MTE 1001

Fundamentals of Sound Synthesis

Topic Area:

Modulation

Readings:

Previously,
Roads: Chapter 6, pp. 224-228
Roads: Chapter 6, pp. 228-232
Roads: Chapter 6, pp. 232-235

New: nothing new

Reminder:

Next Notebook covers from Autumn week 9 through Spring week 4

Notebooks due on Monday, February 27 (week 5)

Review

Modulation

Modulation Definition?

Kinds?

Special Terminology?

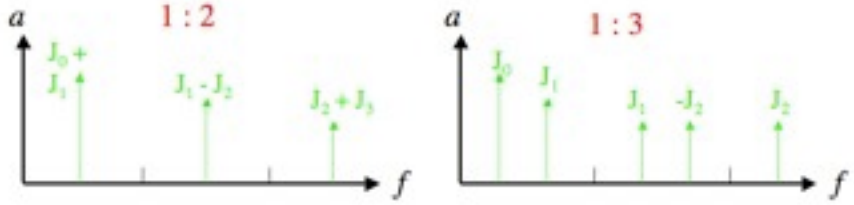
Review

Frequency Modulation

C:M Ratio?

Review

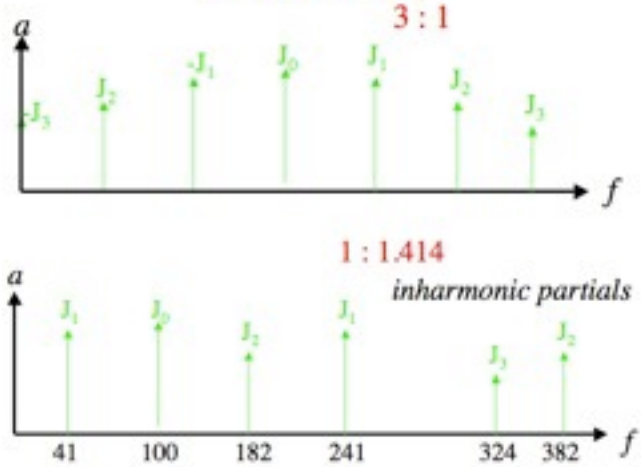
C:M Ratios affect which harmonics are present.



Every Mth harmonic is missing.

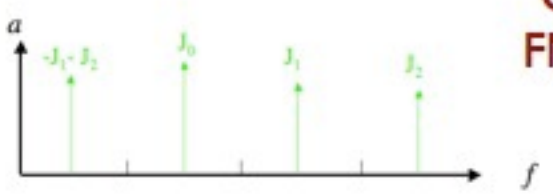
Review

C:M Ratios



Review

C:M 3 : 2



Chowning FM Clarinet

Energy starts in the 3rd harmonic.
Every 2nd harmonic is missing.

Review

Chowning FM Clarinet

Different envelopes for amplitude and for frequency modulation index!

C:M 3:2 Fundamental = 300 Hz Duration = 0.5 sec.

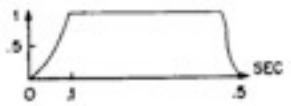
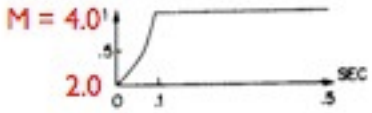


Fig. 12. Envelope function for woodwind-like tones.



These red numbers are the actual low and high values to use for M!

Fig. 13. Special envelope function for modulation index to achieve a better approximation to a woodwind timbre.

Review

Chowning Percussion: Bell-like Sound

Same envelope shape for amplitude and the frequency modulation index.

C:M 1:1.414 Fund. = 200 Hz. Duration = 15 sec.

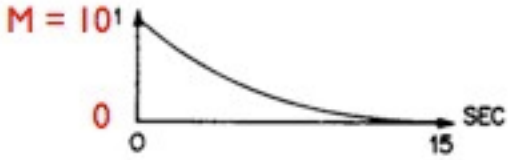


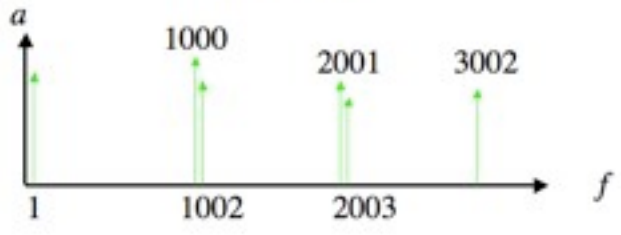
Fig. 14. Exponential decaying envelope for bell-like timbres.

