
PulsarGenerator Manual of Operation

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PulsarGenerator (PG) is a new interactive program for sound synthesis. It emits a train of pulsars in a pattern according to user specifications. PG incorporates a number of musically powerful and innovative user interface features. This document describes the operation of PulsarGenerator, and is designed as a quick start overview.

SOURCES OF MORE DETAILED INFORMATION AND HELP

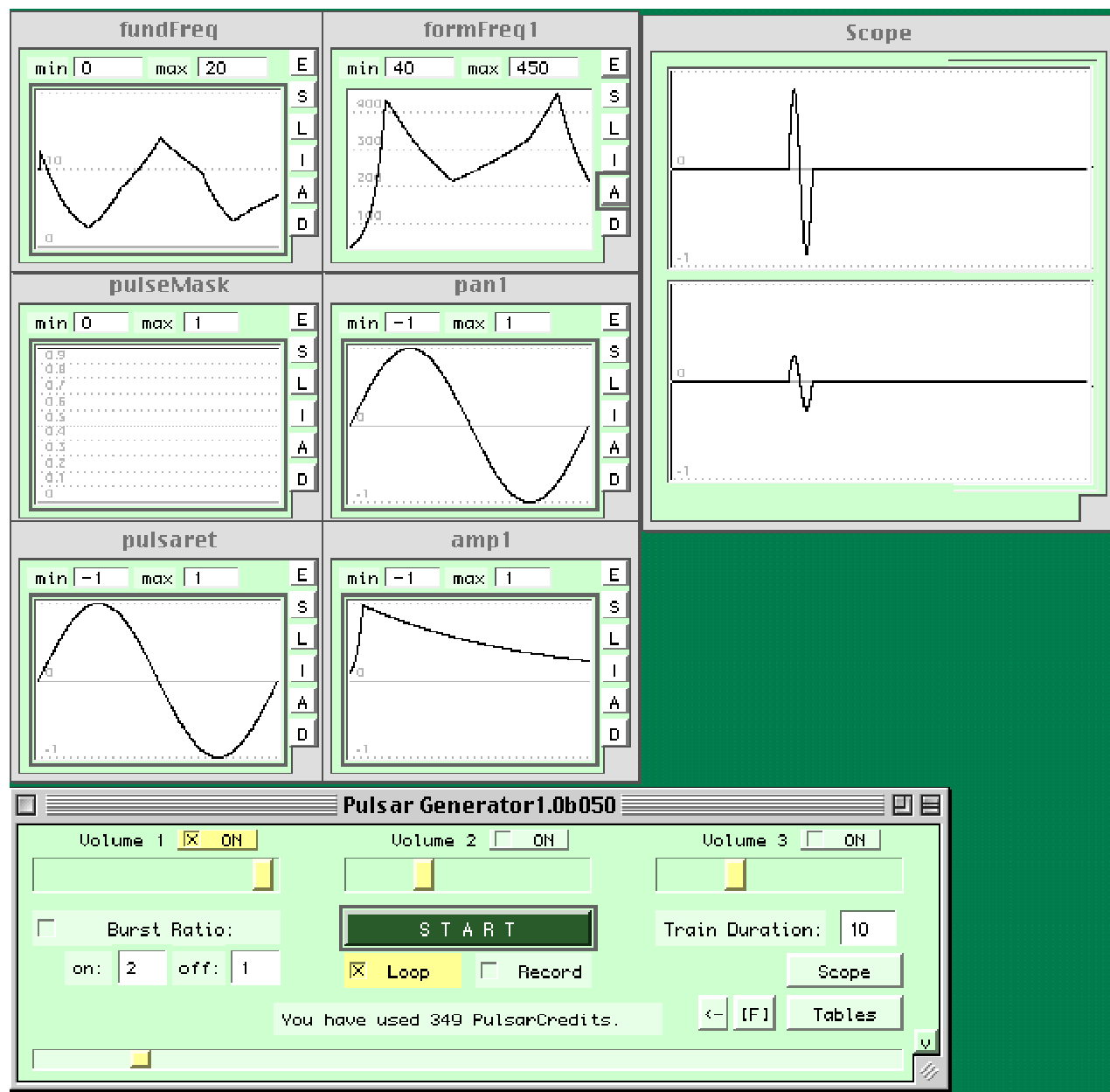
- To read about the theory of pulsar synthesis, launch PG and consult Lib/Help/What is pulsar synthesis?
This means: Select "What is pulsar synthesis?" under the "Help" item under the "Lib" menu.
- For a more detailed explanation, see "Sound Composition with Pulsars" in the March 2001 issue of the *Journal of the Audio Engineering Society*, Volume 49, Number 3.
- PG has many single-keystroke shortcuts. In the PG application, select Lib/Shortcuts
- For detailed information about the PG user interface, select a topic under Lib/Help.
- In the PG application, you can also open documentation and help files using the File/Open dialog. Look under the folders Documentation and Help in the PG folder.

