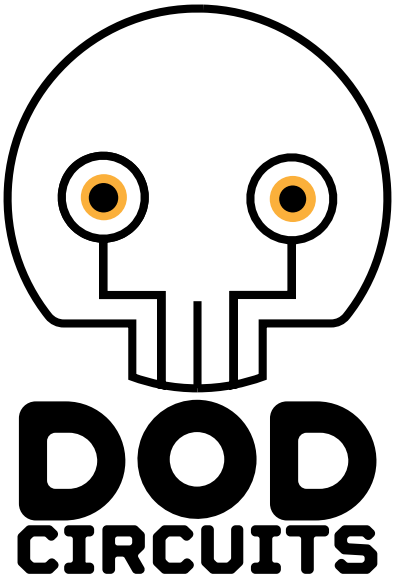
BT110

User Manual



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History

Bytebeat music (or one-line music) was invented in September 2011. Simple Bytebeats are often a rhythmic and somewhat melodic piece of music without any score, instruments, or real oscillators.

How does it work?

The computer program generates audio using a well-known digital technique.

PCM (Pulse Code Modulation). This consists of representing an analog signal from defined values over intervals.

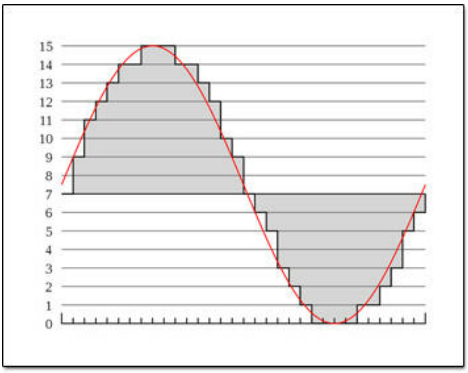


Figure 1: PCM

This computer program is a loop that generates values based on time. These values, when read at a very high speed, create a melody or sound.

Quantifying an analog signal in PCM

In general, the program solves the function in each loop iteration and sends the results (encoded in 8-bit, one byte) to an audio output at a speed of 8KHz (8000 results per second for classic bytebeat). The program is a function with a variable represented by t, which is time.

Time (thus t) increments infinitely, but since the result is encoded in 8-bit, it cannot exceed the maximum value of

$$255 (2^8 = 256)$$

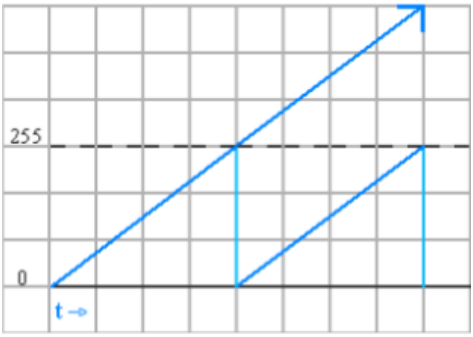


Figure 2: The formula t

When it reaches its maximum value, the result resets to zero. The simplest function of bytebeat is “t.”

How Bytebeat synthesis creates sound

This generated wave will have a frequency such that

$$f = \left(\frac{1}{256 * T_s} \right)$$

when the sampling frequency is 8KHz.

Controls

EDITOR

Editor Mode MODE + 1

The editor screen consists of two distinct parts: The status bar (at the top), and the input area where the user edits a formula.

Editing and navigation are done using controls A and B and the numbered keys. A PS2 keyboard can be used.

The status bar shows the different modes and menus the user is in.

The editor can compile C-compatible bytebeat formulas.

Formula ID: indicates the formula's location in the BT110 memory.

Symbol menu: Indicates what type of symbol will be inserted into the formula

- Operators +, -, *, …
- Numbers 1, 2, 3, …
- Functions rand(), …
- Variables t, a, b, c
- Punctuation (,), ‘,’

Playback mode: Live mode allows listening to real-time formula modifications, while hold mode locks the formula without hearing the changes.

Chaos mode: allows changing all characters of the same type at the same time.

Compilation status: Informs about the formula's syntax correctness. A formula with incorrect mathematical/computational syntax will not produce sound.

- GENERAL
  - Show saved formulas menu — MODE + 1 held
  - Save the formula — FUNC + 1
  - Enable/Disable chaos mode — FUNC + 3
  - Enable/Disable live/hold mode — FUNC + MODE
  - Switch to the editor screen — MODE + 4
  - Switch to editor controls screen — MODE + 1
  - Enable/Disable MIDI — MODE + 1
- LIVE MODE / HOLD MODE
  - NAVIGATION
    - Move left — 4
    - Move right — 6
    - Move left or right — A
  - EDITING
    - Reset t to zero — 1
    - Next symbol — 2
    - Previous symbol — 5
    - Next or previous symbol — B
    - Delete a character — 3
    - Delete the formula — 3 held
    - Insert right parenthesis — FUNC + 6
    - Insert left parenthesis — FUNC + 4
    - Insert space — FUNC + 5
    - Insert “t” — FUNC + 2
    - Previous symbol type — A Click
    - Next symbol type — B Click
- CHAOS MODE
  - Change all operators in the formula — 1/4/6
  - Change all numbers in the formula — 2/3/5
  - Insert a random formula of the type “operator (t operator number) — FUNC + 4

- CONTROLS
  - (MIDI enabled) tStart 1
    - tStart is the initial value of t when a MIDI note is received
  - globop 2
    - the globop is an operator coupled with a value applied to each occurrence of t
  - tInc 3
    - tInc is the increment value of t. It can be positive or negative
  - presc 4
    - The prescaler slows down the frequency of the produced sound.
  - tempo 5
    - The tempo affects the special variable tt and adapts its increment to a BPM.
  - varinc 6
    - Varinc affects the increment of the three special variables a, b, c placed in the formula.

