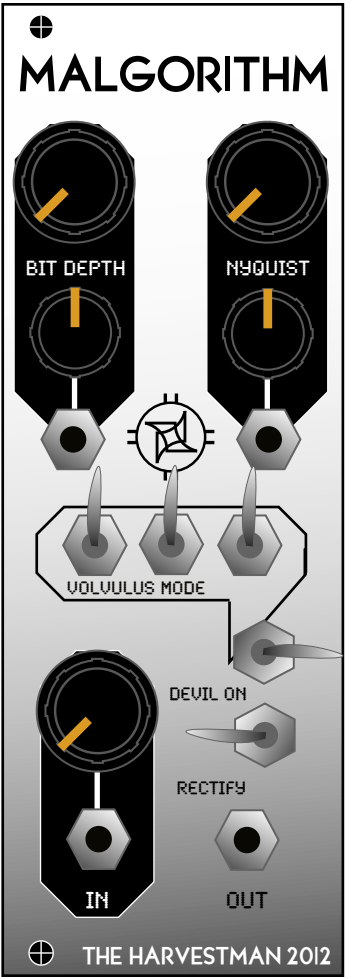
THE HARVESTMAN
DIGITAL AUDIO ELECTRONICS

MODEL 2012 "MALGORITHM"
OPERATOR'S MANUAL

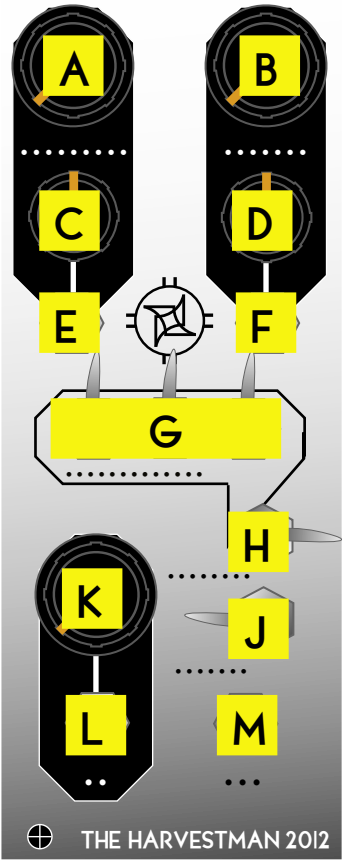
Voltage-controlled bit depth and sampling rate reduction.


MALGORITHM
BIT DEPTH
NYQUIST
VOLVULUS MODE
DEVIL ON
RECTIFY
IN
OUT
THE HARVESTMAN 2012

THE HARVESTMAN-2012
"MALGORITHM"
USER'S MANUAL

Table of Contents

MALGORITHM



A Manual bit depth control

Controls the degree of bit depth reduction, from eight bits to one. This control also acts as an offset for externally applied control voltages.

B Manual Nyquist frequency control

Controls the degree of sampling rate reduction, from 22kHz to 200 Hz. This control also acts as an offset for externally applied control voltages. Use this parameter when you feel that the frequency domain should be periodic.

C Bit depth CV attenuator

Controls the amount of control voltage applied to the Bit Depth parameter.

D Nyquist frequency CV attenuator

Controls the amount of control voltage applied to the Nyquist parameter.

E Bit depth CV input

Accepts a voltage between 0 and 5 volts for control of the Bit Depth parameter. Larger control voltage ranges, as well as bipolar signals, can be managed by using the CV attenuator and offset controls.

F Nyquist frequency CV input

Accepts a voltage between 0 and 5 volts for control of the Nyquist parameter. Larger control voltage ranges, as well as bipolar signals, can be managed by using the CV attenuator and offset controls.

G Volvulus mode selector

The configuration of these three switches determines the transfer function when the "Devil On" switch is enabled. Eight combinations are possible, with a detailed explanation available on Page 7.

H "Devil On" waveshaper enable switch

This switch enables the bitwise waveshaper, introducing nonlinearities of unmatched recklessness.

