

Eigen Manual

Version 1.0.0

Table Of Contents

General Information	2
Standard Features	2
Basic Controls	2
Source & Listener	2
Room	2
Depth	3
Other	3
Three Modes	3
Play	4
Object Positioner	4
Render	4
Views	4
Settings	4
Waveform	5
Spectrum	5
Output	5
Analyze	5
Extra Information	5
Tips	5
Versioning	6

General Information

Eigen is a “Space Simulator” and an “Impulse Response Computer” designed to work with the AU and VST3 plugin standards, on Windows & Mac OS. This manual serves as a full explanation into every parameter and system featured within the scope of the plugin. It will be updated along with the program itself.

Standard Features

The small triangle on the bottom right of the interface can be dragged to rescale the interface, and the program will remember it's previous size for next time (and will also remember regardless of your host; so any DAW you use will have the same size setting).

The Dry / Wet mix control is located on the bottom right of the interface.

Basic Controls

These controls are used in all three modes (with the exception of Propagate / Normalize in Analyze mode, and the reflection depth in both the Analyze & Render modes).

Source & Listener

The source & listener points represent the three dimensional locations of each respective position. These positions are able to be adjusted via the slider groups labeled “Source” and “Listener” on the main control panel.

Room

The room's size is determined with the three sliders labeled “Room”. The materials of the room are decided with the selector on the bottom-left of the interface.

To toggle between the active surface selector, click through the cube until you find the desired surface to change. These materials have a slight effect when being used in *Play* mode, but the effect is greater observed when creating impulse responses with *Render*.

The materials can also be set all at once by clicking the circle in the top-right of this component. A dropdown menu will appear, letting you either set

all surfaces to the same material, or set a variety of material presets that try to approximate different kinds of real-world spaces.

Depth

The Depth slider controls how deep reflections are calculated in real-time processing, which indirectly controls how many reflections are processed: At "Direct" (or zero reflections), a single, direct sound path from the source to the listener is processed. At seven reflections deep, a few hundred reflections are processed. This is the only basic control that does *not* carry over to impulse response rendering; a different control, capable of much higher reflection depths, is provided in Render mode.

Other

The spatial quality of the processing is decided with the Spatial Quality dropdown, located in the second row of the main control panel. In mono mode, a single channel of audio is processed and copied to both the left and right output channels (no spatialization). In stereo mode, the audio is processed according to the left / right / mid channel position of each reflection and outputted accordingly (basic spatialization). The Binaural & HQ Binaural options make use of HRTF filtering for realistic spatial audio perception, but the effect only really works for headphone users.

The "Propagate" button switches between whether or not realistic sound propagation is occurring, that is, when Propagate is enabled, the initial sound travel time will have a slight delay based on the distance between the Source & Listener. When disabled, There will be no initial delay.

The "Normalize" button sets the gain of the reflections to be as if there was no distance-based attenuation, that is, when Normalize is disabled and the source & listener are far away from each other, the resulting direct path & subsequent reflections will be quiet, and when Normalize is enabled, the direct path will be of identical level to that of the input, and the subsequent reflections will have their attenuation adjusted accordingly.

Three Modes

Eigen consists of three different modes. Two of them actually have something to do with processing audio, and the third (Analyze) is not for sound processing, but tailored towards analysis. All that the selector on the screen section of the plugin's interface does is change the *view* to help with doing things in that given mode, pressing it will not affect the audio.

To change between processing in the first & second mode, the “Convolution” button on the top right must be toggled. It can only be selected if a rendered impulse response is present however, the technicalities of which will be covered in this section.

Play

Play mode is for doing real-time early reflection processing. In this mode, the object positioner can be changed at any point to adjust how the space sounds.

Object Positioner

The cube that appears on the screen when this mode’s view is elected is for controlling the three-dimensional position of the source & listener points, those controls are present on the main control panel as well, but the object positioner is provided for intuitive movement adjustments. Click & drag each object to the desired location. To increase your drag sensitivity for more subtle movements, right click and drag the object.

The switch on the right of the object positioner section controls which three-dimensional plane is being dragged on at that time. For instance, if the switch is set so it is facing on the “floor”, the object will be draggable to the left & right, but the up & down coordinates will remain constant.

The slider on the left side of the object positioner section is simply just for adjusting the angle at which the object positioner is viewed from. Its use does not affect the sound in any way.

Render

Render provides a system to facilitate rendering of high-quality, realistic impulse responses given the room dimensions, source & listener positions, and materials of the space as previously set in the Basic Controls menu. Press the big “Render” button to begin rendering an impulse response. The entire process occurs in the background, and should not affect your real-time audio playback (unless you have a very slow computer).

Views

There are three available views in the render section of Eigen.

Settings

The settings menu provides additional controls for further tuning your impulse response beyond just positioning, materials, and room dimensions.

Switch between using high-quality materials, rendering a realistic reverb tail, and adjust the number of sound reflections to be processed.

Waveform

The waveform section is just a waveform display of the rendered impulse response. If no impulse response is present, then it will be blank.

Spectrum

The spectrum section displays how the waveform looks in the spectral domain. It is not animated. If you hover your mouse over the spectrum, a tooltip will display to show the frequency and amplitude of the mouse's position.

Output

Eigen allows you to save the impulse response via clicking the save icon on the right side of the bottom bar. The output is a 32 bit .wav file, and is normalized, then trimmed down to the point where the output drops to -60dB. The saved file can be used in any other convolution reverb you'd want to use.

Analyze

The analysis section is a less major feature of Eigen, but can still be useful for people looking to analyze how their early reflections color sound in the frequency domain (and could even be used to predict real-world room modes).

Based on room dimensions / materials as well as the sound positions, analyze takes in that information and returns a spectrum which contains the maximum magnitude of each frequency as a sound sweep is fed through the same algorithm that processes the reflections.

The output spectrum only ranges from 20 hertz to around 350 hertz: these frequencies are the ones most usually affected by room mode coloration. Any frequencies extending beyond this, at least for measuring this sort of room coloration, are often random and contain no usable information.

Extra Information

Tips

One note for impulse response rendering; when the binaural mode is selected and an impulse response is rendered, the audio will be filtered binaurally. While these impulse responses do sound good on their own, the binaural filtering increases the overall RMS of the impulse compared to how it

would be without binaural filtering. These IRs tend to create much louder output when being used in a convolution reverb. Eigen's internal convolver limits audio to 0dB to avoid excessive clipping, but you should still approach with caution.

The longer a rendered impulse response is, the more CPU cycles will be utilized to process the sound when convolution is enabled. If you design a space to render the longest IR possible (the maximum allowed room size, all concrete / brick materials, and late reflections enabled) you may encounter a situation where your CPU can no longer keep up while in real-time. Rendering your audio in the DAW however, should still work in this case; and the computed impulse response could always be saved to use for other applications.

Additionally, keep in mind that the "Play" mode and the "Render" mode do two different things, so the *materials* that you decide to use in Play mode may not automatically sound good in Render mode. In play mode, an individual reflection's gain is calculated by the average of a material's internally stored "Absorption Coefficients" (and the gain is reduced further and further for each successive reflection on any other surface).

Using concrete materials in Play mode will make your reflections more noticeable, but when in Render mode there are many more reflections processed, as well as an option of a late reflection tail, which might be a lot longer sounding (and louder) than what you initially predicted.

Versioning

The plugin's Version Number on the header can be clicked for a pop-up dialog that provides extra information to the user which might be necessary for dealing with potential technical problems. In this case you will get the version number, build date, and your activation key.