SAMPLER

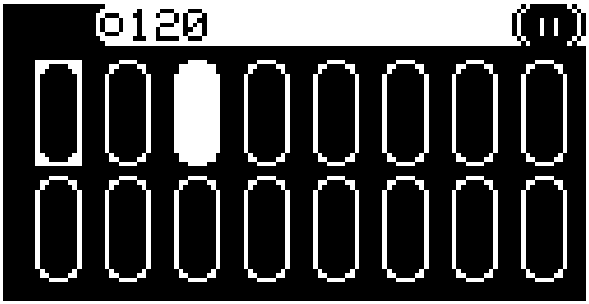
Sampler Mode (Editor) MODE + 2

The sampler allows looping a recording of a formula. The sample can be played backward, at different speeds, and trimmed.

- TRIM MODE 1
  - Trim/expand the sample from the left A
  - Trim/expand the sample from the right B
- POSITION MODE 2
  - Move the sample left/right A
  - Trim/expand the sample B
- SPEED MODE 3
  - Increase/decrease the sample playback speed A
  - Toggle between normal/reversed playback B

SEQUENCER

Sequencer Mode MODE + 3

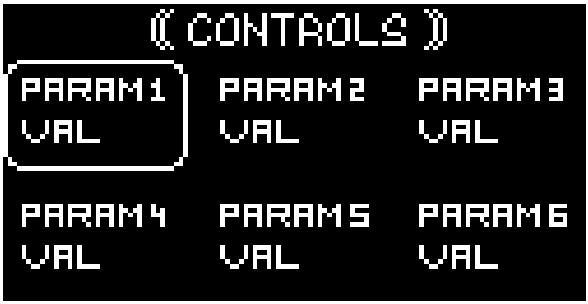


This mode allows playing sequences of 16 steps. Each step can load a formula from static or saved formulas.

- PLAY 1
- PAUSE 3
- STOP DOUBLE 3
- Move the cursor 4/6
- Quick replacement. Select a formula from static/saved memory FUNC + 2/5
- Quick replacement. Toggle between static/saved formulas FUNC + MODE

CONTROLS

Controls Mode MODE + 4

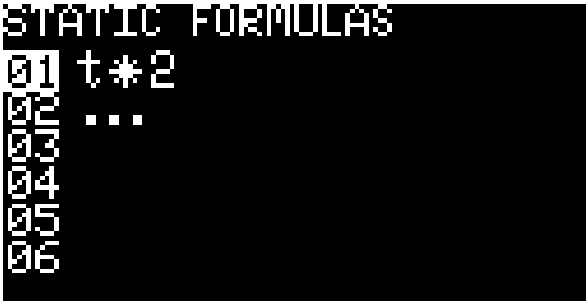


Controls are specific to each mode of the BT110.

- Select one of the controls 1/2/3/4/5/6
- Increase/decrease the control value A/B
- Reset the selected control FUNC

FORMULAS

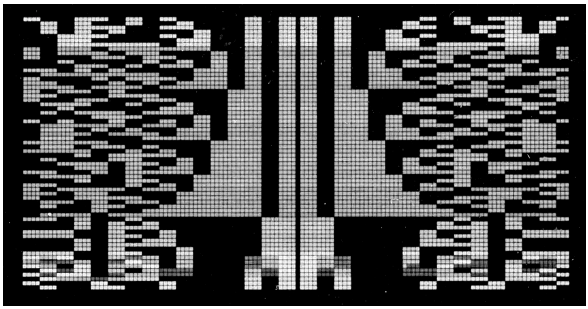
Formulas Mode (Editor) MODE + 1 (held)



- Toggle between static/saved formulas 4/6
- Move the cursor down 5
- Move the cursor up 2
- Load the selected formula into the editor 1
- Close the saved formulas menu 3
- Preview the selected formula MODE

VISUALIZER

Visualizer Mode MODE + 5



It is possible to display a visual result of your ByteBeat synthesis and switch between different modes.

- Previous visualizer 5
- Next visualizer 2

CONFIGURATION

Configuration Mode DOUBLE MODE

This mode allows you to modify the general configuration of the device.

- midiChannel — Allows modification of the MIDI input channel to listen to.
- autosave — Enables/disables the automatic saving of the current formula in the editor.
- keyboard — Allows modification of the default keymap for the PS2 keyboard.
- about — Displays a QRCode that points to the dodcircuits website.

MIDI

The various parameters of the BT110 are controllable using MIDI CC.

Editor

Parameter	Description	CC	CC Min	CC Max
t increment	modifies how much the increment of T changes	22	−16	16
reset t	resets the value of t to 0	24	0	1

Sampler

Parameter	Description	CC	CC Min	CC Max
sample start	modifies the starting point of the sample	30	0	127
sample end	modifies the ending point of the sample	31	0	127
sample position	modifies both the starting and ending points of the sample simultaneously	32	0	127

Audio

Parameter	Description	CC	CC Min	CC Max
prescaler	modifies the speed of audio generation	40	0	127
top pwm	modifies the top wrap of the PWM	41	0	127
pwm frequency	modifies the PWM frequency	41	0	127
Other				
panic	resets all MIDI parameters	70	0	127

HAPPY DISCOVERING!

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