



JAX TRIPLE [3] SERIES

Essential Effect Processing Re-thought.

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The JAX TRIPLE Series is our collection of new audio units, based on an adjustable 3-band analog filter frequency split.

All the audio units in this series can be used like usually for common allpass (entire frequency spectrum) processing. But the important feature is the unique bandpass split function, which effectively will triple the effect processing engines and deliver easy to use parallel multi-band audio processing on demand.

Multi-band audio processing comes mainly from the professional audio mastering sections, where audio is commonly separated into several frequency bands to do selective modifications to these bands. It depends very much on the kind of audio material, how the frequency bands are adjusted to achieve the desired sonic results.

We have adopted this professional method and applied an analog modelled zero latency frequency split bandpass filter to all the effects in the series, so these effect processors can also be used in realtime without any additional latency for recording and live effect processing.

Each of the 3 stereo band effects will get its own set of automate-able and storable parameters. If the base effect is a reverb for instance, now 3 stereo reverberation instances will perform on 3 different frequency bands, each with its own unique set of parameters and finally, all is mixed together to the final stereo output again.

Note: All JAX TRIPLE SERIES effects are true stereo effect processors, so in fact not merely 3, but actually 6! effect instances will be performed in parallel connection.

So, the user can for instance apply a completely different reverberation to the high frequencies than to the mid and low frequencies. The result mostly will be significantly different, than passing the entire audio thru one single reverberation engine.

The reverb effect (JAX 3Verb) for instance, is merely an example for illustration. The new approach can be applied to everything, from frequency selective stereo wideners, phasers, saturation effects up to pitch shifters and what you can imagine. Everything consequently in triple band mastering quality.

We will successively release several essential audio effects with our JAX TRIPLE SERIES and replace some existing ones with the new method. The first unit is the recreation of our famous JAX Stereo Tool, widely used on many iPad Studios worldwide. ^^



The JAX TRIPLE SERIES | JAX 3Verb

The 3Verb is our advanced 3 band algorithmic reverb implementation. So each of the bands can get its individual, independent, fully featured reverberation effect.

Our new flagship reverb can do many things that are impossible with usual reverberators. There are 2 independent delay units and an advanced shifter module implemented for creative purposes.

A Mastering Reverb

Conceptually it was developed specifically as a mastering reverb, because of the implemented multiband feature. Mastering requires special reverbs, which allow advanced frequency separation and specially adjusting mixing controls.

Such reverbs are commonly used for closing frequency “holes” in a mix. This is always “adding reverb in a selective way”. The emphasis here lies on the word “adding”, not just applying.

Because of the fact, that a common reverb usually will spread over the entire frequency spectrum with uncontrolled energy and decays, common reverbs (even convolution reverbs) are not well (rather generally never any good) suited for usage as mastering reverbs because of the problematic, heavy frequency and transient masking occurring with them.

If you for instance apply a “canyon” reverb to an entire mix, even if only to a certain percentage, all will sound like played in that canyon and therefore wash out the transients and rhythmic definitions, making it a piece of damage, finally.

Users must understand, that a 3-band reverb is fundamentally different in usage and its sound possibilities than a common reverb. Although, JAX 3Verb has a “classic” mode too, which is called “allpass”. In this mode only one (the full) frequency band is used for

the reverberation. This can be used for common and creative reverberation with single tracks and voices.

Mastering reverbs, on the other side, will do some things differently. Correctly applying a mastering reverb to any audio mix should result in smooth transition of the frequency selective parts into the entire existing sound and a mix can profit from certain improvements.

So the mastering reverb is much more respecting the input and more subtle than just applying a whole reverberation to the entire spectrum, which most likely must fail, the more the mix content is complex.

Our JAX 3Verb fulfils all requirements of a high class mastering reverb and can be used additionally for building of all sorts of creative “stand-alone” effects too. It is not limited in its possibilities compared to other reverbs, it is rather actually widely extended and conceptually improved.

The Multi-Band Engine

With our multiband feature, the energies of the 3 bands can be controlled perfectly and adjusted with different decay times and so create any combination of reverb tail development over time and the desired frequency spectra. This is ideal for closing holes in the mix and for adding special effects.

It is fundamentally different than to modify the reverberation result with EQs and filters afterwards. Instead of feeding the entire sound into the reverb and then modify the result to fit into the mix, you will select the frequency band for the reverberation first. And you will have the chance to edit each frequency band with different sets of parameters. Often even a single, well defined frequency band will deliver the desired result. Everything should be somewhat subtle.

The 3Verb is thought for both, using on a mixing send bus, routing its return signal or alternatively as a mastering reverb, directly processing onto the mix.

In these cases, the separated dry/wet controls are of special importance. And this is the reason that we did not combine these controls, as seen in other products. If you want to close holes in a final mix and use the “mix over” approach, the dry parameter must be set to 100 percent, of course, otherwise the sound would wash out. The bands and the wet parameter must be adjusted carefully, to fill exclusively the frequency gaps and the possible frequency deficits in the sound.

