Procedural Audio and Musical Effects

Abstract

This PDF is a condensed overview of the following articles:

- Disadvantages of Creating Procedural Audio and Music
- A Breakdown of Andrew Lowell's Work
- An Introduction to CHOPS
- Music and Visual Effects

- In this summarized PDF we will be talking about how music and audio are integrated into visual effects and post production work. As well as the artists pushing this process along.

Disadvantages of Procedural Audio and Music

Are We Losing Creativity in the Music Industry?

With all the new ways to generate music, and how easy it has become to distribute it, one could argue that we don't get more reward out of creating music as we used to. Therefore, our effort for creating it has become lax. When music could only be replicated by sheet music, sharing it was expensive. But now with the creation of the internet, the price of purchasing a song has dropped so low, not much profit is made on sharing music. Putting in the same amount of time into a song that you did 20 years ago will no longer give you the same profits that you generated 20 years ago.

One could also argue that more creativity in music is being shifted to the brand development of the artist, rather than the music itself. As we have previously mentioned, our musical ranges are declining as well as our chord progressions. As well as our acclimation to procedural generated audio. When everything starts to sound the same, how do you still make those artists stand out?

Branding is the overall answer. If the artist can look differently, understand social media, and be their own character; then they no longer have to look out for their music being compared to others. Plus, they will be recognized more.

The music industry today relies more on the other activities their artists complete on the side, rather than selling music. Overall, it does not care about the traditional artist's sound and creativity. It just wants to figure out a way to make more money as it's main resources have dried up.

Why Does All Music Sound The Same?

Because it does. In the past few decades popular songs, and bands have started using new tools that make the music recording process easier and faster. As well as relying more on patterns of what their audience expects from them. We also now use the internet to our advantage to download music samples faster, and can create a recording booth in our basement if we feel like it. Music has become a very easily spread luxury.

In 2012 a group of researchers named Joan Serrà, Álvaro Corral, Marián Boguñá, Martín Haro and Josep Ll. Arcos analyzed music patterns between the 1950s and 2010s. They looked at pitch development, timbre, rhythm, vocal ranges, and other important musical aspects. Using the online Million Song Dataset they were able to determine several interesting facts about our musical evolution. They found that ever since the 1960s, our musical timbre range has started to decline, as well as the use of chord progressions and less traditional music recording techniques.

However, they also found that music is becoming louder. At a rate of one decibel every eight years. This increase of decibels is also taking away the dynamic range of music as our ears start to no longer recognize the softer parts of a song. Simply because the entire song is just plain loud.

Video games have also helped procedural music in more ways than it appears. Most games require the same sound effects to be played repetitively, and at the same time sound a bit different through different actions the characters make. For example, if a character hits another with his sword, it is going to sound a bit different than if he hit a tree or a rock with the same object. Sometimes the same tune has to be repeated in different character encounters, and maybe slightly different based on the character's choices. Such as Untertale. These sounds and rhythms would be hard to replicate without a software proactively analyzing and editing the sounds we create. Plus, for video games on a budget, hiring a composer would be incredibly expensive.

Another interesting study done in 2013 by researchers Héctor P. Martínez, and Stefania Serafin studied if gamers could react and sense the difference between proceduralized music, or traditionally created ones through motion controllers in video games. As well if it would influence their reactions in the game differently. Through their work they concluded that gamers could not tell the difference, or did not care either way. It did not have a single change in the game performance. Proving that we don't really care how the music is made, we just like listening to it. However, there was one outlier game in this experiment. When the test subjects played a skiing game under the testing environments, they preferred the procedural music to the traditionally recorded ones. A good take away from this might be that the players preferred electronic music to the standard already. This might show how we have grown accustomed to modernized music, and are ok with not changing from our current musical genre.

The Future of Music

This need to create audio fast has led to the development of tools such as Oscillators, Magenta, and others. Oscillators run on a simple set up of creating a waveform such as a sine wave. Since waves generate tones, we can switch through these waves to create alternating rhythms.

Magenta is something a bit more complex. Magenta is an open source project designed to help use machine learning in creative processes. Currently, it is being used for generating music and images

by using python. Right now from the Magenta website you can download an extension to make your browsers sing. Whether that be from instruments or computer generated vocals, it's up to you. Most of this software is designed to use internet content you see visually, and translate your mouse movement or internet images into sound waves. It's worth a listen.

Interactive music in the video game industry has also taken music to otherworldly places. In the GDC 2017 conference several musical systems were presented that already have an impact on how we further understand music in video games. Interactive music is where all these systems focus, as they wish to reduce the repetition of sounds in games. However, they also create a focus of where and how they repeat theme songs to make them more memorable. By making the music interactive, it can also help the player have a more enjoyable experience in the game. Such as timing music with cut scenes, basing player interactions on where music is added, and adding selective music based on the player's choices.

However, Interactive music also has its downfalls. If the character is interacting with the music too much, this can lead to the music cutting in and out at the wrong time, and making the sounds seem staggered. Also, if you are using interactive music to remix a popular song, then copy write issues may also start to occur.

An Introduction to CHOPS

How Do You Use a CHOP?

A CHOP is a Channel Operator. It is one of several network folder types in Houdini. Any nodes associated with this network type are built for editing animation curves and audio data.

They also are capable of digital audio processing, developing rigging tools, and modeling and sculpting animation. Pretty much anything that involves a curve, creates a curve through motion, or has a relation to cos,tan and sin can be edited in a CHOP network.

In order for a CHOP net to work, you need to read in a path from a SOP geometry. So basically, create a sim or geometry in SOPs, add a null, lay down a CHOP net in the same object node, and read in the data.

Procedural Music Development in Houdini

Who is Andrew Lowell?

Andrew Lowell is a SideFX Consultant, and Professor of Visual Effects at VIA University College. Originally a sound engineer, he moved into visual effects and was able to create a fusion between sound design and the visual effects industry. This is a brief summary of his work, and I recommend reading more about his achievements.

In 2018, he presented something that will be the focus of this article here. Professor Lowell found a way to create music inside Houdini's 3D space. As well as how to influence dynamic simulations and animations through Houdini's CHOP network. Because Houdini works naively with audio data, and has waveform visualization, Lowell was able to easily create sound based creations with a few nodes.Some of his main discoveries were:

- You can create music and sounds in Houdini and export them.
- You can use musical notes to make the character move automatically. Including expressions of the character.
- You can create particles using music and sounds, and vice versa. And then create further music based on how the particles interact.
- You can control the volume and timbre of sounds based on impact collisions.
- You can create a musical song and it's score in Houdini.
- You can record sound in 3D space.
- You can influence dynamic simulations with sound.
- You can animate color correction and textures using sound.

Professor Lowell does note that since the mainstream music industry is based around human performances, this method of procedural music might not flourish as much as it could. But with the way electronic music genres are flourishing, who knows where it will go.

- Currently Professor Lowell is working and has developed a musical toolset for Houdini that you can purchase off his website. There are also a set of tutorials for this tool set that he has created, and they are very useful for understanding a musical workflow.