CONFIGURE ASIO BEFORE LAUNCHING PG

Before launching PG, be sure that your sound output is configured with an ASIO driver. See the PG READ ME in the PulsarGenerator folder. PG comes with a SoundManagerASIO driver, so the built-in hardware and SoundManager-compatible hardware should work right away.

THE PG INTERFACE

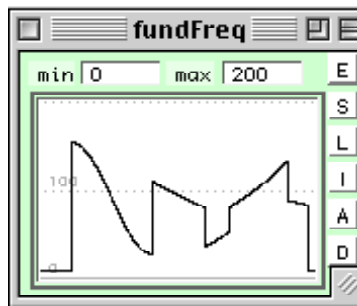
The PG interface shows a collection of wave table views, each in their own window. Here is the display in the Basic user mode (Lib/UserMode/Basic).



You can edit the waveform by Command-click and dragging the breakpoints. Try also Option-click and Control-click for exponential and cosine interpolation between breakpoints. You can rescale the visible range of any wavetable by clicking on its min or max number and dragging the mouse up or down.

To enter a number into any of the number boxes in PG, click on the box, type the number, and hit the ENTER key (not the RETURN key).

Notice the buttons E, S, L, I, A, D on the side of the window



E brings up a dialog box that lets you rescale the range of the wave within the window.

Min	Current Range	Max	Flip Within Current Range	
10		154.023	-> [-1, 1]	-> [0, 1]

Min	Set New Range	Max	Scale By:	Add Offset:
10		154.023	1	0

S saves the contents of the window to a wavetable file.

L loads a saved wavetable file.

I imports the first 2048 samples of the first (left) channel of (almost) any audio file into the wavetable. A multitude of formats are supported, including AIFF, WAV, SD2, and Sun (.au).

A rescales the visible range of the window so that the wavetable is centered.

D resets the contents of the wavetable to its factory-supplied default.

EXPLANATION OF THE WINDOWS

fundFreq - The fundamental frequency of the pulsar train. Below 18 Hz it is a rhythm. Between 18 and 30 Hz it is a fluttering sound. Above about 30 Hz it fuses into an audio tone. The fundamental frequency is proportional to the rate of pulsar emission. If all three formants are ON, a fundamental frequency of 1000 Hz means that PG is scheduling and generating 3000 pulsars per second. When the rate of pulsar emission exceeds 3000 pulsars/second, PG is consuming a significant percentage of the CPU. You can see this in the meter at the top of the screen when PG runs:

CPU: peak: 92.1% avg: 68.3%

Obviously, this is less of a problem on a new fast machine.

Note that separate maximum fundfreqs can be set for 1, 2 and 3 pulsar trains for overload protection. See the Lib Menu / Preferences window.

formFreqN - This is the center of a formant frequency, which is independent of the fundamental frequency. In general, the formant is higher than the fundamental, but it can cross down below it to implement *pulsar-width modulation* (pulWM). The value of formFreq has no effect on CPU use.

pulseMask - This is a probability function ranging from 0 to 1. If its value is a constant 0, no pulsars are emitted. If its value is 1 (the default), a synchronous train of pulsars is emitted. When it is in the range 0.9 and 0.8, it causes an analog-like intermittancy, as if there were a loose connection.

