

Iter Musicis

An audiovisual EP

Submitted in Partial Fulfillment of the Degree of
Master of Music in Music Production, Technology, and Innovation

Supervisor: Pablo Munguía

by Varnavas Koromias

Berklee College of Music, Valencia Campus, Spain

July 2019

Table of Contents

Acknowledgements	iii
Abstract	iv
1. Introduction	1
2. Review of the State of the Art	2
3. Description	4
4. Innovative Aspects	8
5. New Skills Acquired	9
6. Challenges	11
7. Future Ramifications	14
8. Conclusion	15
9. Appendix	16
10. Bibliography	13

Acknowledgements

I would like to acknowledge all of the Berklee staff that helped with the progression of this Culminating Experience project, including but not limited to my supervisor Pablo Munguía. Mr. Pablo challenged me to pursue a unique and ambitious goal which would not be possible without his feedback and advise. Frederic Warnecke has given valuable feedback towards my progress, and Benjamin Cantil, is responsible for the class where I composed the track titled Mothership of Doom. In addition, I thank my colleagues Rayhan Rafique and Arash Rezaei who have helped with numerous recordings and gave feedback to my compositions. I would also like to give a special thanks to my brother, Yiannis Koromias for helping with the EP artwork and my parents Chloe and Georgios Koromias, for endlessly giving mental support throughout this year. Last but not least, I would like to thank my God and Savior Jesus Christ for giving me the talent to compose and strive for the best, as well as the opportunity to be a part of the Berklee community.

Abstract

This CE consists of an EP titled “Iter Musicis”, Latin for “Music trek”, which signifies a musical journey. As such, the scope of this project is to engage the listener in a melodious venture. This is done by combining the composer’s influences into a blend of progressive rock/metal, electronic, and classical music. In turn, the music is accompanied by oscilloscope visuals which are programmed using 3D modeling and sound design. The visuals accompanying the tracks revolve around the composer’s reflections on his own compositions and what imagery they bring forth when listened to by the artist. The tracks featured in this EP will be part of a full-length album. By completing this project, the composer has gained experience in composition, sound design, mixing, as well as 3D and 2D modeling.

Keywords: EP, Progressive rock, Progressive metal, 3D, 2D.

Introduction

The purpose of this culminating experience is to deliver an EP that guides the listener to experience a musical work that showcases the amalgamation of all the composer's influences while blending them with a unique visual aspect. The EP consists of four instrumental tracks in the style of progressive rock/metal heavily influenced by bands such as Dream Theater, Opeth¹, Dark Tranquility², Devin Townsend³ and Theocracy⁴, while also incorporating electronic and classical influences. These styles are what the composer grew up listening to and educating himself about throughout the course of his artistic journey and thus are the primary thrust of what makes the EP personal and unique. By completing this project, the artist attained experience in multiple areas including composition, sound design, recording, mixing, and 3D/2D modeling, skills that are crucial for the artistic development of the musician.

¹ Opeth Official Website. Accessed December 19, 2018. <http://www.opeth.com/>

² Dark Tranquility Official Website. Accessed December 19, 2018. <http://www.darktranquillity.com/>

³ Townsend, Devin. "About Devin Townsend: HevyDevy.com: Devin Townsend's Official Website." HevyDevy.com | Devin Townsend's Official Website. Accessed July 05, 2019. <https://www.hevydevy.com/about-devin/>.

⁴ Theocracy Official Website. Accessed December 19, 2018. <https://theocracymusic.com/>

Review of the State of the Art

When it comes to progressive music, many bands have created albums that encompass a variety of musical styles. One of the main influences that inspired the composer to create such works is Dream Theater's "Metropolis Part 2: Scenes from a memory"⁵, an album that combines thrash elements with sophisticated harmonic progressions and odd time meters. In addition, Devin Townsend, who is known for blending multiple styles into his compositions including ambient, choral music and technical death metal, has a notable influence on the composer's repertoire. Further influences include bands such as Dark Tranquillity, who are known for being one of the pioneers of Swedish melodic death metal; this style combines fast guitar riffs, odd time signatures that occur within songs, as well as catchy melodic sections backed up by keyboards and synthesizers. Another notable inspiration is Galneryus⁶, a band that combines neo-classical music with progressive power metal; a style known for its happy, fast and technical virtuosic nature, as well as Periphery⁷, a band known for its low tuned heavily syncopated music.

When it comes to the visual aspect of the EP, only a couple of composers have been using oscilloscope visuals including Chris Allen⁸ and Jerobeam Fenderson⁹. Jerobeam Fenderson is known for sculpting shapes using sound design techniques either through using modular synthesizers, or by designing sound patches with visual programming languages such as Max

⁵ Dream Theater. *Metropolis Pt. 2*. BearTracks Studios, October 26, 1999, <http://dreamtheater.net/discography/metropolis-pt-2/>.

⁶ Galneryus Official Website. Accessed December 19, 2018. <https://www.galneryus.jp/ja>

⁷ Periphery Official Website. Accessed December 19, 2018. <http://www.periphery.net/>

⁸ Allen, Chris. "C. Allen | Domination (Oscilloscope Music)." YouTube. November 23, 2017. Accessed November 27, 2018. https://www.youtube.com/watch?v=HwBUHu36M_I.

