

LISTAHÁSKÓLI ÍSLANDS
Iceland Academy of the Arts

Electronic Dance Music (EDM)

Brief introduction of EDM production

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Abstract

This thesis provides a brief introduction of Electronic Dance Music (EDM) production and discusses the process of providing the audience with a maximized experience. The literature study for this thesis is based on books, articles, websites and a analysis of three tracks.

For the last two decades EDM has developed vastly and several genres have emerged under the EDM umbrella term such as House, Techno and Dubstep. The core of most EDM tracks, is the collaboration between drums and bass, hence the backbone of a dance track is the rhythm or so-called groove. To be able to create drum patterns and rhythms it is important to understand the basic drum sounds and rhythm techniques. To then cause the drums and bass to cooperate well, it is essential to understand various bassline composition techniques. At the same time synthesis is a crucial tool to understand for the reason it essentially produces the main sounds of EDM such as drums, bass, pads and effects. The mixing should then secure that every sound has its own space in the frequency spectrum and bring the mix into three dimensions. Furthermore, building energy in a track is substantially based on structure and arrangement such as breakdowns, buildups and drops. As a result of EDM being rather repetitive, the music has to include not only a dynamic journey which is endlessly evolving throughout the track but also a constant manipulation of the sounds to keep the interest going.

Table of contents

1. Introduction.....	1
1.1 Introduction	1
1.2 Aims and objectives	1
1.3 Method	2
2. Creating drums	2
2.1 Drum sounds	2
2.1 Rythm	3
3. Synthesizer.....	4
3.1 Analogue vs. digital and hardware vs. software	4
3.2 Harmonics	4
3.3 Filters	5
3.4 Oscillators	5
3.5 Envelope and LFO	7
3.6 Various types of synthesizers	7
4. Bass and basslines	8
4.1 Basslines	8
4.2 Bass synthesizer	10
4.3 Sub bass.....	10
5. Mixing	11
5.1 What do I need my mix to do?	11
5.2 EQ	11
5.3 Compression	12
6. Structure and Arrangement	13
6.1 Essential techniques	13
6.2 Structure analysis	14
7. Conclusion	16
8. Bibliography	17
9. Figure references	19

1. Introduction

1.1 Introduction

Electronic Dance Music (EDM) emerged in the 1980s, roughly at the same time as drum machines and synths. With the technology at hand, the urge to produce inorganic sounds and timbres developed and furthermore, the desire to make people dance. Even though this umbrella term over various music styles started to appear in the 1980s, it was not until the last two decades that EDM rapidly developed and became mainstream.¹ EDM is now not only played on radio stations, festivals and clubs but is also heard in advertising, video games, television and in movies such as *The Social Network* (an Academy Award winner for Best Original Score), *Divergent* and *Neighbors*.

EDM includes genres such as Garage, Techno, House, Trance, Trip-Hop, Ambient, and Drum 'n' Bass. Although they all have specific traits, it is often hard to categorize EDM tracks into one specific genre for the reason that EDM has no strict rules to follow. I myself did not acknowledge the genre until 2015, same year as my interest was drawn to music production. One of the reasons for me being intrigued by Electronic Dance Music was that it does not have many principles or rules concerning music theory. Instead, EDM focusses on structure-based composition rather than note-based.²

EDM is a big topic yet this thesis has a limited word count, thus instead of discussing the EDM culture for example, the focus of this thesis will be directed at a few basic elements and parameters of EDM.

1.2 Aims and objectives

With that in mind, the aim and problem statement of this thesis is to give a basic introduction of EDM production and how to maximize the audiences experience of EDM. In order to achieve this, the following objectives has been chosen:

- Different methods to create drum patterns and rhythms.
- Brief introduction of some aspects of synthesizers.
- Sound design for bass and composition methods for basslines.
- What do I need my mix to do?
- Typical structures and arrangements in EDM.

¹ Matos, Michaelangelo. "Electronic Dance Music." *Encyclopædia Britannica*, 23. November 2016, accessed 16. December 2017. www.britannica.com/topic/electronic-dance-music.

² Halick, Mary E. "What Can You Teach with Electronic Dance Music? A Music Teacher's Guide to EDM", *General music today* Vol 30, Iss 1, 2016, accessed 13. December 2017, doi:10.1177/1048371316637887.

1.3 Method

To solve these objectives the thesis will be a literature based study. The thesis is primarily based on Felton's, Scarth's and Chris's book "The Secrets of Dance Music Production".³

The choice to mainly base the study on a singular book comes from the experience of researching various outdated books that did not apply to the aim of this thesis. Even though other books have similar content, EDM is evolving fast which means the more up to date the book is, the better. The book chosen has a modern and straight forward explanation of Electronic Dance Music which suits the word limitations of this thesis.

