Marimba Note

A marimba is an instrument that consists of wooden bars that are struck with soft beaters (figure 1).

Figure 1: a marimba

A note from a marimba can be imitated reasonably effectively using a relatively small number of oscillators as is apparent from its spectrogram (figure 2).

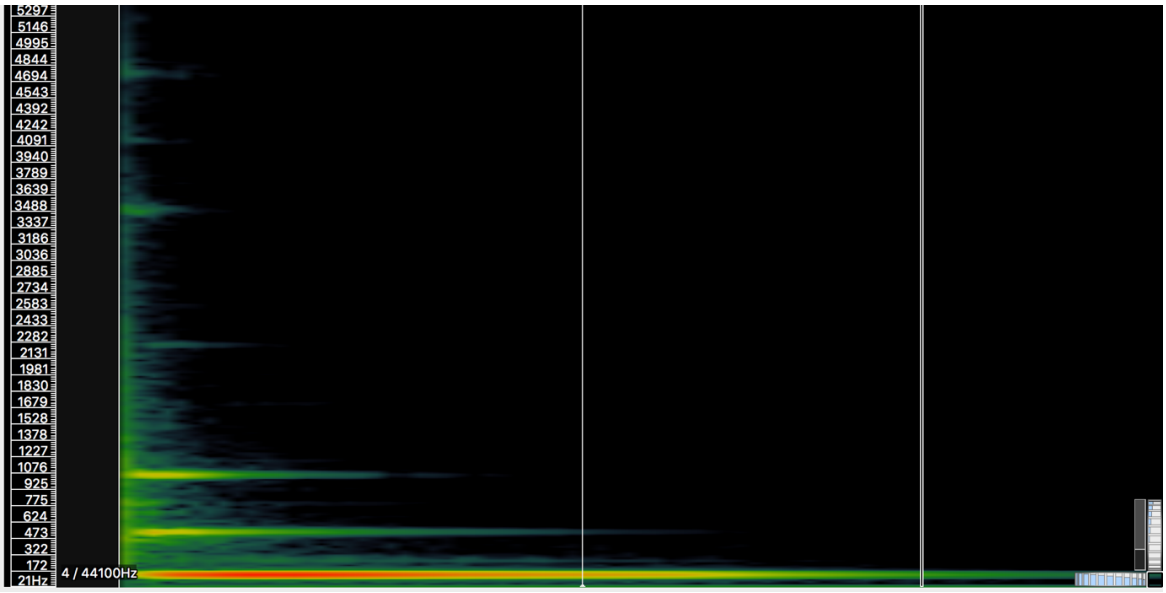

Figure 2: spectrogram of a marimba note

There is a strong fundamental at 132 Hz and additional weaker partials at 526, 1053, 2259, 3490 and 4659 Hz. The higher partials appear to decay quicker.

The table in figure 3 describes the rate of decay of each partial. Intensity levels expressed as decibel values are provided for each partial at the beginning of the note and when 1 second has elapsed. It can be assumed that the decay of each partial continues at the same rate beyond 1 second. Using this information we can create envelopes to control the amplitude of each partial.

Partial Frequency (Hz)	Start dB	dB after 1 second
131	-5	-35
526	-16	-86
1053	-26	-176
2259	-50	-550
3490	-50	-750
4659	-50	-950

Figure 3: Table describing the decay of each partial

Synthesise the marimba note using 6 sine tone oscillators using **`poscil`** in the arrangement shown in figure 4.

Hints

- **`poscil`** expects its amplitude expressed as a raw amplitude value, not decibels, so before we control its amplitude using an envelope created using the data in Figure 3, we need to convert the envelope variable from decibels to amplitude using **`ampdbfs()`** (see week 2 notes).
- Decibels readings normally decay in linear fashion (not exponential) so this should inform our choice of envelope opcode.
- If you are unsure if your envelope is correct, test your instrument through the speakers, not through headphones so that you won't deafen yourself is something goes terribly wrong!

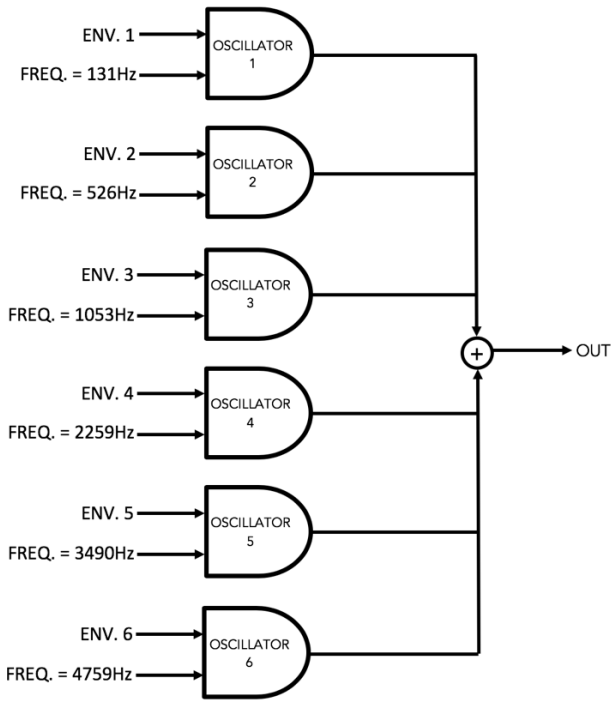

Figure 4: schematic for MIDI note