J Rectification toggle switch

This effect can be thought of as taking the "absolute value" of a bipolar signal. It can operate independently of the bitwise waveshaper.

K Input attenuator

This control moderates the amount of audio signal presented to the Malgorithm. Note that the amplifier circuit has some gain, so clipping will take place if hot signals are used with little attenuation.

L Audio input

Insert your signal here. A maximum amplitude of 10vpp is possible before clipping.

M Audio output

The results of the Malgorithm's process can be retrieved here.

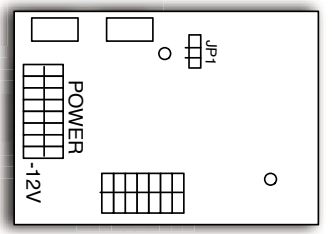
Introduction

The Malgorithm is a modular bit depth and sample rate reduction processor, colloquially known as a "bitcrusher". These processes offer time- and amplitude-domain quantization of an incoming audio signal, with the optional addition of a bitwise waveshaping stage. Malgorithm offers voltage control of each dimension of quantization for maximum modular utility. This device was designed to maximize control of a non-ideal digital audio processor, for creative applications of nonlinearity, discontinuity, aliasing, and quantization. This module is also used to bring external signals into aesthetic compliance with the Harvestman system.

Configuration

The Malgorithm occupies 9HP of rack space and requires a "Eurorack"-style power distribution board. When connecting the power cable to your enclosure, orient the red band of the module's power cable to point towards the -12V power rail. If you experience difficulty with the module's odd front panel measurement, you may solve this by adding another odd-measured Harvestman module to the system.

The Harvestman modules, due to heavy use of digital circuitry, could benefit from the use of a dedicated 5V power supply. If you have such a supply available on your power bus, move the power jumper on the circuit board TOWARDS the edge of the board. All modules are set by default to use the onboard voltage regulator (jumper setting AWAY from the edge of the board.)



* Removal of motherboard from module assembly is NOT recommended unless a jumper change is necessary.

Waveshaper Modes

The bitwise waveshaper introduces eight arbitrary flavors of unnecessarily destructive nonlinear signal processing. Three classes of transfer functions exist.

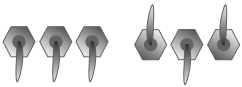
I. Conditional bitwise operations

These operations recontextualize sampled data depending on a bitwise examination of its numerical value. The modified data bits may not be the same as the ones tested. You can obtain predictable spectral evolutions using this class of functions, especially if you make use of the audio input attenuator (or an external VCA.)

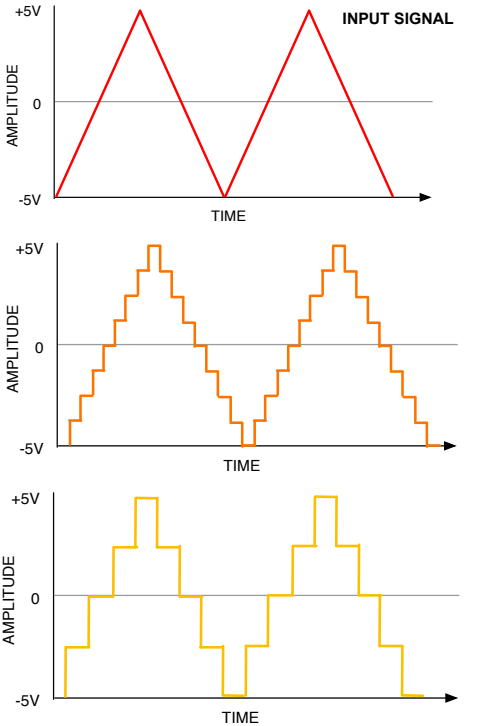
II. Single-sample delays

These three functions operate on past generations of sampled data applied to the output sample, with a high degree of timbral transgression that may not resemble the input signal very much at all. Under the proper conditions with no input signal, these three settings may oscillate at a multiple of the Nyquist frequency. By controlling that parameter, you obtain the bonus functionality of a simple voltage-controlled tone generator. Use the Nyquist parameter to choke the upper frequency limit in order to avoid listening fatigue.