To connect the discussed objectives with concrete produced EDM tracks, the thesis will include tracks as references and a specific track will be analyzed for its structure.

2. Creating drums

2.1 Drum sounds

It is possible to program drums with a single drum machine only using its built-in sequencer. Another option is to program it with MIDI patterns in a DAW or play around with drum pads or triggers to have a more hands on feel while creating the drum pattern. With today's technology, there are vast possibilities of drum sounds but even though the opportunities have expanded the rudimentary categories of drums still consists.

Kick drum, also known as bass drum is the core of a dance tracks beat. Out of all drums, the kick drum takes up the lowest frequency space. It gives a punchy low-end energy with its short attack time and its distinctive click at the beginning of it. To put in mid-range contrast to the low-end drum kick you have the snare and/or clap. The sound of a snare drum or clap is sometimes from actual recordings but it is also common to use synthesized drums. To get a more exclusive sound, some producers layer snare and claps together for a hybrid sound effect. For the higher frequency spectrum, there are drums such as toms, congas and bongos. The pitches on these drums are highly defined and adds a certain character to a beat. They can be tuned up or down to a key and that way easily interact with other elements. Cymbals are another well used drum group in dance music, where the most used one is the hi-hat. To drive the beat forward the hi-hat is commonly set up as a sequence of constant hits over a bar or by playing around on the offbeat. Percussion such as claves, shakers, finger clicks and rim shots often cooperate with the hi-hats to enhance

³ Felton David, Greg Scarth, and Chris Barker. *The Secrets of Dance Music Production*. 2nd ed. (London: Attack Magazine, 2017).

the groove. The ride cymbal is used in a similar way as the hi-hat, the difference between them is that the ride cymbal has a more tuned sound and a longer decay. The cymbals that are less used such as crash and splash, have a big role in transitions between the start of a bar or at the end of it.⁴

As mentioned before these drum sounds are vastly used and have become a norm in the EDM world. Even so, more contemporary drum sound techniques are emerging in modern tracks such as “Urban Surfer” by Audialist⁵, where the percussion driving the track forward is not a cymbal but rather resembling a manipulated clock sound.

2.2 Rhythm

Rhythm is known as the base of EDM tracks. It is what drives the track forward and what urges people to dance. “As a dance-based genre, rhythm is essential and it is vital to never “lose” the beat.”⁶ The typical form of an EDM rhythm is the so called *four on the floor* rhythm. In this rhythm, you have the kick drum on beat 1, 2, 3, 4 and the snare drum on beat 2 and 4. You can then add a hi-hat that plays 16th notes over this rhythm. Even though this is a base of the rhythm, it is important to add constant variations into EDM to keep the listeners attention. One common variation in EDM is *hemiola*. It is where you subdivide a bar into a triplet rhythm over the already existing one, which creates a cross meter modulation between the on grid and the off-grid beat. *Polymetering* is another well used method. There you have two different rhythms of differing bar lengths, running at the same time but moving in and out of sync with each other. You can also play around with the accent between the on and off beats. In a 4/4 time signature the on beats are on 1 and 3, while the off beats are on 2 and 4. Traditionally the music is stressed on the on beat but as a variation you can change it to the offbeat. This is called *syncopation*. On to the last variation, we have the so-called *swing*. This is a very subtle change but definitely one of the important ones. To create swing you program parts, such as a snare, to be either slightly early or late. If you program it to be slightly early it will give a more driving effect while if you program it to be slightly late it will give it a more relaxed feel.⁷

⁴ Felton David, Greg Scarth, and Chris Barker. *The Secrets of Dance Music Production*, 8-9.

⁵ Audialist. *Urban Surfer*. In: Audialist. Deep Heads. 2014.

⁶ Halick, Mary E. “What Can You Teach With Electronic Dance Music? A Music Teacher’s Guide to EDM”.

⁷ Snoman, Rick. *Dance Music Manual: Tools, Toys, And Techniques*. 3rd ed. (Burlington: Focal Press, 2013, 39-48

3. Synthesizer

3.1 Analogue vs. digital and hardware vs. software

Synthesizers are what absolutely defines Electronic Dance Music. Synthesis is used to create core sounds of a EDM track such as pads, leads, bass and drums. At the early stages of synthesis, the options were more limited, compared to today where you have access to *analogue* or *digital* and *hardware* or *software*.

