SONICCHARGE

BitSpeek

version 1.7

nuedge DEVELOPMENT

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Introduction

I N T R O D U C T I O N

Bitspeek is a real-time pitch-excited linear prediction codec effect. Right now, you are probably thinking, “oh, another one of those”? Or perhaps not. Chances are that you have never heard about “linear prediction”, although most of us use it daily when we talk on our cell phones. Linear prediction coding is a voice compression technology that appeared in commercial products in the seventies and was implemented in some well-known speaking toys of the early eighties.

We have applied this technology to create a VST®/AU effect plug-in that analyzes audio, extracts parameters like pitch, volume, and formant data, and then resynthesizes the audio using a simple oscillator, noise, and filter architecture.

Ever heard the robotic voice in Microtonic that reminds you to purchase? That is an example of what Bitspeek can sound like. But there is more to it. We have added playback parameters that adjust the pitch and tonal quality of the sound, as well as support for MIDI and a beat-synchronized “formant freezing effect”. Despite having only a few simple controls, this box can produce a broad range of sounds, from cheap speaking toys to high-end vocoder and talkbox effects.

/ Magnus Lidström

User Interface

Main Menu

The “Main Menu” button *(top left corner of the display)* contains functions to undo/redo the last operation, copy and paste patches, and zoom the interface, amongst other things.

> **TIP** You can shift-click the main menu button to repeat the last chosen menu. It is handy for things like quickly performing multiple undo/redo.

Rate *(kHz)*

The Rate choice affects several internal parameters in the DSP algorithms and changing the Rate changes the sound dramatically. **Bitspeek** always performs its calculations at the chosen sample rate, regardless of the sample rate setting in the host.

Frame Rate

The audio signal is analyzed and processed in blocks called “frames”. **Bitspeek** estimates the incoming audio’s pitch, volume, formants, and voice/noise balance for each frame. The analysis is performed less frequently when lowering the frame rate, achieving a cheaper toy-like sound. You can also “freeze” the audio by dragging Frame Rate down to 0.

Sync

Enable Sync to make **Bitspeek** “freeze” frames in sync with the tempo of your music. When Sync is enabled, the Frame Rate slider lets you select various time-synchronized rates *(1/8, 1/16, etc.)* instead of a frequency.

MIDI

Enable MIDI to control the pitch and envelope of the effect via MIDI. You need a host capable of transmitting MIDI to effect plug-ins to use this feature. Please read the documentation for your host for information on how to set it up. When enabled, Bitspeek will only play when it receives MIDI and transpose the pitch according to the MIDI notes it receives. Turn down the Tracking parameter to zero to achieve a vocoder / auto-tune-like sound. If you set the Frame Rate to zero *(with Sync disabled)*, Bitspeek will "freeze" the formants on the MIDI note-on, allowing you to create interesting "stroboscopic" audio effects. Finally, Bitspeek supports Pitch Wheel messages *(one octave up and down)*, and the MIDI Sustain Pedal can also be used to "freeze" frames while playing.

Pitch

You can transpose the outgoing audio by -36 to +36 semitones *(-3 to +3 octaves)*. Hold down the shift key while turning the knob to make finer adjustments down to a single cent in precision.

Tracking

Determines how the source signal pitch affects the synthesized audio, from 0% to 200%. At 0%, the pitch will stay fixed and produce a robotic vocoder-like quality. At 100%, the processed audio will follow the original audio pitch intonation as precisely as possible.

> **NOTE** Sometimes, the tracking detects the wrong octave, especially on source material with an extremely low pitch.

Detune

A second oscillator can be used to achieve a fat detuned sound or for chord-like effects. The second oscillator is transposed from the first by +0 to +1200 cents, representing a range of up to one octave.

Noise

This parameter adjusts the balance of "voiced" vs. "voiceless" sound. At the default setting +/- 0%, Bitspeek attempts to follow the source signal so that "voiced" sounds *(like vowels)* produce distinct tones while "voiceless" sounds *(such as consonants)* produce noise. Turning Noise down to -100% will remove all noise from the output audio. By turning Noise up to +100%, the output audio will consist only of filtered noise *(sounding like a loud whisper)*.

