Intro to Synthesis

What is a Synth?

Generates audio signal electronically

Has tone-generating modules that create sounds

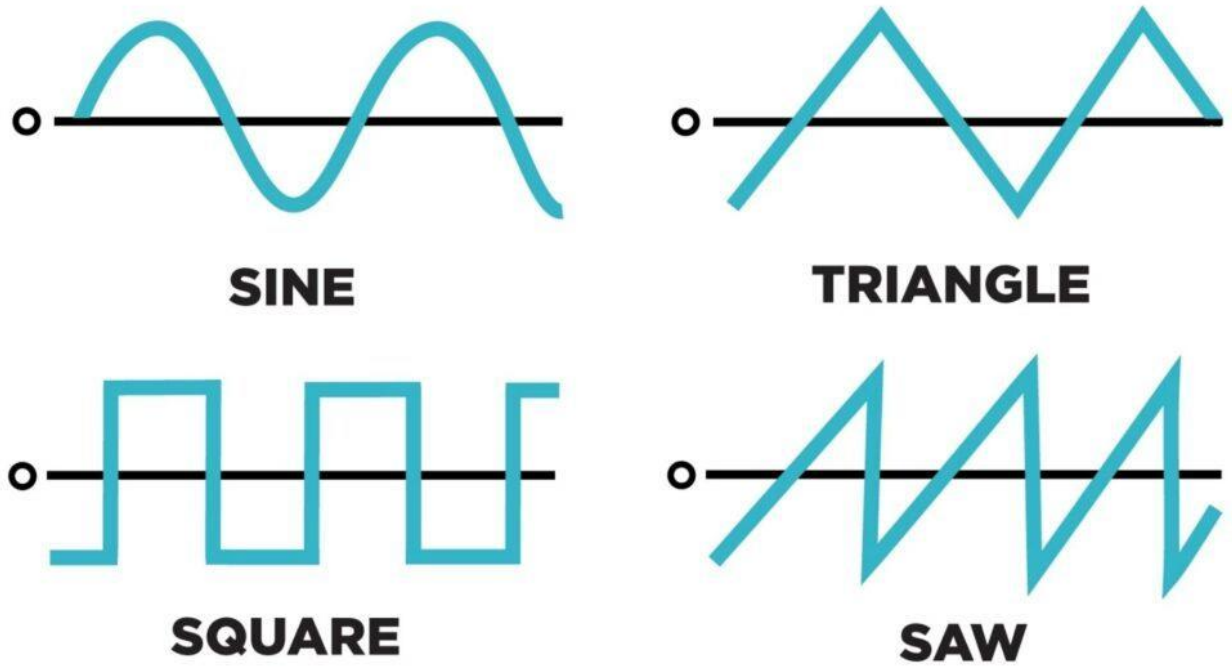
Filters, envelopes, and waveshaping change quality of sound (timbre)

3 main types of synthesis:

Subtractive Synthesis

Additive Synthesis

FM (Frequency Modulation) Synthesis



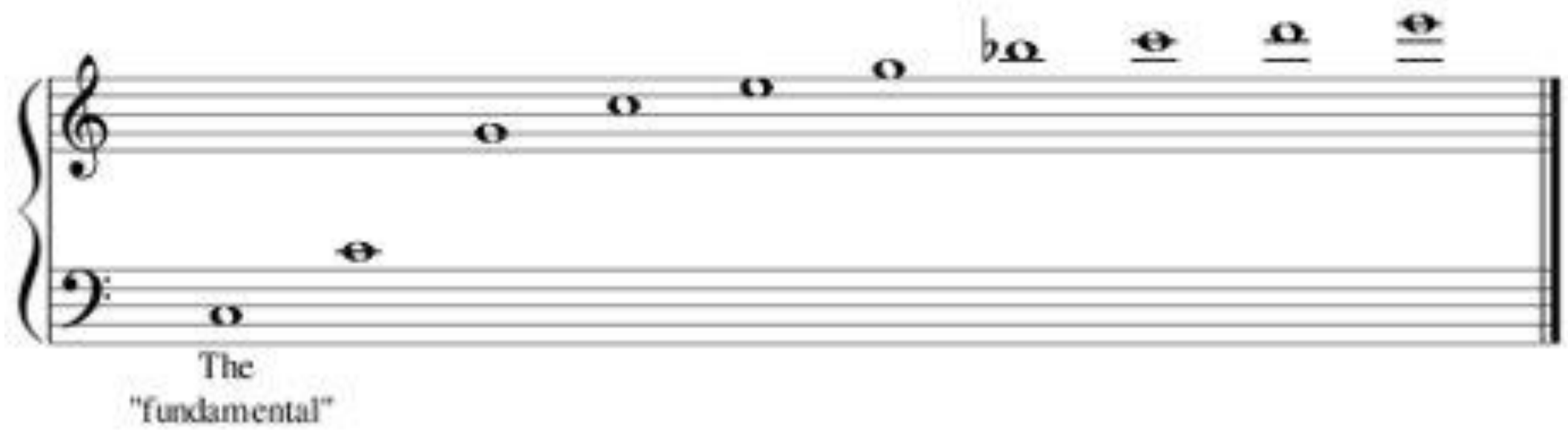
Oscillators + Waveforms

Oscillators are the tone-generating part of the synth

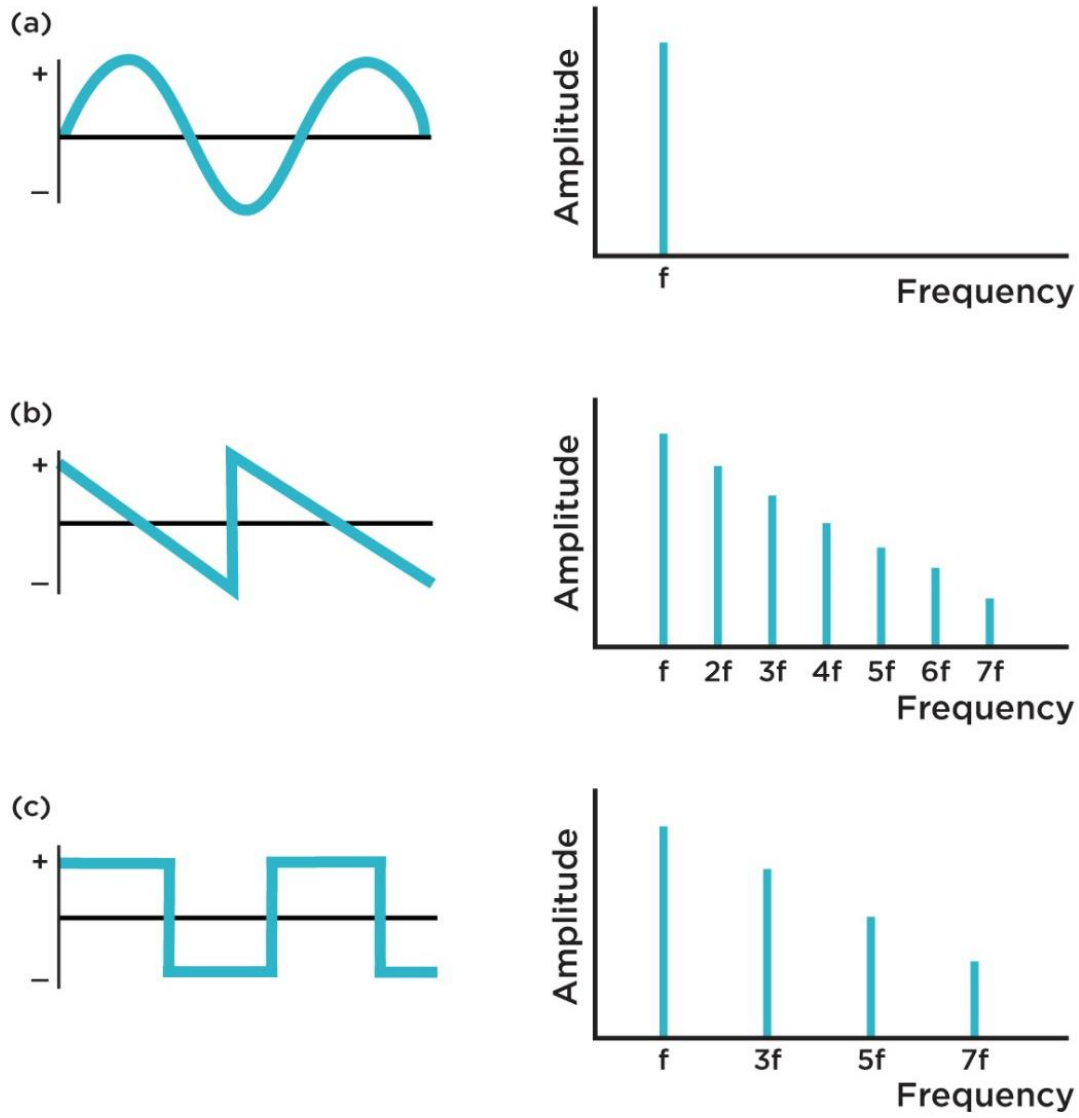
There are a few main waveforms that affect the timbre or quality of sound