The analogue synth was the first synth to arrive at the scene and still produces a unique sound that many producers or musicians search for. “Analogue signals are continuous electrical currents which vary in frequency and amplitude.”⁸ The processes that appears in an analogue synth, takes place in the analogue domain. An analogue signal, created by the *oscillators*, comes through and is then shaped by analogue filters and VCAs. A digital synth on the other hand, drives on digital signals that are based on sequences of pulses that only resides of 1s and 0s. Using complicated digital signal processing (DSP), the digital synth creates its sound altogether in the digital domain. It is not until the final stage of the signal path, that the digital synthesizer transforms it into an analogue signal and then sends it to the audio output socket. The difference between hardware synth and software synth can also be easily explained. A hardware synth is a physical equipment that is not dependent on a computer or a DAW such as synths and drum machines. For the software synth, it is all computer based. It is most commonly used as plugins in a DAW but can also be used as independent applications.⁹

3.2 Harmonics

“In the instrumental world sound is made up of the fundamental frequency of the note played – for (middle) C4 this is 261.6Hz – and a series of overtones above the fundamental called harmonics that are unique to the instrument.”¹⁰ Synthesis is based on the same process as these instruments. “In synthesis, a synthetic waveform is made up of the fundamental frequency then multiples of that fundamental, depending on the nature of the waveform.”¹¹ Hence what defines a synthesizer’s sound is the unique blend of fundamental plus harmonics.

⁸ Felton David, Greg Scarth, and Chris Barker. *The Secrets of Dance Music Production*, 79.

⁹ Felton David, Greg Scarth, and Chris Barker. *The Secrets of Dance Music Production*, 78-80.

¹⁰ Felton David, Greg Scarth, and Chris Barker. *The Secrets of Dance Music Production*, 72.

¹¹ Felton David, Greg Scarth, and Chris Barker. *The Secrets of Dance Music Production*, 72.

3.3 Filters

Filters are purposed to shape the oscillator waveforms even further by deducting frequencies, and in that way, frame the harmonic content of the sound.

- On a synth, the *low-pass filter* is the most common one. While allowing the lower frequencies pass through, it reduces the volume of frequencies exceeding the cutoff point.
- The opposite of a low-pass filter is the *high pass filter* which allows the higher frequencies pass through untouched while reducing the level of lower frequencies above the cutoff point.
- Furthermore there is the *band-pass filter* that allows the frequencies on the band through while reducing the frequencies below and above.
- Likewise, the band-pass filter has an opposite filter called *band-stop filter*, thus letting the frequencies below and above through and cuts down the level of frequencies on the band.¹²

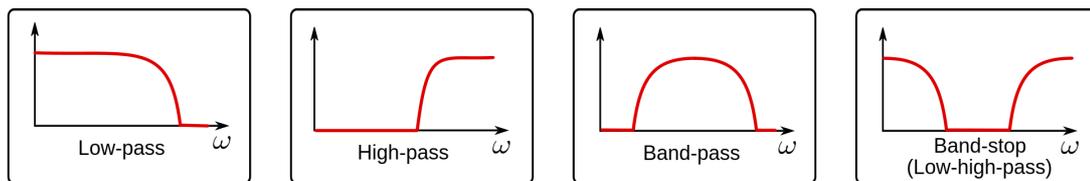


Figure 1. Low-pass, high-pass, band-pass and band-stop filters.

3.4 Oscillators

The oscillator is considered to be the core of a synth, after all it is where the waveform outset takes place. Most synths have several options for the oscillator waveform such as the sine waveform, square waveform, pulse waveform, triangle waveform and sawtooth waveform.

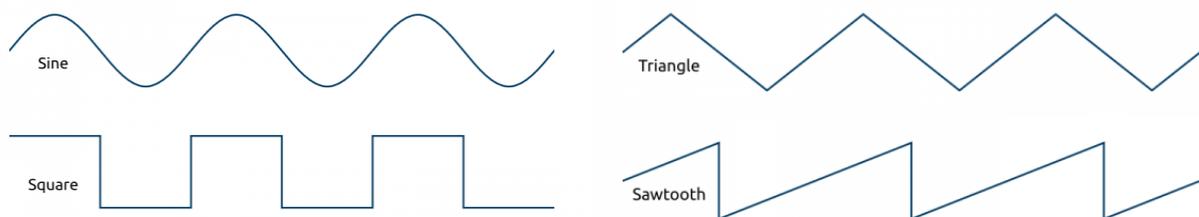


Figure 2. Oscillator waveforms: Sine waveform, square waveform, triangle waveform and sawtooth waveform.