Mix

A simple dry/wet mix control. The dry signal is "latency compensated" to be in phase with the wet signal.

Legacy Mode

Version 1.5 of Bitspeek features a vastly improved volume tracking algorithm and introduces support for stereophonic processing. For compatibility reasons, you can turn these new algorithms on and off by clicking the LEGACY MODE text in the top right corner of Bitspeek's display.

> **NOTE** The improvements in version 1.5 are most apparent on noisy material with sharp transients, like drums.

Bitspeek Versus Vocoders

Vocoder is short for “voice encoder”, which technically means any device capable of breaking down a voice signal into a set of parameters from which you can reconstruct the voice intelligibly. With this terminology, **Bitspeek** may be called an “LPC vocoder”. *(LPC is short for “linear prediction coding”*.)

However, in musical contexts, the vocoder we all know is a device consisting of a filter bank controlled by a modulation source *(e.g., speech)*. This filter bank is fed with an arbitrary carrier signal *(typically from a synthesizer)* played independently of the modulation source.

This method is very different from how **Bitspeek** works. In **Bitspeek**, a built-in synthesizer tracks and follows its input’s fundamental frequency, volume, and noise level. The synthesized tone is passed into a formant filter that is not implemented as a bank of bandpass filters like in conventional vocoders. Instead, the analysis is divided into time frames *(typically around 10ms each)*. For each frame, the algorithm quickly constructs a resonant filter that closely represents the formants of the input.

In other words, whereas conventional vocoders work with several bandpass filters at stationary frequencies, **Bitspeek** creates animated filters whose peaks are precisely positioned in the spectrum. On the other hand, the signal is chopped up in discrete time frames, whereas filter bank vocoders vary formants smoothly over time.

Using Bitspeek in your Host

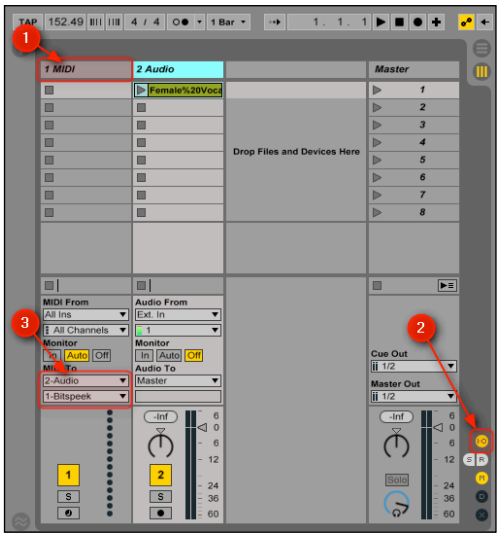
When not running in “Legacy Mode”, **Bitspeek** works with stereophonic sound. It analyzes the stereo image of the source signal and extracts two parameters: panning and stereo width *(corresponding to the amplitude balance and the correlation of left and right signals)*. **Bitspeek** will then attempt to mimic the stereo image with the built-in synthesizer.

The oscillator is only monophonic *(but panned), whereas* the noise is stereophonic and copies the stereo width from the source. This solution opens up some interesting pseudo-reverb effects.

Bitspeek requires “lookahead” and adds a latency of around 13 ms. Most modern hosts compensate for this latency during playback.

Playing the pitch of **Bitspeek** with MIDI notes is great fun, and most hosts support routing of MIDI effects. Here are a few quick instructions on how to set things up in some popular hosts. In all examples, MIDI is set to “On” and Tracking to 0% in the **Bitspeek** interface.

Ableton Live



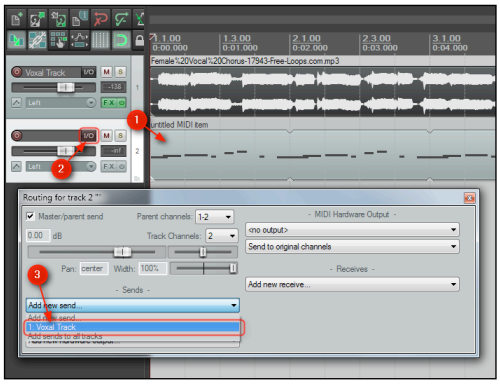
(Add Bitspeek to the effect chain on an audio or instrument track. Then turn the MIDI switch to "On" and Tracking down to 0% in the Bitspeek interface.)

