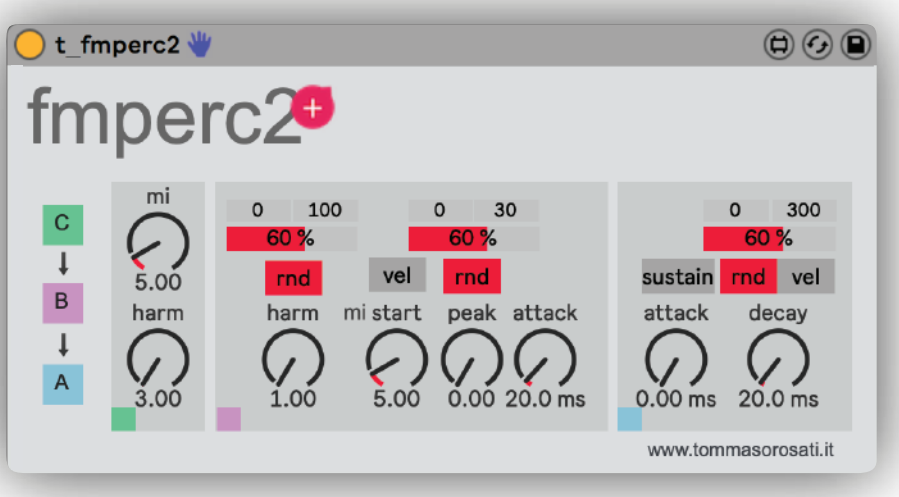
fmperc2

max for live
FM glitch percussion

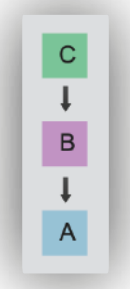
user manual



fmperc2 is a max for live instrument device for Ableton Live. It uses FM (Frequency Modulation) synthesis to create glitchy percussive sounds.

> Frequency modulation synthesis (or FM synthesis) is a form of sound synthesis where the frequency of a waveform, called the carrier, is changed by modulating its frequency with a modulator. FM synthesis can create both harmonic and inharmonic sounds. For synthesizing harmonic sounds, the modulating signal must have a harmonic relationship to the original carrier signal. As the amount of frequency modulation increases, the sound grows progressively more complex. Through the use of modulators with frequencies that are non-integer multiples of the carrier signal (i.e. inharmonic), inharmonic bell-like and percussive spectra can be created. [wikipedia]

In the classical terminology of FM synthesis, oscillators, which can act both as modulators and carriers, are called operators. In this device there are 3 operators in series. Operator C modulate frequency of operator B that modulate frequency of operator A. All the operators are sinousoidal oscillators.

