MUS499IA
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Music Synthesis
with a Focus in Logic Pro

Music synthesis is the process of creating musical sounds with technology. Some of the more primal synthesizers were first invented using oscillators and frequency modulators. Since the late 1800's, scientists were beginning to experiment with the creation of these instruments. Since then, this field has grown into a massive field of music today. For my independent study, I wanted to learn about these instruments, how they are used and created, and how they have affected the music culture since their invention. In addition to my research, I wanted to create my own music using synthesizers. I did this in SUNY Plattsburgh's music technology lab, using the program Logic Pro. Through my research, I have learned about the several technological components that contribute to the field of synthesis, as well as some social and cultural aspects that have developed alongside the technology.

The first music synthesizers was very basic. In 1876, an American inventor named Elisha Grey accidently discovered what is now known as a single note oscillator. This was done by creating a vibrating electromagnet that created a single note. The pitch of the note could be changed by modifiying the amount of watts to the magnet. This would increase or decrease the amount of vibration, and therefore, change the pitch of the note. Again, this was a very simple and primitive synthesizer. The instrument was never used musically, only invented for the sake of science. However, this changed within the next twenty years. Other inventors were interested in Grey's discovery and wanted to explore the field of electronic sounds. One of the earliest electronic instruments that took the world by storm is the Theremin. Invented by Leon Theremin, this instrument uses two radio frequency modulators to create a simple tone. The instrument

was revolutionary. In order to create a tone, the musicians hands would be placed in two specific locations around the instrument's antenna. both volume and pitch were controlled by careful location of the hands, making physical contact with the instrument useless. Not only was the sound beautiful, but society had never seen an instrument that could be played without physical contact. This created a stir in the music world, and showed that beauty could be achieved through technology. Since then, inventors have created several monumental instruments that have changed the music industry.

There are some key components to the modern synthesizer that makes them so versatile and diverse. The first component would be the oscillator. An oscillator is a tone generator. Some oscillators are very simple, creating only one tone at a time, others can be more complex, creating more that one tone at a time. An oscillator can also create different types of waveforms. These different waveforms (sine, triangle, sawtooth, square) create a different timbre and are a key factor to the diverse nature of electronic sounds. Another important aspect of a synthesizer is its filter. A filter is a tool that is able to either enhance or eliminate certain frequencies that are produced. This helps with the clarity of a synth, and enhance the sharpness of the tone. Different types of filters are used to modify the tones. A different example of an important factor of a synthesizer is it's envelope. The envelope's controls consists of four sections. They are the Attack, Decay, Sustain and Release. These four sections can be modified in order to control the dynamics of a single tone. The last example of a key component would be the LFO (low frequency oscillator). An LFO is an overtone generator that is essentially used to create a vibrato effect on the tone. This gives the synth a more acoustic effect, rather than a controlled tone and frequency that is produced by electronics, giving the overall sound a more natural tone.

Although there is an extreme diversity of the instruments and sounds that are created by

synthesizers, there is a single principle that binds all electronic instruments. The principle states that a tone can be created by one of two types of synthesis, additive or subtractive. The principle basically explains how different waveforms and frequencies are arranged together to create the final tone of the instrument. Imagine if an artist was creating two different sculptures using two different materials, one made from clay and one from stone. Their sculpting process would be completely different, but ultimately, both sculptures could look almost identical. With clay, the artist is able to take small pieces, mold and add them together. This is just like additive synthesis. A basic waveform is sculpted, shaped, and then added with other waveforms to create a sound complex sound using different waveforms and overtones. If the artist is using stone, then there is no way to connect or add pieces to the material, only to take away. This principle is the same with subtractive synthesis. When making a sound with subtractive synthesis, the synthesizer first starts with several different oscillators creating many different tones and overtones. It is the job of the artist to sculpt and take away any rubbish that is unnecessary to the integrity of the sound.