1. Create a MIDI track.
2. Bring up the I-O parameters if they are hidden.
3. Assign "MIDI To" to the audio track that contains **Bitspeek** and make sure "MIDI To" is assigned to the **Bitspeek** effect and nothing else.

Apple Logic Pro X

1. Create a new instrument track.
2. Click the "Plug-In" button and select **Bitspeek** under MIDI-controlled Effects. *(Turn the MIDI switch "On" in Bitspeek and turn down Tracking to 0%.)*
3. Select your audio track from the Side Chain menu in the top right corner of the plug-in window.
4. You can mute the audio track output since it is already passing through the instrument track.

Cockos Reaper



(Add Bitspeek to the effect chain on an audio or instrument track. Then turn the MIDI switch to "On" and Tracking down to 0% in the Bitspeek interface.)

1. Insert a new track and then add a "New MIDI item".
2. Click the "I/O" button for the MIDI track.
3. In the Routing window, choose "Add new send…" and select the track with the **Bitspeek** effect you wish to control.

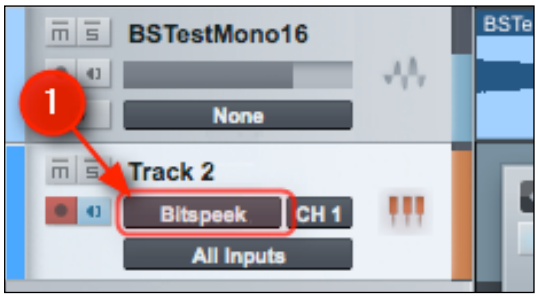
Steinberg Cubase

(Add Bitspeek to the effect chain on an audio or instrument track. Then turn the MIDI switch to "On" and Tracking down to 0% in the Bitspeek interface.)

1. Create a new MIDI track.
2. Select **Bitspeek** as the MIDI destination for the new track.

PreSonus Studio One

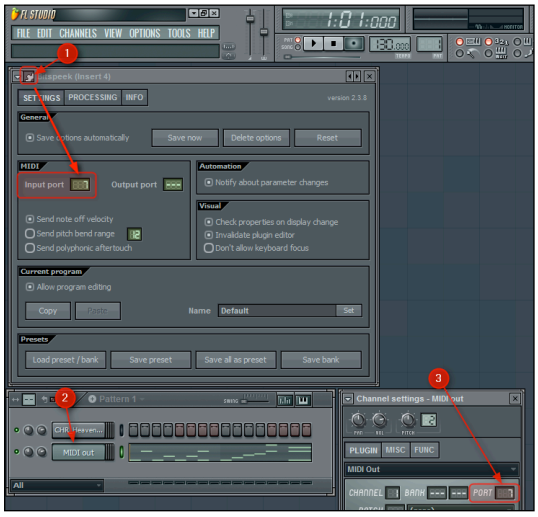
(Add Bitspeek to the effect chain on an audio or instrument track. Then turn the MIDI switch to "On" and Tracking down to 0% in the Bitspeek interface.)



1. Add an Instrument track and select **Bitspeek** as the destination for the new track.

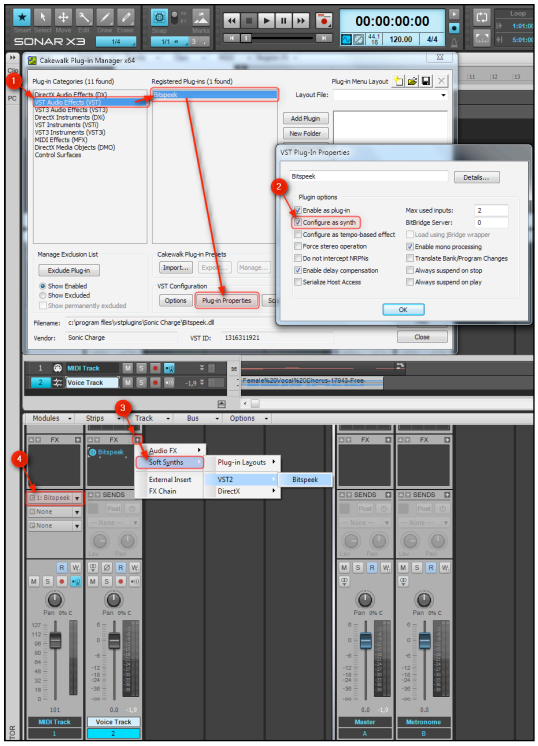
Image-Line FL Studio

(Add Bitspeek to the effect chain on an audio or instrument track. Then turn the MIDI switch to "On" and Tracking down to 0% in the Bitspeek interface.)