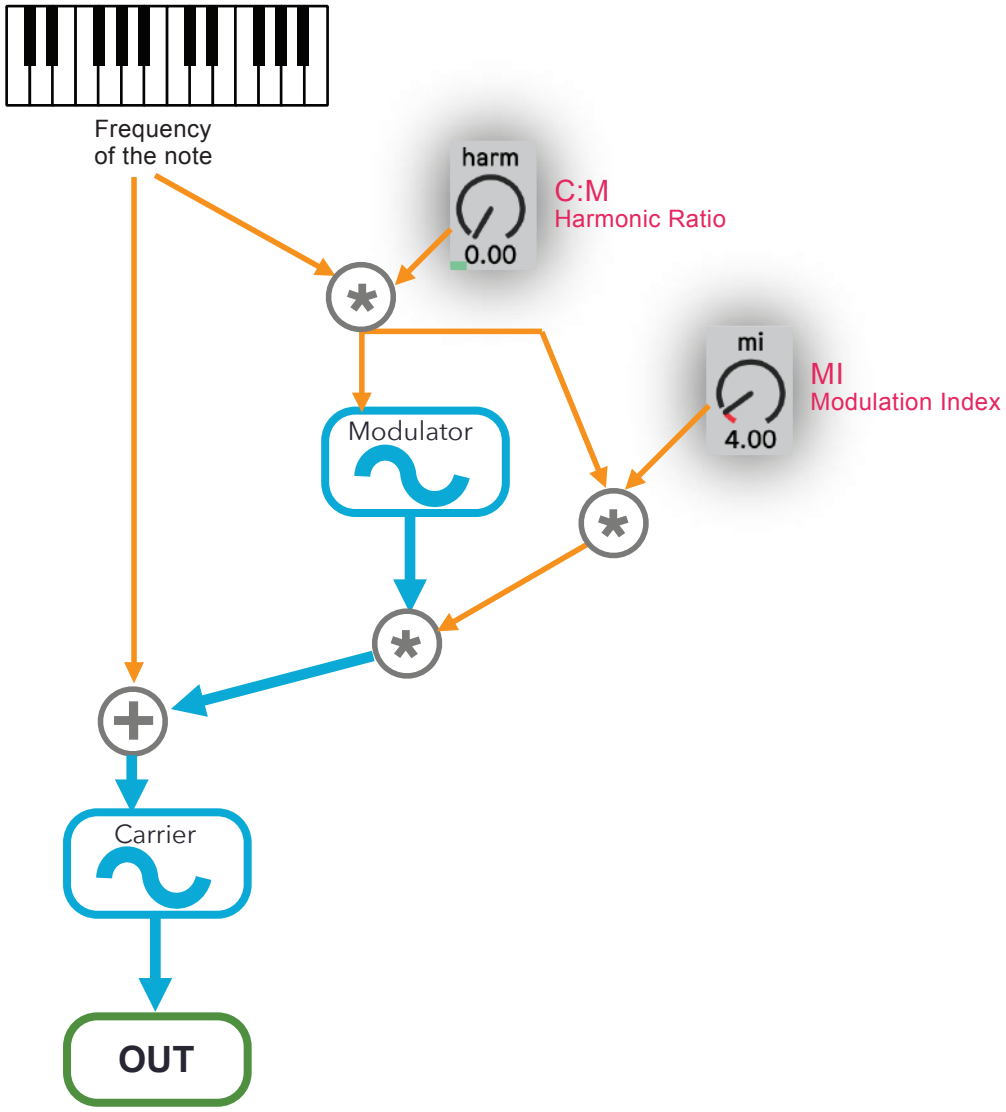


The two most important parameters are the harmonic ratio and the modulation index.

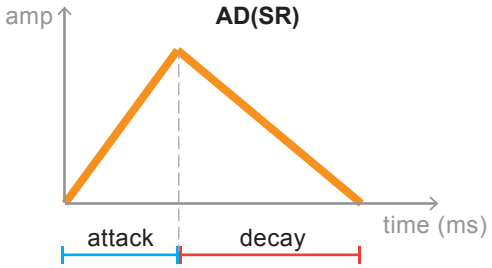
The harmonic ratio (C:M) establishes the relationship between the partials and the fundamental of our timbre. In particular, it should be noted that with integer ratios you will obtain more harmonic timbres while with non-integer ratios you will have more complex and inharmonic timbres.

The modulation index (MI) instead indicates how many partials our synthesis creates. The higher the number, the more partials there will be. Note that the increment is not linear.

The following is the basic algorithm used for the synthesis.



Operators and envelopes



Operator C

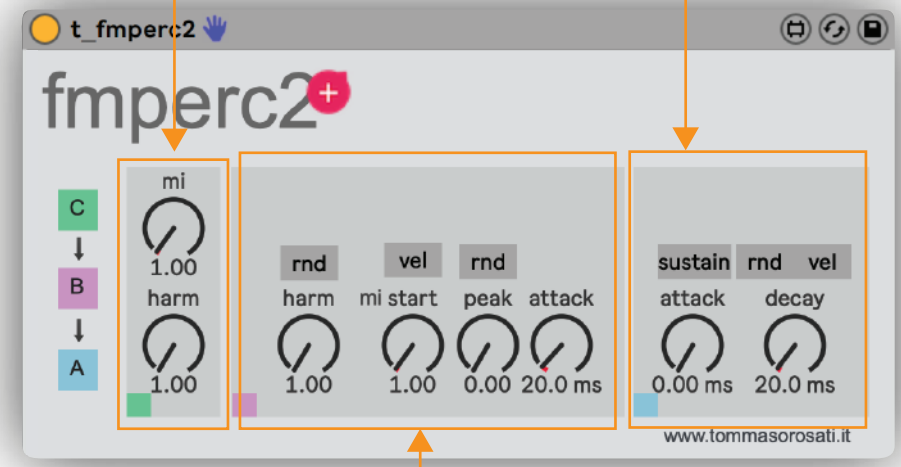
Modulation Index and Harmonic Ratio

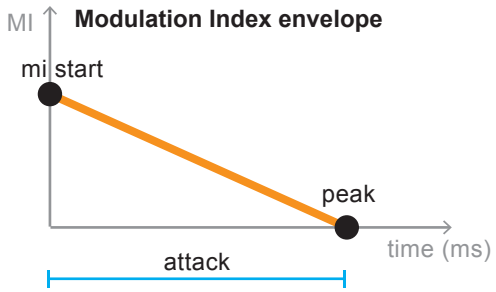
higher mi → more partials in timbre (more complex)

integer harmonic ratio → more harmonic timbre

float harmonic ratio → more inharmonic timbre

Controls for **ADSR** (Dynamic Envelope)