¹² Felton David, Greg Scarth, and Chris Barker. *The Secrets of Dance Music Production*, 74.

- Out of all these waveforms, the *sine wave* is the most basic one. The sine wave does not consist of any harmonics which makes it sound as a single fundamental tone. It is mostly used to create sub-basses but it is also typical to mix it with other waveforms to give the sound more body or power.
- The next waveform, the *square waveform*, only stands in two states: high and low. It is often described as hollow or woody and is commonly used for imitating wind instruments. It also brings more width to strings and pads but can also create a smooth bass and lead sound.
- The *pulse waveform* is quite alike the square waveform, the difference is that in the pulse waveform you can adjust the width of the high and low states. It is rare to have both of these waveforms in the same synthesizer as a result of being similar to each other. A common use of the pulse waveform is for soundscapes and pads.
- To add a bright effect to a sound, the *triangle waveform* is a common solution. It is typically mixed together with a sine wave, square wave or pulse wave to add a sparkling effect on a pad.
- Furthermore there is the *sawtooth waveform*, the most popular and used waveform. It has the strongest harmonic content and is therefore great for sweeping and sculpting a sound with filters. If you want to construct a big and full sound this is the go-to waveform. It is commonly used for intense basses, big leads and soft, broad pads.
- A *noise generator* is another option that is quite common among synths. It generates random numbers that then triggers particular bands of frequencies. White noise occupies the whole frequency spectrum while the pink noise is more concentrated on the low end of the frequency spectrum. Both of these are frequently used for risers, fallers and also for adding lo-fi grit to keys, leads, basses etc.¹³ A *riser* is an effect that is usually put in as a tension builder. An example is a low-pass filter on a synth with a sawtooth waveform and a noise generator. This filter will gradually open up, the closer it gets to the end of the rise. For even further tension building, a pitch shifter can be inserted and in that way, pitch the

¹³ Felton David, Greg Scarth, and Chris Barker. *The Secrets of Dance Music Production*, 72-74.

waveform gradually up until the rise has finished. *Fallers* are the opposite of risers, here the filter will gradually close up to distinguish the end of a section.¹⁴

3.5 Envelopes and LFO

Like the oscillator waveform, *envelopes* are generated directly after a note is pushed. ADSR is a well-known envelope generator that includes four parameters: Attack (A), decay (D), sustain (S) and release (R). From the moment, a note starts to exist, the attack controls how fast the sound goes from silence up to peak level. Decay is the time it takes for a signal to decline down to the sustain level. The value of the note played, decides how long the sustain level continues and when the note ceases, the release time determines how fast the level declines to zero. Another method called *LFO*, can also be used to shape the final sound even more. LFO works in the same way as an oscillator waveform although it is set to cycle below 20Hz which is the limit for human hearing. Even though the human ear cannot hear the LFO signal, it does effects the other signals that we can hear, such as a sawtooth wave or sine wave. LFO is mostly used with the common waveforms mentioned above (p.5) but can also be used with more complex waveforms. The speed, or sometimes called rate, of the LFO is usually measured in Hz and controls how fast the waveform is operating. Another common function of an LFO is the note-on triggering, a function which retriggers the LFO waveform every time a note is played. LFOs and envelopes can be used to change the sound of a signal, such as pitch, filter, cut-off, volume etc.¹⁵

3.6 Various types of synthesizers

There are various synthesizers with different methods of producing and shaping sounds. *Monophonic* and *polyphonic* synthesizer are simply explained as, a monophonic synth can only play one note at a time while a polyphonic synth can play several notes at the same time. A *subtractive synthesizer* starts off with a produced waveform out of the oscillator. The waveform is then shaped by reducing particular frequencies with a filter. Hence it deducts frequencies which explains the name subtractive synthesis. Likewise, the name explains the method well in a *additive synthesizer*. The synthesis adds various waveforms on top of eachother, a method which produces new fascinating sounds. Although there is one problem with this certain method concerning analogue hardware. The waveforms that are produced in a analogue hardware are hard to tune completely, hence if various detuned waveforms are layered on top of eachother, the results will vary. In digital hardware the

¹⁴ ADSRtuts. "NI Massive - 3 Types of Risers." *YouTube*, 6. August 2015, accessed 18. December 2017. www.youtube.com/watch?v=DeQ6YCnrHrI.