Each waveform is created by a certain amount of partials / harmonics

Harmonic Series Review



Frequencies + Spectra

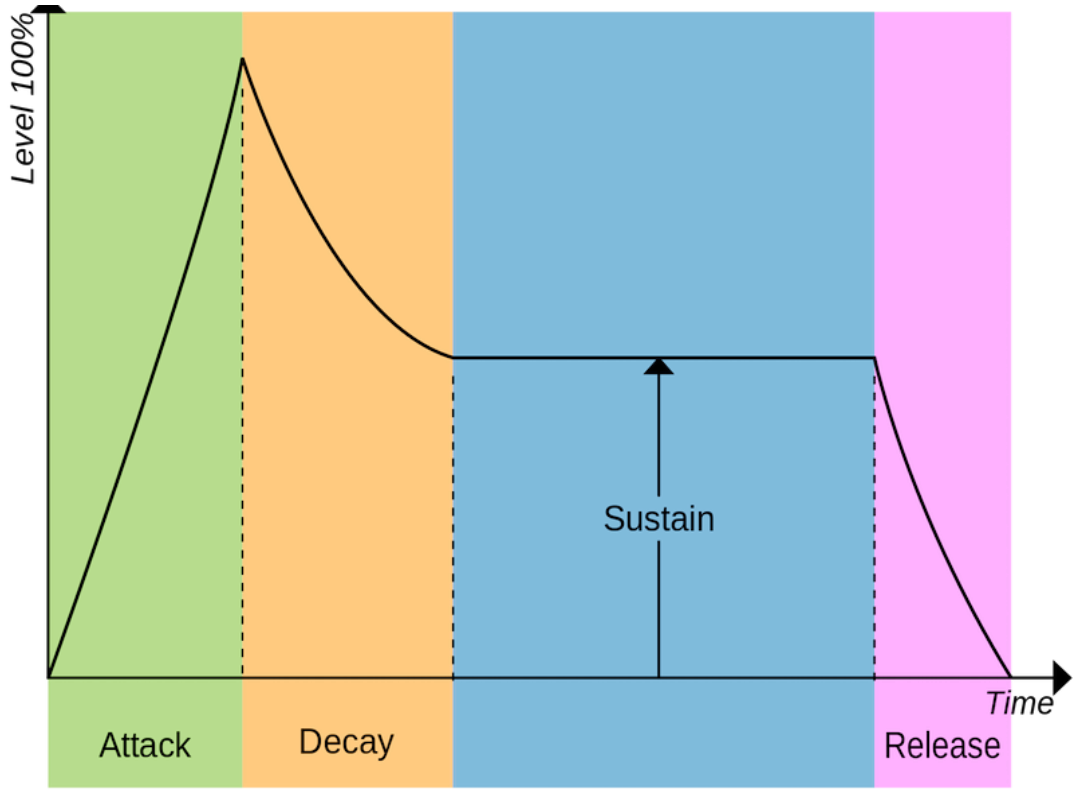


Envelopes

Shapes sound

Similar to fading in and out of a track but with a sound itself

ADSR (attack, decay, sustain, release)



