Reverberator Demo

Recording engineers use reverberators to add ambience and space to the dry tracks of the recording. Reverberators are a crucial component to a well mixed song and have evolved through the history of recording. Echo chambers were the first reverberators used and were large, empty rooms that held speakers to play the recording and microphones to record the reverberation. Sound quality and reverb time were controlled by adding carpet, drapes or moving the microphones. The first artificial reverberators were metal plates or springs that used electronic drivers and pickups (similar to speaker voice coils and guitar pickups) to create echoes. Damping material and spring tension allowed the engineer to tailor the sound to his/her liking.

Nowadays, recording engineers use digital reverberators to add space and ambiance to a recording. Digital Performer offers two digital reverb plug-ins: Reverb and eVerb. We will use eVerb for this lab because it provides graphic representation of the controls you will adjust.

The Digital Performer file prepared for this lab contains 18 sequences that demonstrate the functionality and use of reverberators. Section 1 consists of 15 recordings of a drum kit using different reverb settings for each snare track (the other drum tracks have no reverberation effect.) Section 2 allows you to adjust eVerb's room size or reverb tonal quality. Section 3 uses auxiliary sends to mix tracks to two different reverb types.

Section 1: Common Reverb Controls

Wet/Dry Mix

Most reverberators allow you to mix the reverberation with the recorded sound with the Mix control. 'Dry' sound contains no reverberation at all; 100% wet sounds contain reverberation only – no direct sound is heard at all. Most recordings contain a blend of direct and reverberation. The first recording is an example of an equal mixture of direct and reverberation. The second example is completely dry – no reverberation is heard. The third example is 100% wet.

Listen to these three examples by enabling the play button next to their name in the Chunks window and pressing the space bar. You can isolate the snare from the other drums with its solo button. As you are listening, remember that the snare is the only drum affected by the eVerb plug-in – the other drums will be unaffected by any changes you make.

1. 50/50 mix of Direct and Reverb. This example blends the attack of the snare with the ambience of a large room.
2. Dry Snare (0% Reverb). The sound of the snare in this example differs little from the sound of the other drums because all are relatively dry.
3. Wet Snare (100% Reverb). The snare loses the 'snap' of its attack because very little direct signal reached your ears. You might want to adjust the Wet/Dry mix to hear other possible settings.

Reverb Time; Initial Reflections; Pre Delay; Filters

Another common setting of reverberators is reverb time or RT60. This is the time it takes for the reverb to fade away, which is a drop of about 60 dB. In actual rooms, reverb time depends on the reflectivity of the walls, floor and ceiling. The bigger the room and more sonically reflective the surfaces, the longer the reverberations last. The materials in the surfaces affect the quality of the reverberation. Soft materials—such as cloth, foam and insulation—absorb high frequencies more than low ones, so the reverberation will sound dull because low frequencies last longer. Thin, flexible materials, such as wood paneling and sheet metal, absorb low frequencies and reflect high frequencies, so the reverberations sound thin and bright.

Listen to the next four examples by enabling the play button next to their name in the Chunks window and pressing the space bar. Remember, you can isolate the snare from the other drums with its solo button. Also recall that the snare is the only drum affected by the eVerb plug-in – the other drums will be unaffected by any changes you make.

Example 4 uses a short (.05 sec.) reverb time to simulate a small room. This form of reverb is often called ‘ambiance’ instead of reverb because it makes the sound seem more live rather than emphasizing the reverb sound.

Example 5 uses a long (2 sec.) reverb time to simulate a concert hall. Sometimes the reverberation is delayed by a few milliseconds to mimic the ‘slap-back’ of the first reflection.

Example 6 limits the long reverb time to frequencies below 7 kHz. Rooms with drapery or heavy carpets often sound like this.

Example 7 limits the long reverb time to frequencies above 5 kHz. Very few actual rooms exhibit these reverb characteristics because walls are rarely this thin and the sound is not attractive.

Initial Reflections.
Digital reverberators mimic realistic spaces by combining reverberation with carefully timed echoes called ‘initial reflections.’ Reverberation is simulated by repeating the direct sound over and over again, fading it out as indicated by the reverb time. Initial reflections, on the other hand, are carefully timed echoes that bounce off of the floor, ceiling and opposing walls and give a sense of the size and shape of the room. EVerb provides five different timings for initial reflections: Concert Hall, Auditorium, Small Hall, Small Room and Club.

Example 8 uses reverberation only. You will not hear any distinct echo or reflection, but the sound seems relatively natural. Older artificial reverberators, such as plates, springs and delay lines, could not provide room reflections because they were not sophisticated enough.

Example 9 features the initial reflections with no reverberation. In realistic spaces (except the Grand Canyon), it is impossible to have echoes without reverberation, so this example sounds artificial – especially if the space size is exaggerated.

We will examine this parameter in greater detail later in the demo.

Pre Delay

Sound travels about one foot per millisecond, so when the sound source is a lot closer to the microphone than the walls are, the initial reflections reach the microphone late. To simulate this, digital reverbs delay the reverberations with the 'Pre-Delay' setting. Delays less than 60 msec will sound natural and musical; delays greater than 100 msec will sound artificial if it is too loud because sound dissipates as it travels farther and farther. Delays greater than 200 msec are usually timed to the tempo of the music. EVerb can delay both the reflections and the reverberation, providing complex timing.

Example 10. The reverberation is delayed by 82 msec and gives a sense of distance between the snare and the room.

Example 11. The reverberation sounds immediately after the snare hits, so the snare seems a part of the room.

The High Filter

High frequency absorption is controlled in two ways: separate reverb times (RT60) for low and high frequencies and a low pass circuit that filters everything. This filter is needed because changing the high/low reverb time does not alter the sound of the initial reflections. Engineers usually include the high filter in their reverb settings to reduce brittle or unnatural sounding artifacts.