But the unit can also be used more commonly, to create real interesting sounding and extraordinary halls for usage on any kind of audio material. The unit supports common allpass processing for simple cases, without the band split mechanism.

The algorithmic reverberation kernel as it, is not overly complex and has got the most known parameters for keeping the usage as simple as possible. There are no such special controls as EQ or compressors, like seen in other products, because these would conflict with the frequency selective 3-band scheme. But there are some other special parameters, like the pre/post delay units and the shifter module for instance, which separate our reverb from others.

The Parameters

- Input: adjusts the input volume into the reverberator for each band individually. The bands dry level is not affected by this.
- Output: allows to adjust the output volume of the reverberator for each band. This also does not affect the amount of the dry signal.
- Dry, Wet: These parameters are separated for better control of the reverberation adjustment as needed in different situations. A Wet value of zero effectively means no reverb at all, but internally it will be rendered (i.e. for automation continuity). The dry parameter has very special function for mastering tasks and is completely separated from the reverberation processing. This prevents complicated bus routings.

- Size: will adjust the reverb sizes (decays of the reverberation tail, corresponding to a virtual “room” size). This parameter scales differently with each chosen model.

- Model: the model will allow to select different depth reverberation models for each single band. There is a “early”, a “medium”, a “late” and an “ultra late” model available. Sometimes this is called “gravitation” or similar.

This parameter very much covers the responsiveness of the reverb tail. The combination of different models on different bands can effectively simulate all combinations of so-called early reflections / long developing tail relations. This parameter seems to have a relation to the delay parameter, but is a separate adjustment.

Note: Users often love ultra long developing reverbs as a kind of “bench mark” for the quality of reverbs. ^^ Now, with JAX 3Verb you can create (ridiculously) unrealistic long reverbs that cannot exist in nature. Even in combination with the freeze or the delay feedback feature, this will allow creative application of such super reverbs, for what usage ever. ^^

- Damp: will effectively reduce the energy of the reverb tails over time. This corresponds closely to the prominent “material” (absorption) theorem of rooms and spaces. The parameter also increases or decreases the lower energy parts of the wet signal (emphasizing the lower frequency impact). An amount of zero produces extreme frequency boost in the upper ranges, which can make some trouble. Please be carefully with the adjustment and do not overdo removing natural impulse damping.

- Width: The stereo spread of the reverb tail can be adjusted continuously with this parameter. Zero adjustment will deliver a mono sound of the reverberation, which can be useful in certain situations. The parameter is adjusted in a way, that allows over-boosting the stereo phase of the wet signal. The dry signal is not affected by this.

- Freeze: Normally the reverb energy will decrease naturally over time. With this parameter the (unnatural, unrealistic) freezing of the reverberation can be forced, creating an everlasting reverb tone or the impression of infinity of a space. This parameter also can be automated to the point of needs, which is very effectual. The parameter is even more interesting, when applied only to selected bands.

- Pan: Reverb panning can be applied by this parameter, which in some situations can help to correct the stereo image and to create impression of movement. The pan parameter is applied exclusively to the wet part of the signal.

The Integrated Delay Units

JAX 3Verb has got 2 different delay units, that can be used simultaneously. These are specially integrated into the reverberation engine. The first is a pre-delay, that will be applied to the input before the reverberator. But the dry signal is not affected by this.

The second delay is applied after the reverberator and is also strictly separated from the dry signal. Both delays have the same parameter set but their sonic effect is clearly different. Delays can be switched completely off.

- Delay Tempo: The delay (simulating early reflections) is rarely used on mastering reverbs, because such reflections usually will introduce rhythmic problems if applied to a mix. Therefore we used a tempo delay here. The parameter adjusts the time offset for the delay, which is auto-calculated by a given tempo value. The possible tempo ranges between 40 and 480 bpm. If the song tempo is known, the delay will automatically fit to the rhythm by adjusting it to the song's tempo.

- Delay Division: This is the division of the tempo delay in fractions of a quarter beat. A division of 1/1 means one delay per beat.

- Delay Feedback: For simulating early reflections, usually no feedback is used. But we have implemented a feedback, for special

purposes. Modern music styles will profit from this implementation, as the reverberation can exactly fit (move) to the rhythm and the delay itself is adjusted with a tempo value rather than a time parameter.

The delay will be applied only onto the reverberation result, not to the audio input.

The delay actually extends the 3Verb to a kind of hybrid effect for interesting tempo dependent reverberation. Many reverbs (especially convolution reverbs) have problems with fitting to a song tempo, because the early reflections are an unchangeable part of the reverb



and usually cannot be adjusted to any specific tempo without introducing further problems (i.e. by stretching).

Algorithmic reverbs however are not limited by this.

Note: For a specialized multiband delay effects, please take a look at JAX TRIPPLE SERIES 3Lay. It has got the delay units without the specific integration into a reverb engine.

Real Stereo Processing

JAX 3Verb is a real stereo triple band reverb, which means, the input of each band is not mixed to a mono signal prior feeding the reverberation. Many commercially available effects obviously will mix stereo to mono prior feeding the reverb, without even asking you.

