

Ether VST Plug-in

User Guide

Introduction

This user guide describes the *Ether* VST plug-in for PC. Information on how to install and run the plug-in and a description of what it does are all included in this document.

The Process

Ether is a ‘spectral compositing tool’ conceived and described by Christopher Penrose in his paper “Extending Musical Mixing: Adaptive Composite Signal Processing”. This plug-in offers *Ether* in a real-time processing environment (i.e. any program you have on your PC that can host VST 2.0 specification plug-ins) with some additional controls.

Spectral compositing uses short-time Fourier analysis and resynthesis to combine two sounds according to their spectral content. The ‘spectral content’ of a sound here is considered to be the magnitude and phase of a sound in different frequency bands and how they vary over time. *Ether* analyses two incoming sounds and, for each frequency band, places the magnitude and/or phase of the sound with the highest magnitude in that band into the same frequency band for the combined output sound. If both magnitude and phase are selected to be composited *Ether* works as a mixing tool which adaptively equalises the two sounds to be combined and the effects can be subtle. If only one of magnitude or phase are selected to be composited the effect is similar to that of a vocoder where some timbral characteristics of one sound are imposed onto those of another sound.

If the last paragraph made sense, great! If not you have two options. The first is to go and read a good book (or article) on spectral processing (see the list later on this guide) and then read Christopher Penrose’s paper. The second is to install the plug-in now, experiment and hear what it does.

Installation

This plug-in uses the Intel Signal Processing library (SPL) to perform parts of the algorithm (such as the Fast Fourier Transform). This means that, on Intel processors, the algorithm is extremely efficient (faster than the Fastest Fourier Transform in the West for those who know what that is!). The plug-in will run on other Intel architecture processors (such as AMD) but is not optimised for these. The Intel SPL is rather clever in that it detects the type of processor (PI, PII, PIII or PIV) in your computer and loads program code which will give the best performance for that processor.

In order for this plug-in to run you must have additional Intel .dll files to detect and load the right code for your processor. All of the .dll files included with this installation (i.e. in the zipped archive you downloaded) except for Ether.dll should be copied to your windows\system folder (which is usually on drive C:\). Ether.dll should be copied to the folder specified in the instructions for your VST host

program. For example if you are using Steinberg Cubase VST then Ether.dll should be copied to this directory: C:\Program Files\Steinberg\Vstplugins

Once all the .dll files have been copied then you are ready to begin using the plug-in in your host application!

How to use

This plug-in can only be used as an 'insert' style effect in a stereo signal path (track or buss). If it is used as a 'send & return' type effect it will not output any audio. For information on how to use insert effects in your host application see its user manual.

This plug-in must be used in a stereo signal path as it uses the left input for signal 1 and the right input for signal 2. The output is in mono (left and right outputs are identical). The plug-in takes two signals and combines them into one mono signal. Unfortunately, although 'side-chaining' has been an essential part of studio techniques for decades (used in keyed gating, de-essing etc.), it is not catered for in the Steinberg VST specification. This means that processes which combine two signals in some way (e.g. vocoders, side-chain compressors etc.) cannot be used as easily as they could be. In Cubase VST we have to treat the two separate signals as the left and right channels of a stereo signal. At the time of writing this document Emagic Logic 5.0 has just been released which offers side-chaining however until I am able to test this version I do not if (or how) this side-chaining will work with VST plug-ins. A quick (-ish) way of combining the output of two mono soundfiles is as follows: Place one soundfile on Track 1 of your host application (e.g. Cubase) and the second soundfile on Track 2. Pan track 1 hard left and track 2 hard right and send these to a buss. Insert the plug-in across that buss – track 1 will be treated as signal 1, track 2 as signal 2 and the combined sound will be output on both sides of this buss. Otherwise use a stereo track and combine the two soundfiles beforehand.



Screenshot: Ether v1.0 (in Emagic Logic Audio 4.7)

The plug-in offers six user adjustable parameters, which can be altered whilst the audio is playing, described below:

Cross: This controls the weighting applied to each input signal. When 'Composite' is set to 'Both' it acts as a crossfader between the two sounds.

Window Size: This is the length (in samples) of the ‘analysis’ and ‘resynthesis’ windows applied to the audio. The longer the window, the finer the frequency precision but the lower the time resolution and vice versa. This can be adjusted in steps of 4 samples. Very small values (less than 64) will place a very heavy burden on your processor. Optimum values for performance are when the window size is a power of 2 between 128 and 4096.

Mag Sense: As explained on page 1 of this guide, this process works by measuring the magnitude of each signal in each band and placing the greatest magnitude signal for each band in the corresponding band of the output signal. This control can invert this relationship so that the signal with the *lowest* magnitude in a particular band is used for that band of the output signal. This control has two settings: Normal and Invert.

Composite: This allows the user to select what aspects of the sounds are used in the composite (output) signal: Magnitude, Phase or Both. When ‘Phase’ is selected the magnitude information for every band of signal 1 is copied into the composite signal, when ‘Magnitude’ is selected the phase information for every band of signal 1 is copied into the composite signal. This means that it is important which sound is on which side of the insert – I’ll add a left\right swap button to get round this easily in the near future.

Window Type: This allows the user to choose between five different shapes of analysis window (Hann, Hamming, Kaiser, Bartlett or Blackman). Analysis windows are used to prevent parts of the signal spectrum ‘contaminating’ others. Unfortunately none are perfect and this selection offer a varying trade-off between main lobe width and highest side band level. For a more detailed discussion see the papers by Harris and Nuttall cited below. Otherwise use your ears.

Alpha: The shape of two of the windows offered (Kaiser and Blackman) can be varied by the use of a variable commonly referred to in the literature as ‘alpha’ (hence its use here). For the Blackman window this can be varied between 0.0 and 1.0 and between 0.0 and 0.001 for the Kaiser windows. It is hoped that a future version of this plug-in will offer a more meaningful interaction with this value. For other window types this parameter has no effect (NA).

References

“Extending Musical Mixing: Adaptive Composite Signal Processing” – C. Penrose, 1999 Proceedings of The International Computer Music Conference (p.508)

“Some Windows with Very Good Sidelobe Behaviour” – A. Nuttall, IEEE Transactions on Acoustics, Speech and Signal Processing [ASSP-29:1](1981)

“On the Use of Windows for Harmonic Analysis with the Discrete Fourier Transform”, Proceedings of the IEEE [66:1] (1978)

Good introductions to Spectral Processing

The Computer Music Tutorial – C.Roads (chapter 13)

“The Phase Vocoder: A Tutorial” – M.Dolson, The Computer Music Journal [10:4](1986)

Known bugs

Varying the window size very rapidly will cause the host to crash. Workaround: don't do it!

Please send any bug reports, suggestions or questions to jez@mp3some.co.uk and I'll do my best to look into it and get back to you.

If you are using the plugins and you like them -- don't send any money -- please send us a thank you note: pvnation@leisuresonic.com (Chris Penrose – algorithm design) jez@mp3some.co.uk (Jez Wells – VST implementation). Ta.