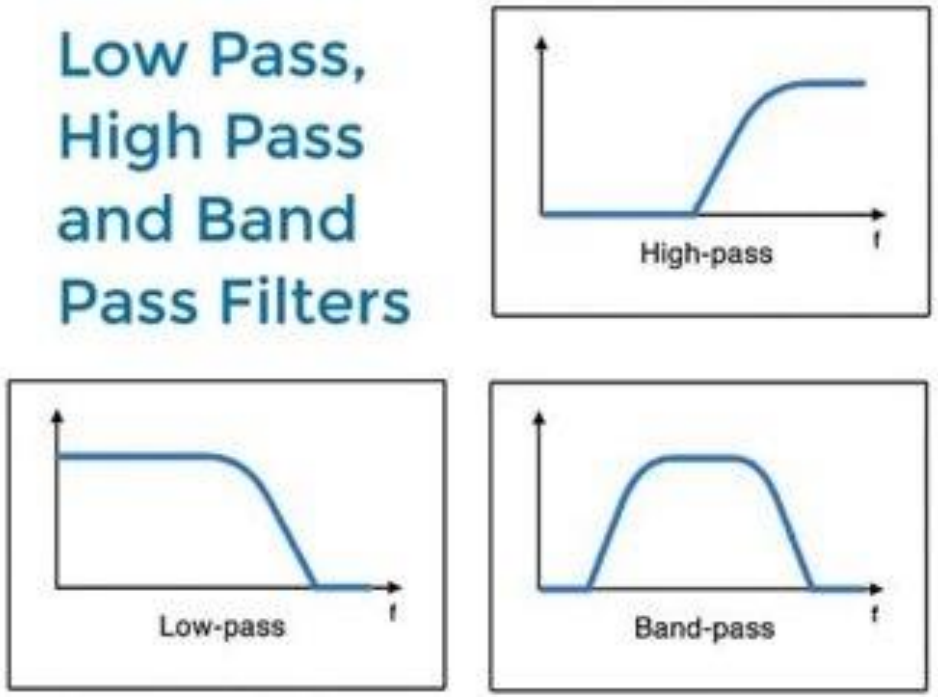
High Pass / Low Pass / Band Pass

Removes certain parts of sound depending

Attenuates high end, low end, or whatever frequency bands you specify

VCF- voltage controlled filter

https://www.perfectcircuit.com/signal/learning-synthesis-filters



LFOs and Noise Generators

LFO- low frequency oscillator (show Max/MSP example)

When an oscillator is low, you can hear frequency cycles sometimes as beating

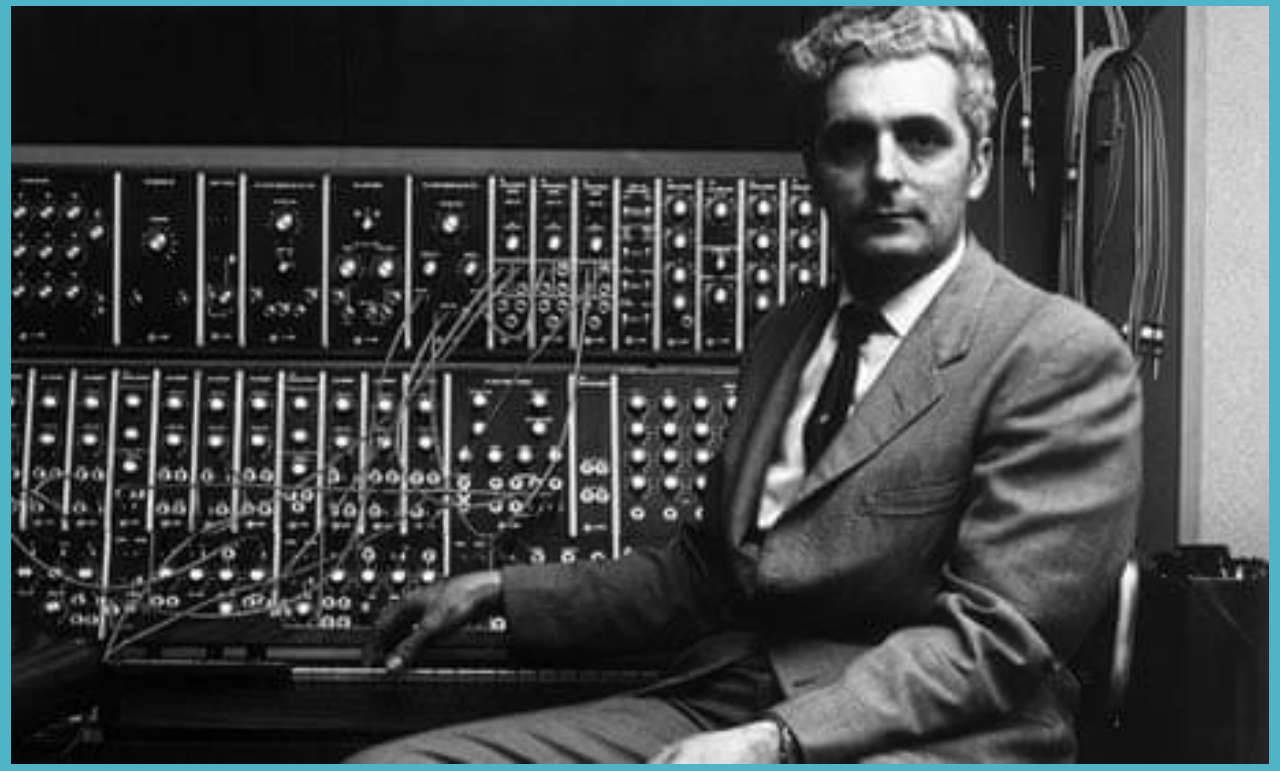
This can be added to a regular oscillator for texture

