

Non-Realtime Recording

The rhythm of a sequence recorded in **detonate** is determined by the event starting times given to **detonate** (that is, the delta time received for each note event), rather than by the actual time **detonate** receives the events. For this reason, a sequence can be recorded over any period of time, or even in a single instant. This is demonstrated in the subpatch **p** 'Another Example', which is a completely separate program from the rest of this patch.

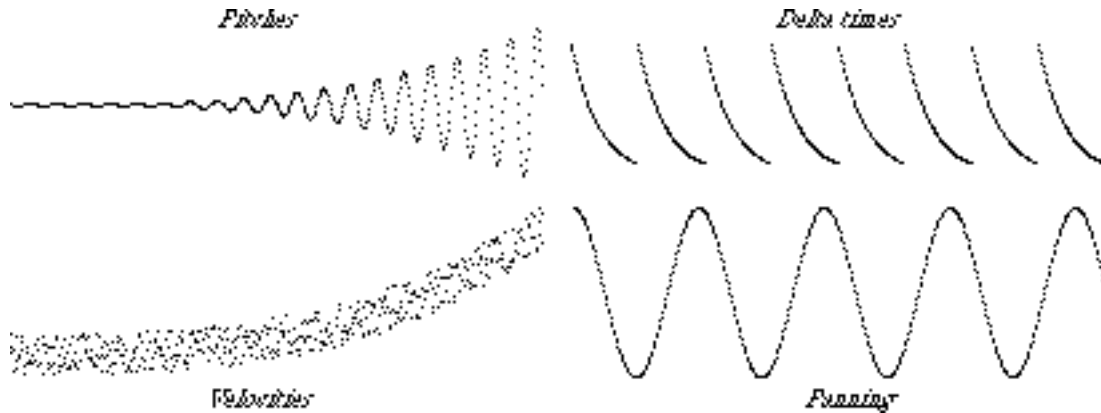
- Double-click on the **p** 'Another Example' object to open it.

Although some of the arithmetic in the **expr** objects may appear daunting, the basic operation of this patch is extremely simple. When you click on the **button**:

1. A record message is sent to **detonate**.
2. **uzi** sends out 1000 numbers ascending from 1 to 1000 (effectively from 0 to 999, since the numbers go immediately to a - 1 object).
3. Each of those numbers is used to calculate the different parameters of a note event.
4. When **uzi** is done, a start message is sent to **detonate**, followed immediately by a next message to send out the first note event.
5. The event parameters are converted to MIDI messages by **makenote** and **noteout** (and **ctloft** for panning messages), and the delta time is used to determine when the next note should be triggered.

In a single tick of Max's clock, a melody approximately 78 seconds long is composed and recorded.

Each of the event parameters is calculated according to a unique formula describing a particular curve from the beginning to the end of the melody's duration.



When these individual curves of progression for each of the parameters are combined, they create a constantly changing yet still quite predictable melody. Panning moves according to $4\frac{1}{4}$ cycles of a cosine wave, beginning panned to one side, then moving slowly from side to side and ending in the center of the stereo field. Velocity is random within a restricted range that begins from 1-32 and increases according to an exponential curve ending in the range 96-127. Pitch moves in 480 cycles of a sinusoidal wave centered around key 66, beginning with an amplitude of 0 semitones and ending with an amplitude of ± 30 semitones, from 36 to 96. Delta time between notes changes according to 8 exponential curves of acceleration, repeatedly accelerating from 5 notes per second to 50 notes per second. Duration is always 5 times as long as the delta time of the next note, so that even the fastest notes last at least 100 milliseconds.

- Click on the **button** to compose, record, and play the melody.

Summary

The **detonate** object is useful for recording and playing sequences of notes, and can read and write standard MIDI files. It is also useful for less commonplace sequencing tasks such as non-realtime recording, continuously variable playback speed, and playing back the recorded notes in a new rhythm.

To record MIDI note messages in **detonate**, a **timer** should be used to report the time elapsed between messages, which **detonate** will record as the *delta time* parameter of each note event. On playback, the delta time should be used to determine how long to wait before playing the next note. Multiplying the delta times and durations by some number other than 1 changes the tempo of the playback. When supplying note-offs for notes on different channels, **pipe** can be a useful substitute for **makenote**.