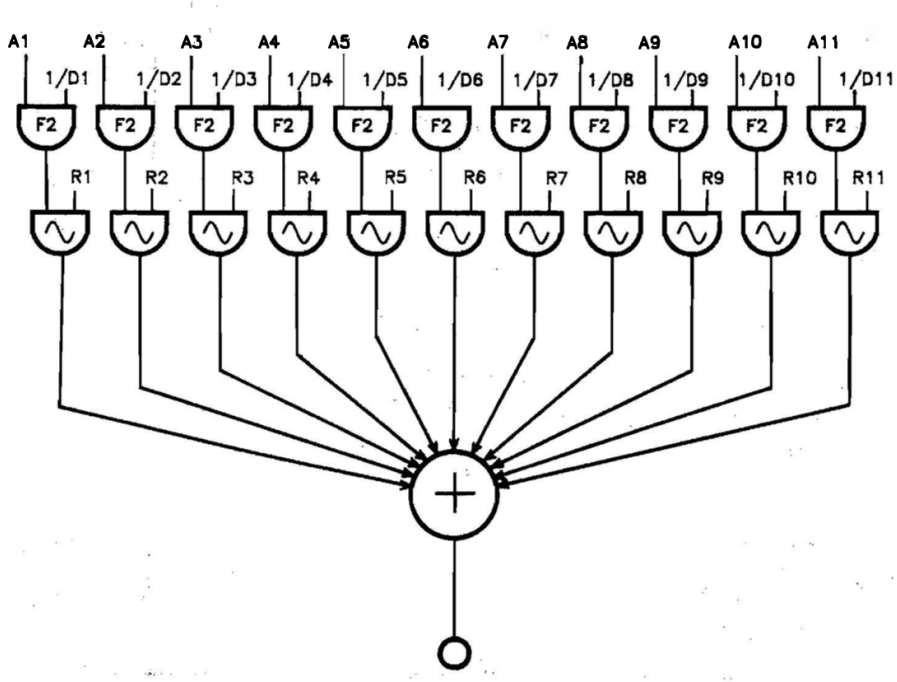


FIGURE 2.26 Graphical approximation of a spectral envelope from a spectral plot.

Harmonic / Inharmonic



Amplitudes		Durations		Frequencies	
A1	AMP	D1	DUR	R1	FREQ*.56
A2	AMP*.67	D2	DUR*.9	R2	FREQ*.56+1
A3	AMP	D3	DUR*.65	R3	FREQ*.92
A4	AMP*1.8	D4	DUR*.55	R4	FREQ*.92+1.7
A5	AMP*2.67	D5	DUR*.325	R5	FREQ*1.19
A6	AMP*1.67	D6	DUR*.35	R6	FREQ*1.7
A7	AMP*1.46	D7	DUR*.25	R7	FREQ*2.
A8	AMP*1.33	D8	DUR*.2	R8	FREQ*2.74
A9	AMP*1.33	D9	DUR*.15	R9	FREQ*3
A10	AMP	D10	DUR*.1	R10	FREQ*3.76
A11	AMP*1.33	D11	DUR*.075	R11	FREQ*4.07

FIGURE 4.28 Bell instrument based on Risset. *(Based on example in Risset's* Introductory Catalogue of Computer-Synthesized Sounds. *Reprinted with permission of Jean-Claude Risset.)*