¹⁵ Felton David, Greg Scarth, and Chris Barker. *The Secrets of Dance Music Production*, 72-78.

waveforms are always tuned except if you deliberately detune them, hence this problem will not occur and additive synthesis is a preferred method using digital hardware. *Frequency-Modulation (FM) synthesis* is another well-known procedure. The synthesizer generates a low frequency waveform which the human ear can not hear. That waveform then interferes with the actual waveform, which humans can hear. Hence, if the synthesizer generates a sine waveform which can be heard, the rogue, low frequency waveform will then affect the sine waveform which results in the transformation into a new sound.¹⁶

4. Bass and basslines

4.1 Basslines

In EDM, the bass functions both as a rhythmic element and as a melodic one. With a rhythmic bass, a track secures a solid ground to build upon while a melodic bass has the opportunity to give a track a unique character. The bass occupies the lower frequency spectrum just as the kick drum does, hence the importance of them working well together, a task that is hard to accomplish. To achieve this task, it is important to have the bass and kick drum, concentrate on different frequencies in the low-end frequency spectrum by using filters. Another method is not to have the bass and kick drum play at the same time or at least reduce the occurrence of it. Over the years different methods of creating basslines has emerged and developed. According to Felton, Greg and Chris, there are eight archetypes.¹⁷

- The *off-beat bass* is a simple way of making a track thrive forward by placing the root notes of the chord progression inbetween each kickdrum. This way it accomplishes a good rhythmic cooperation with the kickdrum and also dodges problems related to frequency overlapping.
- A variation of the off-beat bass is the *root rhythm*, a method where the bass has the flexibility to break away from the off beat rhythm but typically sticks to the root notes. For example, the bass notes could instead be set on the beat with the kickdrum or even play 16th notes. An example of the root rhythm technique can be heard in the track “Rhythm Of The Night - Remix” by Fedde Le Grand¹⁸, where the

¹⁶ Snoman, Rick. *Dance Music Manual: Tools, Toys, And Techniques*, 92-93.

¹⁷ Felton David, Greg Scarth, and Chris Barker. *The Secrets of Dance Music Production*, 104.

¹⁸ Fedde Le Grand. *Rhythm of the Night – Remix*. In: Something real. Ultra Records. 2016.

bassline is mostly playing on the off-beat yet still has a more evolved rhythm than the off-beat bass.

- *Noodle bass* is a more fluid bassline where the movement between notes is the key. It skips freely between notes and octaves with a energetic rhythm and like the others, it tends to slip back to the root note although it does so very liberally with slides and riffs.
- For a different approach, using *bass as a lead* is another method that instead of providing the foundation for a track, it acts as the star of the show. The big task for a basslead is to make sure it is not only occupying the low end frequency spectrum but also dips into the higher frequencies where the actual lead would be. Failing to do so can leave a hole in the frequency spectrum and make a track appear empty.
- *Ostinato bass* has the character of constantly repeating a pattern, something bass as a lead commonly applies. Because it is a repeating pattern, the ostinato bassline needs to be rhythmically, melodically or tonally interesting. It also requires the other elements of the track to constantly evolve and change, this way it keeps the listeners attention through out the track.
- With *modulated bass* you incorporate movement, texture and dynamics into one element. Even though modulated bass is based on simple melodies only involving two or three notes, adjusting LFO, envelopes and automation maintains the listeners attention. Hence, the importance of modulated bass is having constant changes in volume, harmonics, pitch etc.
- A natural expansion of the bass as a lead is the *multi-patch bass* which uses several bass sounds that continuously develop their tones throughout the track with cutoff frequencies, LFOs and envelopes.
- For a complete opposite method there is the *no bass* archetype. If there is already a low-end frequency element in the track, there might not be a reason to put in a bassline at all. An example of this is a kickdrum with a long sustain/release time that fills out the gap where the bass usually would be. Variations of this can be made by adding pitched kick drums over the original one to imitate a bassline.¹⁹

¹⁹ Felton David, Greg Scarth, and Chris Barker. *The Secrets of Dance Music Production*, 104-107.

