

What's a Convolution Reverb?

Ernest Cholakis Explains

By [Ernest Cholakis](#) / March 2, 2011

Ernest Cholakis, president of *Numerical Sound*, explains Impulse Responses (IRs), convolution reverbs, and discusses the Vienna Suite's Convolution Reverb.



Ernest Cholakis has worked with music and computers for over 25 years. In the mid 1990's he developed rhythm technology in the form of DNA Groove Templates and later the Feel Injector Templates (Pro Tools) that have been adopted by all the major DAW sequencers such as Digidesign, Digital Performer, Logic, Cakewalk and Steinberg. He's also produced over 25 products for the contemporary musician, professional and serious amateur composer including his FORTI/SERTI impulses for the Vienna Suite Convolution Reverb. In 1999 Cholakis was commissioned by The National Ballet of Canada to recreate on a Yamaha Disklavier (player piano) the 1981 Glen Gould performance of the Aria from Bach's Goldberg Variations which premiered in November 1999.

Ernest has co-produced the world's most recorded drummer Bernard Purdie, the world's most sampled drummer Clyde Stubblefield, and top Reggae drummer Sly Dunbar. Cholakis' unique drone tones have been used in feature films, film trailers and TV by many well known film composer and several Movie Studios such as Paramount Pictures, Warner Brothers and Lions Gate Entertainment have licensed material directly from Numerical Sound. Numerical Sound has had loops, groove templates and reverberation impulses in such products as Digidesign's Pro Tools, Tascam's GigaPulse, Bias Inc. sound editor program Peak, and Cakewalk's Sonar, and Mark of the Unicorn's (MOTU) Digital Performer. We appreciate Ernest giving up some of his time to answer our questions.

SCTV: In a nutshell, what's an impulse response (IR)?

Ernest: Think of it as an audio recipe with virtually no limitations in its ability to transform sound in any number of ways. What impulses can do is accurately model **1)** any conceivable space with any echoes, and/or early reflections combinations, **2)** a static filter with any possible frequency response. What impulses cannot do is model any distortion, change the dynamics, or modulate the signal in the time domain.

The difference between algorithmic and convolution reverb is analogous to taking a photograph of a particular space where algorithmic reverb (like Lexicon hardware) gives a very general impression of an ambience – more like wire mesh or an architectural drawing of an enclosed space. Convolution reverb is much more CPU intensive than algorithmic reverb with infinitely more resolution. By comparison algorithmic reverb has one advantage over convolution – it can modulate various reverb parameters in real time.

SCTV: This is clearly an area of passion for you. How did you get into creating IRs?

Ernest: When I was a kid I remember seeing the film of *Pink Floyd Live at Pompeii*. I thought that the juxtaposition of this classical ambient band in a historical setting (Roman amphitheatre) without an audience was poetic.

In later years when I traveled through France, Italy and Egypt I brought along some recording equipment in order to capture the spacial sound of many of the unique and inspiring structures that I visited. My partner did graduate studies in Art History so I was filled in on the historical and cultural significance of the places we visited that included temples, tombs, churches and several grottos. It was pretty interesting to compare their importance as architectural monuments and sites to the nature of the sound qualities of each space. Often the sound was not what one would expect. For example, in the Pantheon (Rome) one would think that the reverb time would be long and thick sounding given the incredible size of this temple. However, it's surprisingly short and depending on where you stand has only a few discrete echoes in its "ambience". Another space that I find especially interesting is Brunelleschi's Pazzi Chapel in Florence. It's not a big space, but the reverb time is much longer than I expected (maybe due to its exquisite proportions). Who knows! But it's one of my favourite places in Florence to visit.

SCTV: What sound sculpting advantage does a quality IR have over hardware reverb like the PCM 90 or Bricasti or the Lexicon 960? Or does it?

Ernest: In terms of sculpting sound, impulses have infinitely more capabilities for adjusting sound when compared to hardware reverb units. In building IR's, one has complete control allowing you to create a totally different recipe for each of the 20,000 plus frequencies in the audio spectrum. By comparison, hardware units can only operate using more of a broad brush approach affecting the bass, midrange and treble in a very general way.

There's also a difference in reverb decay timing between hardware units and the Numerical Sound IR's more accurately reflect the properties of acoustic space decays. For example, real world acoustic spaces typically have a top end that decays much faster than hardware units when applied to comparable spaces. In hardware units, you get more of a high frequency wash in the sound. The only hardware units that approximate the sound of the top end more accurately are the large plate reverbs.

SCTV: A side question for our readers. When you see a reverb like PlatinumVerb in Logic which has a built-in EQ, what is the composer EQ'ing here compared to the EQ he may be using directly to shape the sound of the sample?

Ernest: They're EQ'ing only the ambience (or 100% wet signal) which makes sense. Personally, I prefer to create a new track and render the dry material as a 100% wet track(s). Then you can normalize and process the ambience with any EQ or compression combination.

SCTV: I ask this because the Vienna Convo has an EQ tab which the composer or songwriter can edit. How is the EQ in the Vienna Convo similar or different to what you just described about Logic's PlatinumVerb?

Ernest: Vienna Suite Convolution Reverb has a full 5-Band EQ where PlatinumVerb has a single crossover so that you can manipulate 2-bands.

SCTV: Recently you told me that Bruce Botnick, who engineered for the late Jerry Goldsmith, used your IRs exclusively. Are these custom IRs or can customers buy them from your website at Numerical Sound?

Ernest: Bruce uses all the 96KHz/24 bit Pure Space Classical and Mystical Reverberation Impulses and he also has the FORTI & SERTI libraries.