Jean-Claude Risset: Endless Glissando

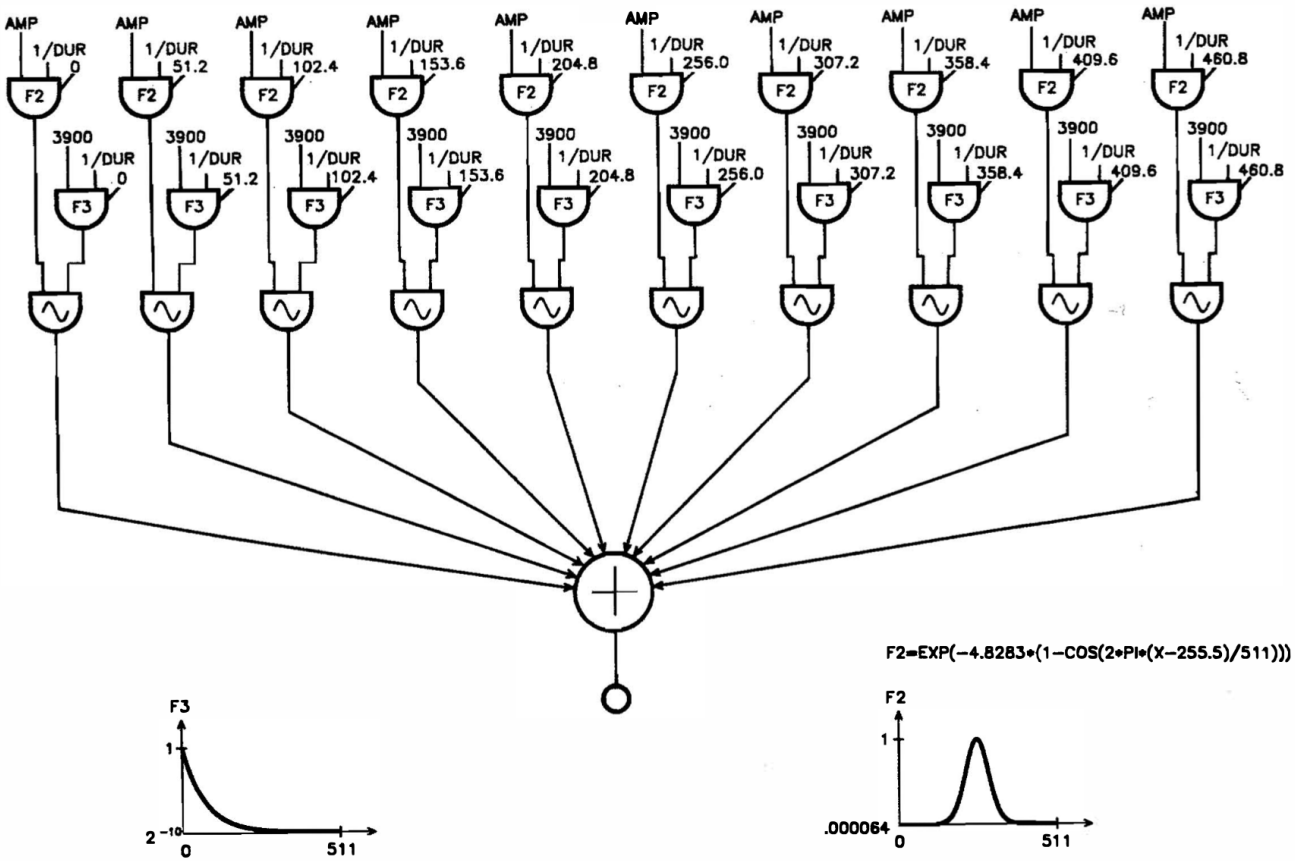


FIGURE 4.29 Design for endless glissando based on Risset. *(Based on example in Risset's* Introductory Catalogue of Computer-Synthesized Sounds. *Reprinted with permission of Jean-Claude Risset.)*

Exercises

- Build an Instrument, able to change the wave form from sine to triangle using only additive synthesis.

Examples

- Mutations by Jean-Claude Risset
- Gottfried Michael Koenig was one of the first composers to create a piece entirely using additive synthesis: 'Klangfiguren I', composed in 1955 in Cologne, Germany: Klangfiguren by Gotfried Michael Koenig
- Live-Improvisation with an instrument containing 32 sine waves: Granit Etuede by Luis A. P.
- Trevor Wishart (1988) used sound analysis as an intermediate stage in transforming vocal sounds for his piece: Vox 5 by Trevor Wishart
- Inharmonique by Jean-Claude Risset

Literatur

- Charles Dodge & Thomas A. Jerse: Computer Music. Synthesis, Composition and Performance. Shirmer, 1985
- Eduardo Miranda: Computer Sound Design Synthesis
- MillerPucket: The Theory and Technique of Electronic Music