4.2 Bass synthesizer

Most basslines in dance music are synthesized, hence the importance of understanding how to create and shape a bass synthesis. The number of oscillators used, depends on what sound you are searching for. If a lead is bass, it is common to layer oscillators in different octaves to reach the higher frequency spectrum that the lead usually occupies and the low-end frequencies which the bass occupies. Adding sub with a sinewave, one or two octaves down is a good way to add more bottom to a bass. For a fuller, rounder and warmer sound, add a sawtooth wave and to thicken the sound even further, detune the oscillators slightly with the fine-tune dial. Another way to thicken the sound is accomplished by switching unison on which adds multiple, slightly detuned, slave oscillators. ADSR play an important part in how the bass sound works with the kick drum. Short attack time gives a punchy bass although too short of an attack time can result in clipping in the transients. The sustain time is also very delicate when dealing with bass synthesis. Too long of a sustain time can make the bass and kick drum overlap while too short of a sustain can leave unwanted gaps between the bass and kick drum. With LFO or envelopes transmitted to filter cutoff, wobble bass like in the genre Dubstep can be created.²⁰ Furthermore, smoother transitions between notes is accomplished by *portamento* or *glide*, a technique to slide in pitch between notes, a good way to shape a noodle bass.²¹

4.3 Sub bass

In dance music, it is common to layer a sub bass one or two octaves lower than the actual bass, to include one bass that you can hear and then another one which you can feel. When programming a sub bass, it is important to understand the frequency range to achieve the best results possible. According to Attack magazine, club sound systems do not play frequencies below 30-45Hz.

A good rule of thumb is to go no lower than E1 (43.65Hz), a frequency that will translate on all but the cheapest club speakers. This rule of thumb helps explain why so many dance tracks are made in the keys of F and G – where the root fundamentals of kick and sub hit at rig-friendly 40-50Hz.²²

Hence there is no point in having a sub bass going lower than 30-45Hz, it will simply not be played. There are different approaches to create sub basslines, one which is simple but affective is to use the main bassline an octave or two lower. Another way is to program a

²⁰ Felton David, Greg Scarth, and Chris Barker. *The Secrets of Dance Music Production*, 108.

²¹ “Legato Synths: Glide, Slide & Portamento.” *Attack Magazine*, 17. December 2015, accessed 19. December 2017. www.attackmagazine.com/technique/passing-notes/legato-synths-glide-slide-portamento/.

²² Felton David, Greg Scarth, and Chris Barker. *The Secrets of Dance Music Production*, 114.

sub bassline on its own, although this tends to be simpler than the main bass. Concerning the oscillator soundwaves used for sub bass, the sine and triangle wave is the optimal option. These waveforms do not have as many harmonics which will intervene with the upper octaves and frequencies of the track.

5. Mixing

5.1 What do I need my mix to do?

Mixing is the step where every element of the track comes together. Every sound needs to have its own space in the mix to balance the track out. The main question while mixing is, according to Felton, Greg and Chris, “What do I need my mix to do?”²³.

In EDM, tracks are specifically mixed for club sound systems, thus the most important section of the frequency spectrum in the mix, is the low end, the part which will get people moving in a club. The mix should still fill out most of the frequency spectrum but the main aim should be the low end. For another important aspect of a mix, there are the three dimensions. There is the stereo field which works ‘horizontally’ by panning elements to the right or left. Second dimension is the vertical one that is dominated by the frequency domain. For the third dimension, the elements can be moved back or forward in a mix. For moving a track forward, it is crucial to keep the signal loud, bright and transient-rich. However, if it is desirable to move the signal back in a mix, the method is the complete opposite. The signal volume has to be reduced, high frequencies needs to be rolled away with a filter and the attack of a signal also has to be reduced. Although there are three dimensions available, it is important to remember that not all situations where the music is being played, have the ability to perform in three dimensions. For example, in a club, a listener might be closer to the right side and therefor miss out important elements that are panned to the left side. Therefore, it is important to make a mix work in one dimension, two dimensions and three dimensions.

5.3 EQ

“EQ, short for equalization, is a process that uses filters to shape the tonal characteristics of a sound by cutting or boosting the volume of selected frequencies within it to balance the whole.”²⁴ That means *EQ* can be used to either cut unwanted frequencies or boost desired frequencies for either creative or corrective reasons. Thus, it can be used to shape the tone of the signal for a creative effect or remove unwanted frequencies for a corrective purpose.

²³ Felton David, Greg Scarth, and Chris Barker. *The Secrets of Dance Music Production*, 11

²⁴ Felton David, Greg Scarth, and Chris Barker. *The Secrets of Dance Music Production*, 210.

The common filters for EQ are high filters and low filters (see p.5), shelving filters and bell filters.

- *Shelving filters* consists of either high shelf or low shelf filter. In high shelf filter, frequencies above the threshold are either boosted or cut and the rest of the spectrum remains intact. The low shelf filter has the opposite effect. It only affects the section below the threshold.
- *Bell filters*, named after the bell shape it takes on, can either boost or cut frequencies around the middle point frequency area.