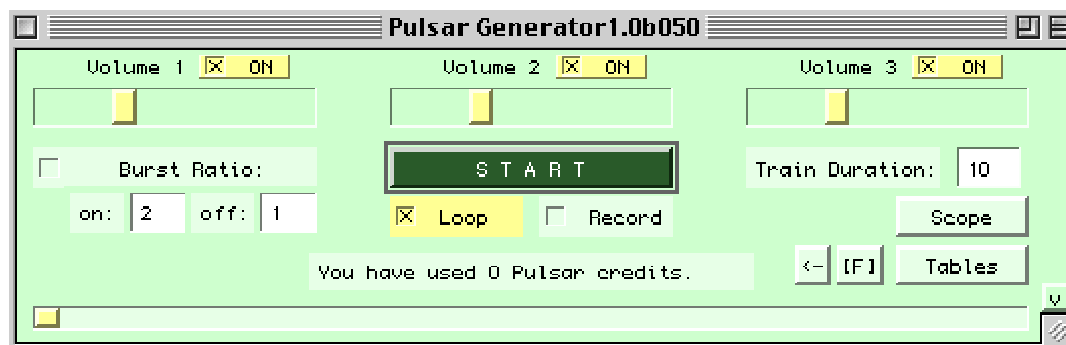
pulsaret - This is the pulsar waveform. You can draw it, fill it using the Fill menu, or import a sample with the I (import) button on the right.

pulsEnv - This is the envelope imposed on the pulsaret. When it is rectangular (all 1) the pulsaret waveform is unmodified. This results in a broadband signal. An envelope such as a Gaussian bell-shaped curve (see Fill/Grain Envelope) reduces the bandwidth of the formant.

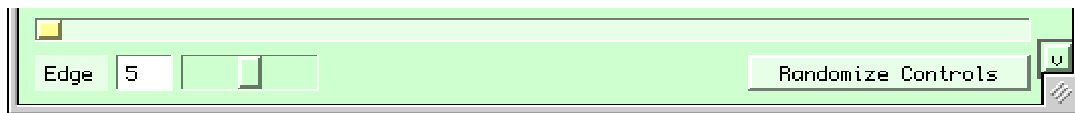
panN - This is the spatial panning curve for formFreqN over the duration of the pulsar train. +1 means left, and -1 means right. Fill it with a sine wave for a back-and-forth motion.

ampN - This is the amplitude curve for formFreqN over the duration of the pulsar train.

Control panel - Lets you START and STOP the playing of a pulsar train. Set the duration of the pulsar train in the number box "Train Duration" on the right. The Loop button causes the train to repeat. Click on the Record button to record a train to a sound file. PG records all your real-time interactions. The recorded file goes into the PG folder under the name "PulsarGenRec." If you record more than one, it automatically numbers them. Each formant has an ON/OFF button and a Volume fader. You can enable burst masking by clicking the Burst Ratio



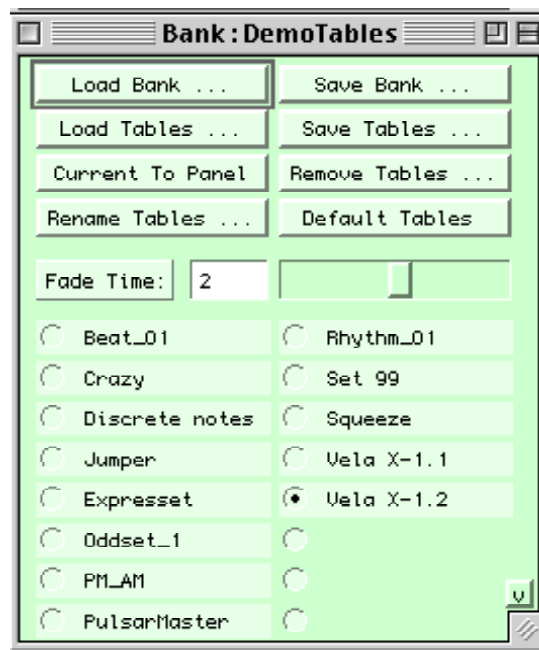
The Burst Ratio settings determine the ON/OFF pattern in the pulsar train. A burst ratio of 2:1, for example, generates a pattern like 110110110110110 etc., where 1 represents a pulsar and 0 represents a silent interval. The yellow slider (the *cyclebar*) at the bottom shows the time position within the train. The <- button reverses the playback direction. The [F] button freezes the time position. When the train is frozen, you can click on the cyclebar button and drag it back and forth in scrub mode playback. The Tables button causes the Tables Bank window to appear (see the description below). The Scope button causes the Scope window to appear (see the description below). Notice the small v button on the lower right. This opens up a small dashboard with an additional setting for the *edge factor*. The Edge controls change the way PG handles overlapping pulses. A high edge factor means that a new pulse cuts off the previous one very quickly, creating a harsher sound; a low edge factor makes the transition more gentle.



fundFreq - fundamental frequency of the pulsar train. The duration of the pulsar train is set in the Control panel.