Example 12. The high filter is enabled in this example. Although the sound seems dark, it seems more natural than example 13.

Example 13. The high filter is disabled in this example, so the high frequencies regenerate more than natural surfaces allow. The overall character is bright and noisy. You may wish to adjust the high filter downward to improve the sound.

Stereo vs. Mono

When reverberators are patched into hardware mixers—either analog or digital—novice engineers often forget to pan the reverberators outputs hard left and right. This mistake returns the reverb in mono, instead of stereo, and collapses the stereo image. You should avoid doing this except for special effect. The Stereo control of eVerb adjusts the width of the image and should be set to 100%.

Example 14. The reverb is in mono because the Stereo control is set to 0%.

Example 15. The reverb is in stereo because the Stereo control is set to 100%. If you want, experiment with the control – you'll see that settings other than 100% aren't very interesting.

Section 2: Adjusting the room's size and shape.

Initial Reflections: As you've learned previously, modern digital reverberators combine two types of delays to simulate natural reverberation: (1) carefully timed, distinct echoes that mimic the first reflection of the walls of the room and (2) regenerated delays that repeat over and over until they fade away. EVerb controls the volume of each effect with the Initial Reflection level and the Reverb level. For this section, we've turned the level of the reverb all the way down so you can easily hear the initial

reflections and how they change with the room shape and room size settings. (The lack of reverb will sound artificial, though.) For this portion of the lab you will select between the five room shapes (Concert Hall, Auditorium, Small Hall, Small Room, Club) and adjust the size multiplier.

Step 1. Play enable 16. Adjust the room's size.
While playing the file, select each room shape and carefully listen to discrete echoes of each. You can use the Mix control to make the initial reflections louder.

Answer these questions:
1. Which room shape sounds the least natural due to the missing reverberation?
2. Which room shape sound the most natural although the reverb is missing?

Step 2. While playing the file, adjust the room size parameter. You'll notice that this control expands or contracts the timing of the initial reflections. As you adjust this control, determine how large you can make the room before it sounds peculiar. Frankly, I'm not sure why eVerb allows you to expand the room by 4 times. You can create nice ambient effects, though, by shrinking the room size.

Looking at the reverb shape display, answer these questions. (Use the size control to help you.)
Which room shape has the softest initial reflections? _____
Which room shape has the fewest initial reflections? _____
Which room shape has the most evenly spaced initial reflections? _____
Which room shape has the most unevenly spaced initial reflections? _____

Reverb: Many digital reverberators approximate reverberation by repeating the direct sound over and over. The regularity of these repetitions is controlled by the diffusion control. Low diffusion settings makes the repetitions farther apart and evenly spaced. High diffusion settings increase the number of repetitions and make them irregular. Engineers usually choose high diffusion settings unless they want to imitate a square or rectangular performance space.

Step 1. Set the Diffusion and Color (more about this later) to 0.
Step 2. Play the example. You'll notice that reverberation sound 'fluttery' or 'bouncy.' This is due to the low diffusion setting.
Step 3. Set the Diffusion to 1. You'll notice that the reverb is less 'bouncy' sounding.

In my opinion, there is still some flutter in the sound even when the diffusion is set at maximum. This is because the direct sound of the snare is the only sound repeated over and over by reverberator. If the initial reflections were also repeated again and again, the reverberation would sound even more diffused. The Color control determines how much of the initial reflections are included in the reverberation. When set to 0%, the reverb comes from the direct sound; when set to 100%, the reverb comes from the initial reflections. Settings between these two extremes use both sources.

Step 1. Set the Diffusion and Color to 0.
Step 2. Play the example and select different room types: Concert Hall, Auditorium, etc. You'll notice that the sound quality does not change because the room types affect the initial reflections, not the direct sound.
Step 3. Set the Color control to 100% and select different room types. You will hear a significant difference now because the reverberator is repeating unevenly spaced initial reflections.

Answer these questions:
When the Color is set to 100%, why is the reverb of the Auditorium so much softer than that of the Concert Hall?

With the Color set to 100%, which room type has the most distinct echo?

Section 3: Using the auxiliary sends to maximize reverberation capability.

All of the earlier examples placed the reverb plug-in as a channel insert, a very inefficient way to use this valuable resource. Indeed, if your recording consisted of 40 tracks, the insertion of 40 reverb plug-ins would overwhelm your computer. If your recording uses more than one track, you should always use this effect as an auxiliary send and return. This is the way all hardware mixers (analog or digital) use reverberators. The following section describes how.

The four knobs at the top of the mixer are 'auxiliary send' controls that send channel signals to bus 1 or bus 2. Each of these busses feed the input of a reverb channel at the end of the mixing board; bus 1 feeds the 'long' reverb channel and bus 2 feeds the 'short' reverb. Since every channel (except the reverb channels) has controls that feed both bus 1 and bus 2, any track can use either reverb (or both reverbs.) Furthermore, one channel can be 'wetter' than another by increasing the level of its auxiliary send. Let's do a little mixing with this mixer setup.

Step 1. Play enable the sequence in the chunk window and press the space bar.
Step 2. Double click on the top left send 'knob' of the Slide Guitar track. (Double clicking a knob or fader raises it to the 0dB setting.) You should hear a lot of reverb wash from the slide guitar.
Step 3. Double click on the top right send 'knob' of the Vox track. You should hear ambience added to the vocals.

You'll want to lower the send knobs a little if you plan to send other channels to the reverb. Generally speaking, one should keep the send levels below 0dB so that you do not overload one bus with signal from many channels; if you have difficulty hearing the reverb, try raising the reverb output first before you raise many reverb sends past 0dB.