To control the behavior of EQ you have the *center frequency* that, in Hz, controls at what frequency the EQ starts to cut or boost. Then there is the *bandwidth(Q)* which controls the width of the frequency range, being affected by the EQ. The higher the Q value, the narrower the range is. Of that selected Q range, the *gain/boost/cut* controls the increase or decrease in volume of those frequencies. To control how sharply the filter and EQ rises or falls, there is the *slope(dB/octave)* controller which in simple words manages how sharply the frequencies are being effected. There are two well-known methods of using EQ. One of them is *bracketing*, a method that with either high or low-cut filters, cuts out parts of the frequency spectrum of a signal which is not wanted or not being used. “Forensic cuts are used to tame unpleasantly rampant rogue frequencies that may be present in a signal.”²⁵ Thus, the *forensic cut* method is used to clean up specific frequencies with a high Q value which can be adjusted after taste.

5.4 Compression

Compression controls the dynamic range of a signal by reducing the peaks hence compressing the audio. Compression can also be used for sound shaping purposes as increasing the attack or sustain of a sound. Bear in mind that compressors can also alter the color of the signal, something that can be creatively desirable at sometimes.

Measured in dB, the *threshold* controls at what level the compressor starts to cut down the volume. The signal below the threshold goes through the compression intact while the volume of a signal above the threshold gets reduced. The extent of volume reduction on a signal above the threshold is then changed by the *ratio* controller. Furthermore, the *attack* controls how quickly the compression kicks in while the *release* controls how fast it descends back to 0dB volume reduction. The *knee* is in control of the behavior of the compression. The compression on a hard knee starts to work as soon as the signal breaks

²⁵ Felton David, Greg Scarth, and Chris Barker. *The Secrets of Dance Music Production*, 210-211.

through the threshold while on a soft knee, the compression starts to work when the signal is imminent of the threshold by rising the ratio higher until the threshold is breached and then enforces the full ratio. The last step of a compressor is the *make-up gain*, where you push back the volume you have lost by reducing part of the signal.²⁶

Side-chain compression in EDM is crucial for the process of enhancing the kick drum in a track. In side-chain, an external signal is fed through the compressor and when that signal is active, the volume of the signal that has the compression on it decreases. DJs for example, use this method by putting a compressor on the backing track yet has the signal from a microphone be the side-chain signal. That way the music decreases when the DJ talks in the microphone. In EDM production, a trick is to have the whole track except for the kick drum, have a compressor on it and the side-chain signal would be the kick drum. This results in the track “ducking” when the kick drum is active hence the kick drum can punch through the track even though the bass and other elements are occupying the same frequency spectrum. Using side-chain in this manner also results in the track pumping with the kick drum which adds further movements to the music.²⁷

6. Structure and arrangement

6.1 Essential techniques

Now that a few fundamental building blocks suited for the scale of this thesis has been mentioned, another important aspect has to be recognized. So far, this thesis has mostly discussed EDM from a producer’s point of view while the audience’s experience is just as important. EDM’s average tempo is 120-130 beats per minute (bpm), a number that has become custom as a result of people easily dancing to that pace. As mentioned before a good basis for an EDM track is the collaboration between a solid drum groove and the ever-evolving bass. This alone has the strength to make people move their feet although the experience for the audience can be enhanced with dynamics. Regarding dynamics, the contrasts are what builds the energy and the desire to dance. Contrasting light and dark, soft and loud, builds and drops is a way of keeping the energy ever so changing which maintains the attention of the listener.²⁸ Another important matter regarding energy, is the development of sounds throughout a track. “A great mix is a living, evolving thing. It has

²⁶ Felton David, Greg Scarth, and Chris Barker. *The Secrets of Dance Music Production*, 213-214.

²⁷ Snoman, Rick. *Dance Music Manual: Tools, Toys, And Techniques*, 123-125.

²⁸ Felton David, Greg Scarth, and Chris Barker. *The Secrets of Dance Music Production*, 238.