Tables Bank - The fill PG interfaces shows 13 wavetables. This window lets you save and load wavetable sets. Going further, there are 16 slots for named wavetable sets. You can switch between different wavetable sets by clicking on them. PG fades from one set to another over the user-specified crossfade time.

Taken as a group, the 16 slots are called a *bank*. You can save all the wavetables in the slots as a bank and load them with a click of a button. For more details, see Lib/Help/Tables_Bank.



Scope - Lets you view the pulsars as they play.

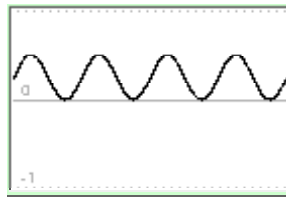
EDITING FEATURES

Alberto de Campo has implemented some innovative editing features in PulsarGenerator. The Shortcuts (Lib/Shortcuts) window lists these.

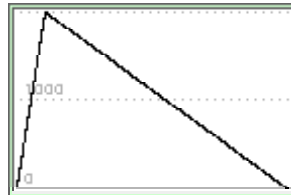
Shortcuts	
COMMAND-R : START SYNTH	IN WAVETABLE VIEWS:
Command-. : Stop Synth	To Begin Drawing :
	Command-click : straight line(s)
IN ANY WINDOW:	Option-click : exponential line(s)
Tab : next controller	Control-click : cosine line(s)
Shift-Tab : previous controller	To End Drawing: double-click
Command-\ : Send window to back	
	S : save wavetable (.wt) file
NUMBER BOXES/SLIDERS:	L : load wavetable (.wt) file
arrow up/right: increment	I : import soundfile
arrow down/left: decrement	D : Default wavetable
x : jump to maximum	s : open Scaling Window
n : jump to minimum	
n : jump to random value	EDITING:
	c : copy
NUMBER BOXES:	v : paste
type number, hit enter	V : scale to peak, then paste
click and drag up : increment	k : clip negative
click and drag down : decrement	m : mix with clipboard
	M : multiply with clipboard
SLIDERS:	n : normalize
Type <0-9> jumps to that value	0 / 1 : set entire table to 0 / 1
CHECKBOXES:	DISPLAY:
n or 0 : off, x or 1: on	+ : resize window to cycle bar
return : toggle	- : back to original window size
	* : maximize window
BUTTONS:	
return : repeat button action	a : scale view to default range
	shift-A : AutoScale view to range
CYCLEBAR:	arrow up: increase view range
f : freeze/unfreeze	arrow down: decrease view range

Besides the usual cut, copy, and paste, notice also and m and M functions. These functions let one impose the characteristics of one wavetable onto another wavetable. Specifically, m mixes the contents of the clipboard with whatever is already present in the window. M multiplies the contents of the clipboard by whatever is already present in the window. Moreover, in both cases, PG automatically scales the result to the range of the second window.

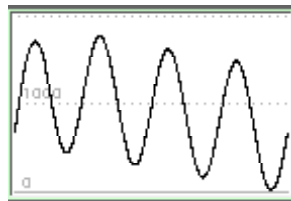
For example, we can take the contents of an amplitude envelope, between -1 and 1,



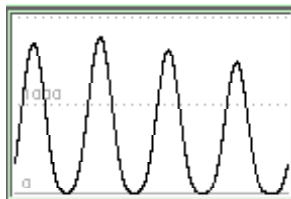
and apply it to a formant envelope in the range of 0 to 2000 Hz.



with the result of an m (mix) operation being:



or with the result of an M (multiply) operation being:



Notice that both results are scaled to the range of the second window, 0-2000 Hz.

If you want to do true add and multiply operations without range scaling, use option-m for true mix (addition) and option-shift-M for true multiply.

You can view the contents of the clipboard at any time by selecting Lib/Table Clipboard. You can also copy tables into new views for more complicated edits, and then paste them back into the currently active tables (with shift-C).

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