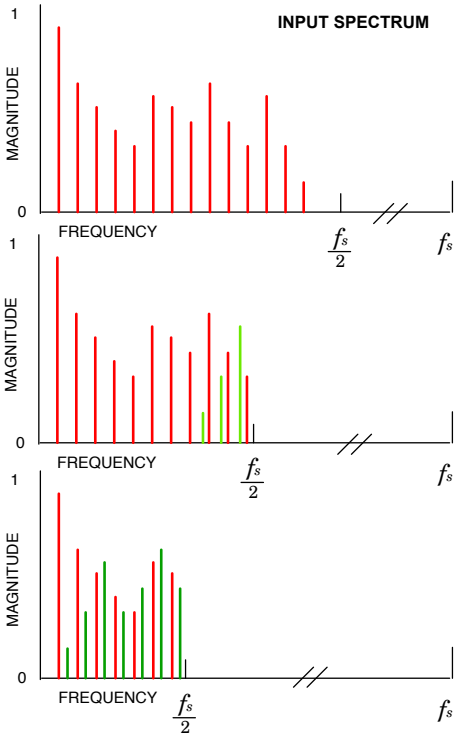
III. Miscellaneous



The first of these functions operates in a similar way as Class I, with additional amplitude-domain quantization. The second introduces some discontinuous "grit" into the signal, useful for simulating defective interconnections or decoding errors.



Bit depth reduction will reduce the number of discrete values used to represent an audio signal when converted to the digital domain. For example, an 8-bit signal has a maximum of 256 values, 7 bits having 128 possible values, and so on. Lower bit depths introduce a greater degree of quantization noise into the signal, alongside a severely reduced dynamic range. At the most extreme setting, 1 bit, there are only two possible states for audio output, essentially "squaring off" any signal presented to the Malgorithm.



Sampling rate reduction governs the upper limit of frequency components that can be accurately represented by the audio system. The "Nyquist Frequency", or one-half the sampling rate, is this upper limit. Any spectral components present in the signal that are above the Nyquist frequency are "reflected" backwards into the audible signal as a result of aliasing: a low sampling rate cannot accurately record higher frequency components, so the reduced data that is captured by the system instead corresponds to an "alias" of lower frequency. Use this parameter when you feel that the frequency domain should be periodic.

Calibration

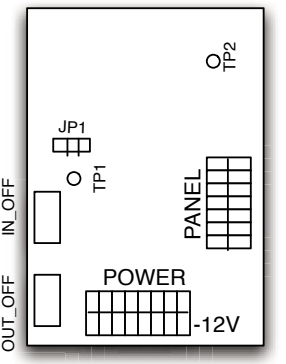
Patch a 10vpp triangle wave to the audio input, and adjust attenuator to 12:00, and all other controls to zero

.

Probe TP1 while adjusting IN_OFF so that the signal is symmetrical around 2.5V. Adjust input attenuator to verify clipping near 0V and 5V.

Probe the audio output while adjusting OUT_OFF so that signal is symmetrical around 0V.

Probe TP2 with a frequency counter to reveal the current sampling rate.



* Don't play with the trimmers or disassemble the module unless you absolutely have to. The guardian will eat you for breakfast if you disturb his beauty sleep.

Warranty

Repairs resulting from a defect of the device or its construction process shall be covered for two years after manufacture, with customer paying transit costs to The Harvestman.

Device dysfunction resulting from incorrect power supply voltages, backwards power cable connection, attempted reverse-engineering or decoding of intellectual property, abusive performance, fluid encroachment, or out-of-specification voltage input is not covered by this warranty, and normal service rates will apply.

The Harvestman implies and accepts no responsibility for undesirable harm to person or apparatus caused through operation of this device.

Get in contact!

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