Review

Detuning the modulator

1 : 1 +/- X Hz

1000 : 1001



Detuning produces beats at 2 X*

Review

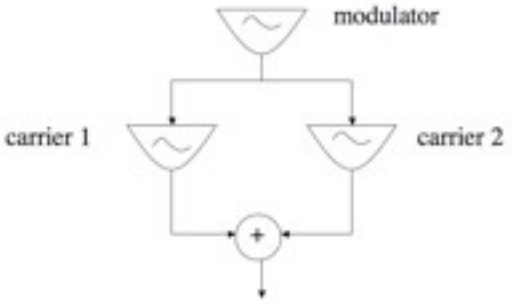
Detuning the modulator

SuperCollider demo

Lecture 13b

Frequency Modulation

Advanced FM Techniques

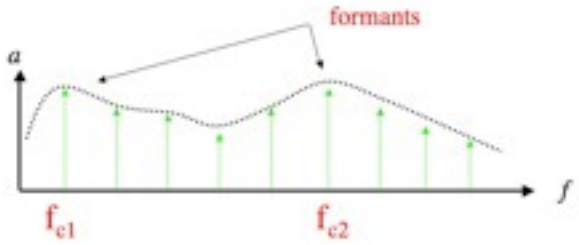


Multiple Carriers

Optional SC examples in SynthesisLect13c

Frequency Modulation

Advanced FM Techniques

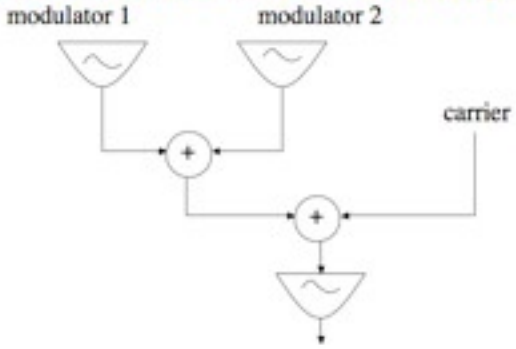


voice synthesis

Multiple Carriers
good for vocal synthesis

Frequency Modulation

Advanced FM Techniques

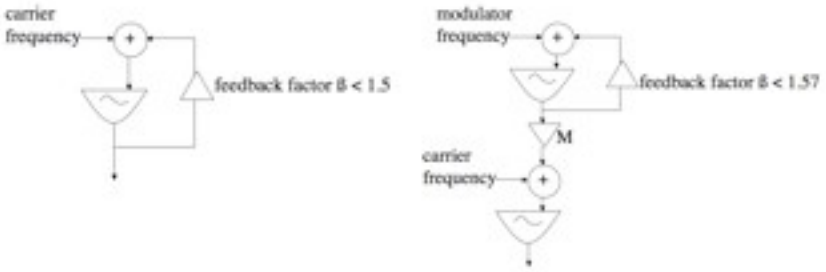


Multiple Modulators good for string synthesis

Optional SC examples in SynthesisLect13c

Frequency Modulation

Advanced FM Techniques



Yamaha actually used feedback FM which was very flexible

We will cover this later in the semester

Frequency Modulation

Advanced FM Techniques

Could FM mimic everything?

Barry Truax - Androgyny

Using FM in a completely different way!

Why imitate known instruments?

Canadian composer, resident of Vancouver, British Columbia and Professor at Simon Fraser University. http://www.sfu.ca/~truax/. Proponent of soundscape composition and primary inventor of granular synthesis.

Barry Truax - Androgyny

Using FM in a completely different way!

". . . the dramatic form of the piece has been derived from the nature of the sound material itself. In this case, the sound construction is based on ideas about an acoustic polarity, namely "harmonic" and "inharmonic," or alternatively, "consonance" and "dissonance." These concepts are not opposed, but instead, are related in ways that show that a continuum exists between them, such as in the middle of the piece when harmonic timbres slowly "pull apart" and become increasingly dissonant at the peak intensity of the work."

All of this is based on the manipulation of C:M ratios and tuning relationships

"Organizational Techniques for C:M Ratios in Frequency Modulation", *Computer Music Journal*, 1(4), 1978, pp. 39-45. See http://www.sfu.ca/~truax/fmtut.html

Barry Truax - Androgyny

1978 - 16 minutes

Barry Truax - Androgyny

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Barry Truax - Androgyny

1978 - 16 minutes

Next Topic:
Sampling