Each signal way of the triple band processing in JAX 3Verb is consequently stereo, also the delay for instance. The additional panning feature will even allow realtime panning of the reverb tails.

The triple reverb engine has got an auto-leveling limiter at the output, preventing unwanted loudness bursts and distortions. If the reverberation starts pumping or losing energy with some frequency content, please check and re-adjust the single bands in its volumes or decrease the global input/output levels. The parameters of the integrated limiter are also available as (hidden) audio unit parameters, not specifically exposed to the user interface.

The user interface of our 3Verb will display the selective frequency spectrum of the reverberation for visual information of what's happen at each selected frequency band. However, it is not thought for any scientific purpose. Only the reverberated signals are analyzed, isolated and maximized in their magnitudes in a special way.

The spectrum is scaled to a "musical" scale, which means that it corresponds to the frequencies of the MIDI key mapping on a virtual

keyboard, where the middle screen position (key 64) has a quite low frequency of merely 311 Hz. 440 Hz (concert tone) is mapped to key 70 for instance on the chromatic scale. The highest MIDI Tone (key 128) has 12.500 kHz, the lowest (key 1) has 8 Hz.

A musical frequency scale is the most logical and consequent frequency analysis scale in audio production, we think.

A Word to the World of “Shimmers”

The so-called shimmer reverb is very popular but also quite misused. And so are many available effects, aiming to deliver something like that.

Generally, a real shimmer reverb does NOT pitch shift the reverberation nor does it pitch shift anything, but will rather emphasize the higher harmonics and frequencies. This creates the natural “shimmer” effect.

So it has not really something to do with “pitch shifting”.

However, we have implemented experimental pitch and frequency shifters for creative purposes. But we want to point out, that such experimental stuff is not part of the reverberation core.

With the frequency selective reverberation of the JAX 3Verb, you can create natural sounding real “shimmering” reverbs by just adjusting the frequency bands in the desired manner. Any reverb, that features a simple high pass filter, will effectively be able to create “shimmer effects” that sound natural and pleasing and also convincing.

Because it lies in the nature of things, that emphasizing the higher frequencies effectively will boost the higher order harmonics automatically, but in a natural way. So there is no “pitch or frequency shifting” required to create shimmering reverbs. Pitch shifted reverbs

quickly will sound like fake. The human brain is extremely sensitive, identifying fakes.

A rare situation where we can imagine the usefulness of a pitch shifter in connection with a reverb is, when temporary positional moving emulation is required, i.e the sound of a fast moving noisy object (a fast driving alarm horn for instance), that creates the short impression of a pitch shifted sound. But this is rather a frequency shift, than really a pitch shift.

The (experimental) Shifter Module

The experimental shifter module can modify the reverb tail to some extent for creative usage. Adding pitch- or frequency shifted duplicates of the reverberation can drastically create new frequency content and this is sometimes more massive than it could be created with any other method, like harmonic exciters or such.

Adding new frequency components has a certain importance for a mastering reverb, because usually a reverb will only alter frequencies, that are available in the audio material. By shifting frequencies in certain ranges, new fundamental frequencies can be created with all their sub harmonics. Therefore the shifters can be tuned in semitones and possibly automated too. Gaps of harmonic content will be closed successfully by using frequency shifting in controlled manner.

There are several shifting algorithms for selection. Some of them need extraordinary high CPU power and are intended to be used selectively and sparingly.

- tdp, a time domain pitch shifter. This is a delay based pitch shifter that tends to become grainy with extreme amounts, but has very good performance.

- fdp, frequency domain pitch shifter. This will use FFT (fast fourier transform) for shifting the pitch. It has clearly higher quality because it is much smoother but needs very much CPU power. It may not execute on all bands without overload with older devices.

- bode, a classic analog modelled bode frequency shifter. Frequency shifting is fundamentally different than pitch shifting and will often result in inharmonic, metallic sound. This kind of frequency shifter also needs some processing power.

Please remember, that there are a maximum of 3 instances of real stereo processing modules (6 instances) performing at ones in parallel connection. The shifters are not an integral part of the reverb and should not be used for everything.

The shift for each band can be adjusted to either

- off
- +/- one semitone (+=-100 cents) or
- +/-12 semitones or
- free.

The “cent” mode is good for minimal detuning, the “semitone” mode is good for melodic adjustment and “free” is good for special effects. In “bode” mode, the semitone adjustment is equal to “free”, because it is not chromatically adjustable.

These parameters can be automated. The chromatic semitones will automatically snap to the values for easy melody creation.

The percentage of mixing the reverberation with the shifted part can be adjusted with the “amount” parameter. A value of 0 will bypass the effect, 1.0 will output 100% of the shifted reverberation. Good results will be achieved with moderate amounts. A 100 percent adjustment will sound most likely unnatural. The right mix does all the magic.

All the shifting generally will only be applied to the reverberation parts, not the dry parts of the signal. The shifter module is placed directly after the reverberator with mode 2 (post connection) or before the reverberator in mode 1 (pre connection). The result is quite differently sounding in these both connection modi.

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