SCTV. After reading *Prelude to a Review on the Vienna Suite*, you spoke to me about the “seductiveness” of the hall name. Would you clarify that for us?

Ernest: Clearly IR users find it very appealing to obtain the impulse of a famous acoustic environment. But in a musical sense why does this matter? The purpose of an audio production is to find the right type of ambience and adjust it as required in order to complement the music. Whether it’s a famous space, one’s bathroom, or a garage – is immaterial. The decision should be made with one’s ears – not one’s eyes.

SCTV: As a I writer, I do tend to look at the hall/studio/room names as a point of security for knowing what I’m getting and about to use, including looking to see who might have recorded in that venue so I can get a CD and have a listen. Is this a weak way to approach evaluating the quality of an IR with a name attached to it?

Ernest: A recording venue is designed to be able to modify the characteristics of its own space in order to meet a musical application. So an IR from a famous place is not necessarily a good indication of the character of the space. In a recording studio or sound stage such as Abbey Road, Sykwalker, Air Lyndhurst, or Todd-AO, the signature ambience of individual recordings produced in these environments varies considerably from recording to recording. The reason for this is because each of these studios has access to a great variety of recording equipment – microphones, compressors, EQ, digital reverb, and so on.

Remember also that in film recordings, the ambience of the studio is often augmented with digital reverb or plate reverbs with the use of mic’s, mike placement and specific digital reverb settings. As well, there is the possible use of compression/limiting that can change the ambient signature of any particular recording. In effect, an IR of a particular venue is more a composite reverb with several layers that determine the overall sound as opposed to the “pure” IR of the main performance space.

SCTV: One thing you mentioned to me was that there’s a musical way to select an IR for use. Could you clarify that a bit more and then give us some insight as to how a composer should approach listening to and testing an IR?

Ernest: The easiest way is to scroll down the IR list so that you can listen to how each changes the overall sound of a particular track. The bass, midrange and treble of each IR decays at different rates, so adding it to a dry track will combine in interesting sonic ways that will, depending on the characteristics of the track and its transients, change the overall sound. The tempo and the textural complexity of the music will dictate the size of the space to use. In all of the Numerical Sound IR products there are IR’s with a tight or fast decaying bass relative to the midrange and treble so that dense musical works or passages can benefit from these types of IR’s.

SCTV: The oft-stated trend has been to use two reverbs per section. One is for early reflection and the other for tails. As a developer what's your take on this?

Ernest: Yes I would definitely recommend this, especially for the instruments in the foreground of an arrangement. I often use two ER's and one Tail. Applying a different ER/Tail set for each instrument would be great, but we'll have to wait for the 100-core machines before considering this!

SCTV: You have a set of IRs that are included with every purchase of LASS. What are the Numerical Sound IRs that come with LASS and how should composers approach using them?

Ernest: There are three Tails and six ER types with variations in the decay times and the overall character of the sound (Bright, Dark & Flat). They can shape the ambience in many unique ways and are very transparent sounding.

SCTV: One thing you mentioned to me on the phone was that IRs can also be used to help position instruments in the mix. LASS, obviously, is pre-positioned. But how would you approach picking IRs for LASS (starting with what's included from Numerical Sound) and then say a woodwind/brass section from Vienna?

Ernest: Use several plugins either as an insert or as a pre-fader aux send with a TILT filter (from FORTI or SERTI), Convolution Reverb with an Early Reflection and Vienna Suite PowerPan. Add another channel strip with a TILT filter and Convolution Reverb. The TILT can brighten or darken the ambience which in effect can move the track either to the foreground or background. Select a RI ER and Tail that sounds musically right then use the VSL PowerPan to precisely adjust where in ER are coming from in the stereo field.

SCTV: As a developer, what do you see are the great strengths of the Vienna Convolution Reverb?

Ernest: The quality of the convolution engine – one of the best sounding that's currently available. I also like the flexibility of the plugin (AU,VST & RTAS) and the fact that the content is protected with the Syncrosoft key. I have spoken to all the major convolution players about adding reasonable security for third party libraries. Unfortunately, they seem only interested in protecting their plugins and not the content of third party work. This is short-sighted as it hinders the commitment of many from developing amazing new ideas and material but this is the music industry. The only company that has invested the time and money to protect third party content is VSL. They are a dedicated group who care deeply about audio quality, potential and flexibility which resonates with me.

Vienna Suite with Vienna Ensemble Pro allows you to economically spread the plugins over three computers (Mac or PC). I think that this is a unique feature that Apple with Space Designer will surely not match.

SCTV: *06 Large Concert Hall Warm* is a Numerical Sound IR included with the Vienna Convo. The notes say that the speaker position is center and the mic position is far back. Explain what this note is telling the composer in terms of what it means and how to use it.

Ernest: This IR has omnidirectional patterns that sound like they are from the back of the hall. The warmth of the ambient tone is because of the embedded TILT filter in the IR. Use a configuration similar to the above example.

SCTV: For those who aren't engineers, what's the benefit of being able to pan an IR, which you can do in the Vienna Convo, when you already have panning in the channel strip or you're using the PowerPan feature in the Vienna Suite, or the instrument(s) are already pre-panned?

Ernest: The Power Pan can be used to position the Early Reflection impulses anywhere in the stereo field more precisely than a regular pan and is much more flexible than pre-fixed placed instruments. I would add a TILT filter, Convolution Reverb, PowerPan and a Limiter in the channel strip.

SCTV: Ernest, thanks for your time.

Ernest: A pleasure!

This article was previously published at the SonicControl website.