Noise generators can be used with filters since noise has many frequencies

(and sine tones do not!)

White noise is all frequencies at same volume

White noise, pink noise (lower sounds are amplified), brown noise



Moog / Buchla

https://www.perfectcircuit.com/signal/what-is-west-coast-synthesis

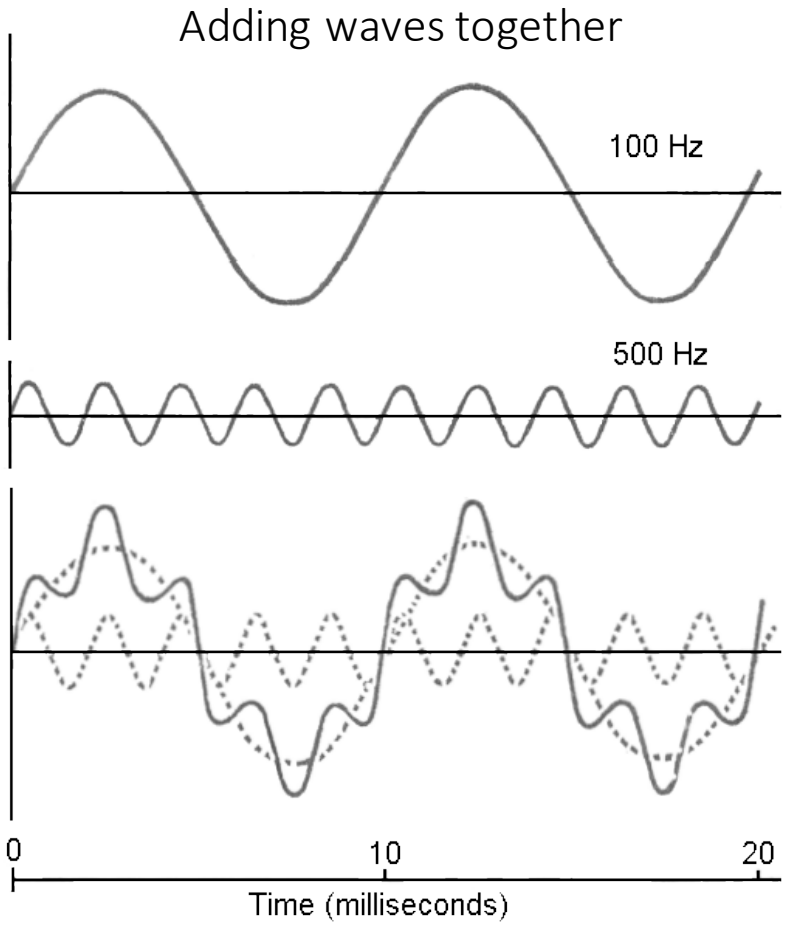
AM and Additive Synthesis

Can do AM synthesis (amplitude modulation) which sounds like tremolo

Can also add or multiply waves directly

Additive synthesis comes from the idea of creating complex timbres out of many sine tones

Wave multiplier is a module found on some systems



FM (frequency modulation)

Carrier / Modulator

FM famous in 1980s with Yamaha DX7

But initially used by Buchla

Developed and patented at Stanford with John Chowning

Maximum synthesis, min. computation

(show Csound plugin)