Sound is complicated. Though I will not try explain every aspect of sound that I know here, there is much more to it then is discussed below. Here I will attempt to explain the concept of *subtractive synthesis*.

**Subtractive Synthesis**

Subtractive synthesis is a way to create sound. It must be understood that there are a variety of ways to create sound, using mechanical instruments such as violins and flutes, electric signals from guitars and synths, and digital instruments that use code to tell the computer to play certain sounds. The kind of subtractive synthesis to be discussed will be focused on the digital format, as it deals with the most basic principles of sound development and therefor needs no hefty background in physics.

The term subtractive synthesis comes from the idea of taking a pure, unaffected sound wave and manipulating it to create a certain sound. In order to successfully create the wanted sound, there are multiple variables that must be addressed that can be used affect the sound as wanted. The first, and most basic, is affecting the volume of a sound throughout its playtime. The second, and most drastic change to the sound, is layering harmonics on the sound wave (this may sound like it goes against the whole “subtractive” concept, but I’ll explain). The third most prominent change to a sound is applying filters to the sound. These are the three main aspects of digital sound that create the base for a sound. There are many other adjustments and changes that can be done to sounds that can drastically change what a listener would hear, but that is for another time.

Volume control of a sound is called the *envelope* of a sound. This describes the volume of sound as it is heard. The most basic parts to the envelope of a sound are the sound’s attack, decay, sustain, and release. The attack of a sound is how long the sound takes to reach its maximum volume. The decay of a sound is the time it takes for a sound to reach the volume for which sound with be played at if it is played for a while (really for any time longer then the time it takes for the sound to reach the sustain level). The release is the amount of time it takes for the sound to go back to having no volume. Now, (if you were paying attention carefully) there is point that is not addressed in this method of changing the volume. That is volume of the sound at the point where the attack and the decay change. Logically, it will be louder than the sustain volume (whose duration is determined by how long the player decides to play the sound). This maximum volume is volume of the unaffected sound, which explains why this aspect of subtractive synthesis is subtractive. The attack makes the sound volume start at zero and increase to its original volume. Then the decay lowers the volume of the sound back down to a designated volume, which is determined by how much influence the sustain is given. Then when the player releases[[1]](#footnote-1) the sound from playing, the release determines how long it takes for the sound to flatten out. This method of volume control is very powerful in determining what kinds of sounds want to be created, such as percussive sounds or horns, which have very different envelopes.

I noticed my response got rather lengthy, and I only covered the first topic, which is the most simple. I’ll to show you the other two aspects mentioned above if you’d like. I have the tools on my computer, so it can even be done in class if you’d like.

1. *The player does not actually release the sound from being played. The sound is playing always, and the player only allows it to be heard using the components of the envelope. Envelopes can be triggered using a variety of the things, such as keyboards or information on a computer much like a music box.* [↑](#footnote-ref-1)