Operator B

Harmonic Ratio, Modulation Index with its **envelope** (MI starting point, MI end point and attack time).

higher mi → more partials in timbre (more complex)

integer harmonic ratio → more harmonic timbre

float harmonic ratio → more inharmonic timbre

Velocity and Sustain

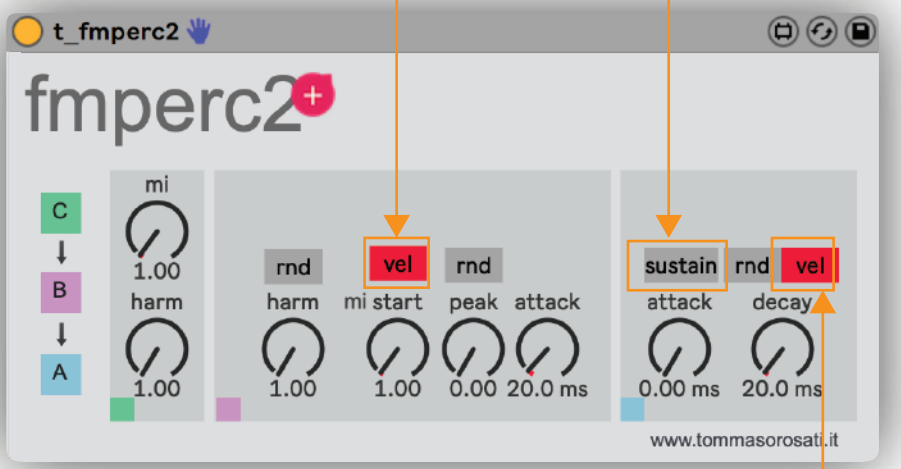
vel

this switch activates the modulation index (MI) control by the **velocity** of the input note.
The stronger the input note, the higher the mi start will be. The increment is in relation to the value set in the mi start knob.

stronger note → more complex timbre

sustain

allows you to activate the **sustain** of the sound. Designed for percussive controller with control of sustain (*Keith McMillen Boppad* and similar) or standard midi keyboards.



vel

this switch activates the decay control by the **velocity** of the input note.
The stronger the input note, the longer the decay will be. The increment is in relation to the value set in the decay knob or, in the case of random decays, it will be in relation to the last decay generated by the randomizer.

stronger note → longer decay

Randomizing

rnd harmonic ratio in operator B

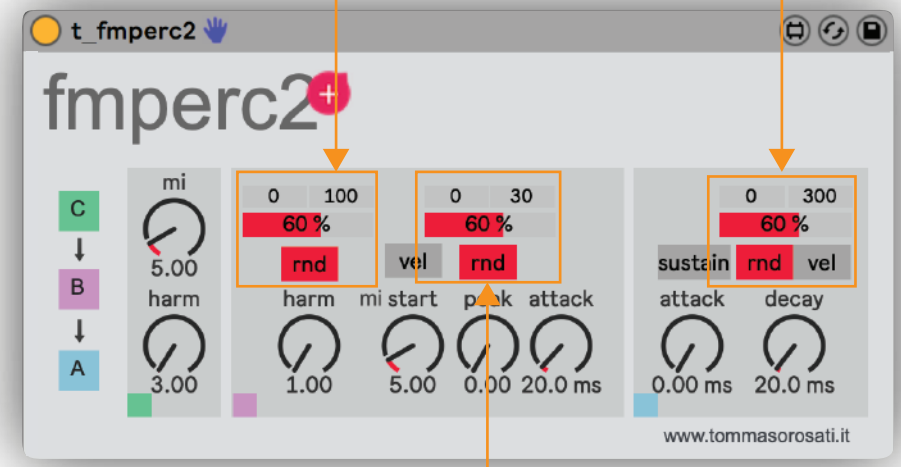
This switch activates the **random** section of the second operator's harmonic ratio. Minimum value, maximum value and randomisation percentage will appear, i.e. with what percentage each note will generate a random or fixed harmonic ratio (set in the knob below).

higher % → more variability in timbre harmonics

rnd decay

This switch activates the **random** section of decay time. Minimum value, maximum value and randomisation percentage will appear, i.e. with what percentage each note will generate a random or fixed decay (set in the knob below).

higher % → more variability in decay time



rnd modulation index peak in operator B

This switch activates the **random** section of the second operator's modulation index peak. Minimum value, maximum value and randomisation percentage will appear, i.e. with what percentage each note will generate a random or fixed modulation index peak (set in the knob below).

higher % → more variability in tha amount of partials

References

CYCLING '74, MAX/MSP reference manual Version 6, Cycling '74, 2012

CURTIS ROADS, The computer music tutorial, The MIT press, 1996

ABLETON, Ableton Live reference manual Version 9, Ableton, 2013

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