1. Select a free input port under the MIDI section in the plug-in settings.
2. Add a "MIDI Out" channel.
3. Select the same port number in the channel setting as you did for **Bitspeek**.

Cakewalk



1. Enter the Cakewalk Plug-in Manager, select **Bitspeek**, and click "Plug-in Properties".
2. Turn on "Configure as synth" and click OK. **Bitspeek** should now show up under VST Instruments.
3. Insert **Bitspeek** in the FX chain as a "Soft Synth" instead of an "Audio FX". *(Turn the MIDI switch "On" in Bitspeek and turn down Tracking to 0%.)*
4. Insert a MIDI track and select **Bitspeek** as output for the new track.

Requirements

The minimum requirements for installing and running Bitspeek are:

- Microsoft Windows 7
  A host that supports 64-bit VST 2.4, or VST3 plug-ins
- macOS High Sierra (10.13)
  A host that supports 64-bit VST 2.4, VST3, or AudioUnit 2 plug-ins

Change History

Version 1.7 *(2022-11-07)*

- VST3 support.
- Increased resolution of graphic resources.
- Support for MIDI controller mapping.
- Supports program switching with MIDI Program Change messages or MIDI notes.
- Added “Main Menu” button.
- *(Windows)* Deprecated 32-bit support.
- Bug and compatibility fixes.

Version 1.6.2 *(2022-02-16)*

- *(Mac)* Native support for Apple Silicon.
- Bug fixes, “under the hood” maintenance, and improvements.

Version 1.6.1 *(2020-08-24)*

- Added support for time-limited licensing.
- Made a workaround to handle a rare Windows problem generating a unique machine-id.

Version 1.6 *(2020-03-04)*

- Scalable GUI and retina support.
- New algorithm for the “system unique identifier” used for authorization. Hopefully fixing the problem where the plug-in became unregistered spontaneously.
- *(Mac)* Solved a compatibility problem with DAWs that are built with recent Apple SDKs, e.g., Cubase 10.5.
- *(Mac)* Notarized installer for Catalina.
- *(Mac)* New 64-bit compatible uninstaller.
- *(Mac)* 64-bit Audio Unit no longer depends on the “Component Manager”. This means you should not need to restart after installation.

- *(Mac)* Preferences and registration data are now shared with “sandboxed” DAWs like GarageBand *(meaning Authenticator works with these DAWs too)*.
- *(Mac)* Fixed a problem where under certain conditions, the preferences data could stay locked if the DAW crashed, requiring a full system restart.
- Lots of other minor bugs and compatibility fixes.

Version 1.5 *(2014-12-16)*

- Vastly improved volume tracking algorithm *(old patches open with legacy mode enabled for backward compatibility)*.
- Stereophonic processing.
- Dry/wet mix knob.
- New skin.
- Rebuilt GUI from scratch using our latest in-house framework *(giving you features like undo/redo, copy/paste, and more)*.
- Right-click context-menu on knobs and sliders to set exact values with text.
- Recalls last used program(s) when creating a new instance.
- Changed trial to be fully functional for three weeks instead of having regular audio dropouts.
- Supports Sonic Charge Authenticator for easier registration.
- Many minor bug fixes.

Version 1.0.2 *(2011-10-07)*

- 64-bit support.
- Changed to stereo I/O configuration (although the effect is monophonic)
- Improved compatibility with older VST 2.3 hosts and wrappers.
- Many other minor compatibility improvements.

Version 1.0.1 (2011-01-01)

- Solved a problem that prevented registration from working if you had not installed MicroTonic or Synplant before Bitspeek.

Credits and Contacts

Sonic Charge Bitspeek v1.0 - v1.7 *(2011 - 2022)*

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