Throughout the history of music synthesis, the field has gained tons of popularity, and currently has found a comfortable space in todays popular music culture. One of the first popular groups to use commercial synthesizers was Pink Floyd. First popular in the late 60's, this British rock group was a pioneer in the use of synthesis. Pink Floyd's primary songwriters Roger Waters and David Gilmour wanted to achieve a different ominous feeling to their music, as well as have their songs recorded as though they were through composed. This gave them plenty of room to experiment with different sounds and effects produced by synthesizers. A little less than a decade later, pop star David Bowie started to used synthesizers in his music. Bowie's music was considered to be unlike any other of its time. Mixing acoustic and electric instruments, David was able to create a unique and futuristic sound that defined his career as a

musician. Following the path of Bowie, a popular 80's band called The Talking Heads was notorious for their progressive use of synthesis and music technology. Not only was this band using synthesizers as a primary instrument in their ensemble, but also was known for using electronic percussion in their recordings. These were popular tactics during the 80's, but The Talking Heads used these instruments very musically, and achieved a lot of recognition and fame for their clever instrumentation. After years of development and increase of availability, there was a massive surge in the popularity of synthesis in pop music. During the early 90's a band called Daft Punk started to gain fame in their homeland, France. The electronic duo was a band that was based entirely on music synthesis. The two helped define a massive cultural movement towards electronic dance music. Massive amounts of young people found this sound to be the future of pop music and immediately identified with this movement. Since the initial popularity of Daft Punk, pop music has slowly diverted to what today is an electronic revolution in music. Most pop music being produced these days uses very few (if any) acoustic instruments. This is because of the increase in versatility and user friendliness of these synthesizers. Entire instrumental songs can now be produced from sitting behind a computer with less time, and money. This makes it more appealing for record companies to invest in this type of music because it is more cost effective and still creates the same effect on the listener.

As a songwriter, I have been writing my own music with intentions of recording, promoting and selling my music. With this in mind, I too have utilized music synthesis into my own art. Although my songs do consist of acoustic instruments, there are several components of my songs that are produced with synthesizers. Most recently, I have been recording one of my lastest songs. Originally, the song was simple folk song. However, I felt a strong connection to the text, and felt like there was a lot of musical potential for the song that as outside of the traditional folk chords and instrumentation. After thinking of how I wanted to revamp the song, I

felt like there would be an easy transition from the folk sound, into an indie rock/ island sound. I then started to think of a rhythm guitar part. I chose to do this first, because the original song only had a rhythm guitar track written. This made it easy for me to transfer the chords into a different rhythm. After deciding on a format to my song, I then recorded the rhythm guitar track on Logic. After finding a proper guitar tone, I decided to add a drum part. This was the first instance of synthesis on the project. I used Logic's default drum instrument called Ultrabeat. After experimenting with some world percussion sounds, I decided to stay with traditional drumset sounds for the recording. Once these two tracks were in place, I felt the next logical step was to record a bass part. At first, I wanted to use synthesis for the bass part, but after several failed attempts to create a good tone, I turned back to the acoustic bass. This felt very natural for me to produce. I was able to comfortably play along with the track and fine tune any parts that may have caught my ear. After writing the bass part, it was recorded and dialed into the mix by adjusting tones and prominent frequencies. After, I then started to think about the effects that I wanted to create with my synthesizers. I started by working with some chordal ideas. This is predominantly in the chorus of the song. The first synth track I recorded was some inverted chords that accompanied the rhythm guitar. The timbre of the synth is very soothing and acts as a compensating tool to maintain fullness after the guitar chords dissolve. This proved effective and added a new timbre to the song as a whole. I then wanted to add a melodic component using a synth. After sampling different sounds, I found a preset that was close to the sound that I wanted. After changing some parameters on the filter and the LFO, I was satisfied with the sound. I then worked out the kinks with my melodic ideas, and recorded it to the track. This synth added a new hook to the song, strengthening to the chorus and the song as a whole. After adding a few more components to the song like a lead guitar track and vocals, I began to balance and mix the song to my best abilities. Currently the song is in an almost presentable

state. There is some mixing and equalization that needs to happen in order to achieve a radio ready product. However, the song has changed severely since day one of the recording process.

Looking back at the project, I am very happy with the ending results, of both my research and my experience in the studio. I was able to sink my teeth into a subject that I was both passionate about and that applied to my own creativity and art. Spending time in the studio also made me realize how involved the recording process is. Producers and audio engineers are highly skilled professionals who, over the years, develop an ear for many different flaws that could not be detected by an average human. I took time to think critically about some of these flaws, and did everything I knew how to do in pursuit of fixing them. Although I will alway be learning new information about music technology, this project was a huge leap in my development as a musician.