sustained interest that engages the listener from start to finish.”²⁹ To accomplish this there are a couple of tricks to be used. Breakdowns, buildups and drops are good examples of keeping the listeners attention. *Breakdown* is the calmest section of a track involving melodies and atmospheric sound design. The reason for a breakdown is the opportunity to build the tension from scratch which will magnify the climax of a track. The *buildup* essentially amplifies the tension to a maximum with a riser for example, before the drop. It is important to use the buildup as a transition tool, hence it often includes elements from the breakdown and the drop for a smoother arrangement. Then comes the *drop*, the section which the audience has been anticipating. The drop should be the most energetic and catchy section of the track thus the section where people dance the most. Another good approach to engage the listener even further is playing around with the arrangement. Have some elements drop out at some points or have some small elements that might only surface once or twice in the track. “For example, removing the bass drum line creates a temporary feeling of loss and builds anticipation of the eventual dramatic return of the beat.”³⁰ Every change in the arrangement will give the audience more opportunities to engage with the track in different ways. For further changes, automation is always a good choice. Automation can reduce or increase volume freely and even better, it can tweak the parameters of envelopes, distortion and filters too. The last but not least trick is the so called ‘ear candy’, where sound effects (FX), samples, *sweeps*, risers, fallers etc. are inserted in the track to give it unexpected colors.³¹ Sweeps are similar to risers apart from it being considerably quicker.³²

6.2 Structure analysis

EDM is produced with the aim to make the audience dance yet also to take them on a vivid journey to maximize their experience.³³ The chosen track to analyze “Pizza” by Martin Garrix³⁴, does exactly as mentioned above.³⁵ When analyzing “Pizza”, the structure of it contains breakdowns, buildups and drops. It starts off with a majestic orchestral intro or

²⁹ Felton David, Greg Scarth, and Chris Barker. *The Secrets of Dance Music Production*, 235.

³⁰ Halick, Mary E. “What Can You Teach with Electronic Dance Music? A Music Teacher’s Guide to EDM”.

³¹ Felton David, Greg Scarth, and Chris Barker. *The Secrets of Dance Music Production*, 234-241.

³² imamusicmogul. “How to Make EDM FX Sweeps.” *YouTube*, 8. December 2015, accessed 18. December 2017. www.youtube.com/watch?v=IOx4ymBSSPQ.

³³ Solberg, Ragnhild Torvanger, “Pleasurable and Intersubjectively Embodied Experiences of Electronic Dance Music,” *Empirical musicology review* Vol 11, Iss 3, 2017, accessed 13. December 2017, doi:10.18061/emr.v11i3-4.5023

³⁴ Martin Garrix. *Pizza*. STMPD RCRDS. 2017.

³⁵ Cihak, Lennon. “Have a Slice of (and Listen to) 'Pizza' with Martin Garrix.” *EDM.com*, 25. August 2017, accessed 19. December 2017. edm.com/articles/2017/8/25/martin-garrix-pizza.

breakdown where the main melodies are introduced. The breakdown then transits into a buildup section. To make that transition smooth, Martin incorporates some of the buildup elements into the end of the breakdown section. In the buildup, there are both noise generated risers and pitch risers. To underline the buildup, the drums go from a quarter note value to a semiquaver value which interacts well with the pitch riser, which is also advancing in a semiquaver value. Following the buildup is the drop, the most energetic section of the track. Here the main melody is very noticeable by layered synth sounds in at least two different octaves and supported by a strong four on the floor beat.

7. Conclusion

In conclusion, this thesis gives a brief introduction to EDM production by explaining the basic drum sounds and how to use them to make drum patterns and rhythms such as the four on the floor rhythm. The rhythm section also included numerous variations to enhance the audiences experience. Furthermore, a brief introduction of some aspects of synthesizers was made by presenting various kinds of synthesizers, filters, LFOs, envelopes and oscillators. For the reason that most of the sounds in EDM are commonly produced by synthesizers, this was an important step to aid for a deeper understanding of the core sounds of EDM such as bass, pads, synths and drums. Concerning the sound design of bass, there was an introduction of various techniques to achieve a good sound depending on the bass composition. For example, the ostinato bass works well with portamento which allows the quick note-changing bass to pitch glide between the notes. Furthermore, seven other bass composition methods such as the off-beat bass and the modulated bass was introduced. In this section, a reference to a track called “Rhythm Of The Night” was made to underline how the root rhythm bass can work in practice. Mixing is another important aspect of EDM production. As explained in the thesis the mixing should put the track in three dimensions by panning left or right, station elements in different parts of the frequency spectrum and controlling the appearance of an element being either in the front or in the back of a mix. To achieve this, EQ and compression are two well-known methods. To maximize the audiences experience in EDM, the structure and arrangement is a big part of the equation, for that is where the dynamic journey is created with breakdowns, buildups and drops. All of these structure sections become enhanced with risers, sweeps, fallers and other sound effects to achieve an amplified experience for the audience.

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9. Figure references

Figure 1: SpinningSpark. *Filter bandform diagrams*. 4. January 2009.

Figure 2: Mckay, Duncan. *Waveforms*.