⁹ Fenderson, Jerobeam. "Jerobeam Fenderson - Blocks." YouTube. October 03, 2016. Accessed November 27, 2018. <http://www.youtube.com/watch?v=0KDekS4YUy4>

MSP and Pure Data in order to have complete control over the visual nuances. In addition, Chris Allen is using sound synthesis to create shapes, but he also works with another approach by sculpting sound with shapes through using Blender.

Description

This project is all about creating a composition that blends the artist's influences in a way that is fresh and original. In addition, the work is accompanied with a unique visual aspect in the form of oscilloscope visuals. These visuals are generated using sounds that are specifically designed to look good on an oscilloscope. An oscilloscope is a device that is primarily used by electric and electronic engineers to measure and display signals to make calculations based on those readings. All oscilloscopes have a vertical mode for viewing signals, and depending on the model, can also have an X-Y mode for viewing signals both horizontally and vertically at the same time. What oscilloscope music pioneers like Chris Allen and Jerobeam Fenderson did was to experiment with sounds to see how they looked on the X-Y mode of an analogue oscilloscope. An example of such sound manipulation is to have two oscillators, each loaded with a sine wave, and to change the phase of one of the oscillators while each being panned the opposite way from the other in order to produce a circle ([appendix 1](#)).

The primary method used for programming sounds into oscilloscope visuals, was to experiment with software synthesizers such as Serum, Zebra 2, and Sytrus to articulate the way that the visuals were shaped. These software synthesizers were the most suitable for this as they offered control over numerous parameters for each sound including the panning and phase of each oscillator.

When it comes to other ways of producing visuals, one method is to convert shapes into sounds by using a web-based oscilloscope graphics editor created by reddit user Thomerow¹⁰ ([appendix 2](#)); this essentially lets the user draw using the mouse and then separates any drawing

¹⁰ Thomerow. Oscilloscope Graphics Editor. April 28, 2017. Accessed July 04, 2019. http://bummsn.de/osc_txt/.

into two channels, one for left and one for right. This is then imported into an FL studio session where the left and right signal of the shape are separated and then routed into two separate oscillators of the Sytrus synthesizer thus converting shapes to sounds. Perhaps, the most preferred method of converting shapes to sounds is using Blender in combination with Oscistudio. This is a program whose purpose is to automatically render blender objects into oscilloscope visuals while also providing complimentary effects to change or enhance the sound such as automated rotation, multiplication of objects, twist effect, flower (which turns objects into the shape of a flower) while also providing tools for timing animations. Oscistudio communicates with blender through a blender plugin which sends information from blender in order to output the desired visuals. Upon creating the oscilloscope visuals, it is time to synchronize them with the music within a Digital Audio Workstation (from now referred to as DAW). This is done by loading any of the software synths with the appropriate preset for each shape and aligning the MIDI events with the music. In the case of audio samples gathered through Oscistudio and Blender, the sound clips are recorded in Oscistudio and are then inserted into a sampler which turns them into MIDI events that can in turn be aligned with the track. This is further accommodated with Prettyscope¹¹ (left side of appendix 1), a plugin that allows the user to preview and make modifications to the sound clips in order to correct errors and make the visuals sharper. To further decorate these samples, one can easily insert signal processors and effects in accordance to what the desired result may be, such as adding distortion to literally make the visuals more distorted, or delay to make them more delayed. Additionally, one can create a bus where the visual samples and the actual music can be recorded together into a single source, thus enhancing the visuals while also making them seem more in sync with the music.

¹¹ Hickler, Elan, and Alejandro Hernandez. "PrettyScope." Soundemote. March 30, 2017. Accessed July 04, 2019. <https://www.soundemote.com/plugins/prettyscope>.

After the synchronization is complete, it is time to export the audio that contains the visuals as well as the music, and import it over to a new DAW session, in order to minimize any latency issues that may be caused when overloading the CPU (Central Processing Unit) of the computer while capturing the screen. When that is done, StreamLabs OBS¹² is used to capture the screen while the Prettyscope plugin displays the visuals during playback. Lastly, the captured footage and the music are imported to Adobe Premiere Pro, to be aligned and edited as needed.

As far as advantages and disadvantages of each method are concerned, when using the oscilloscope graphics editor, the interface only allowed for straight line drawing, as the only shape that could have been drawn was a line with adjustable length. This made it very difficult to draw shapes such as circles and as such was solely used for polygonal shapes, and even then, was only a tool used in the beginning when no other method was known for creating custom shapes. After getting more comfortable with Blender, all the shapes were formed there as it was more accurate, allowed for any shape to be formed using Blender's available meshes, and more importantly, it came with the ability to animate these shapes. However, there are limits when forming shapes using blender as it is closely tied to Oscistudio, the program used to preview and enhance the shapes designed in Blender. Oscistudio is currently in its alpha state (A6) meaning that it is not in its final state, and thus limitations are always present when dealing with such programs. For instance, one of the limitations is its incapacity to run off the computer's graphics processing unit (from now referred to as GPU) which limits the program from processing more than 2000 vertices, thus enabling the designer to create simple yet effective visuals for the scope of this project. When it comes to limitations regarding the use of software synthesizers, the most obvious one is the inability to articulately design shapes of the same complexity as when

¹² Moiz, Ali, and Murtaza Hussain. "Streamlabs: #1 Free Set of Tools for Live Streamers and Gamers." Streamlabs OBS. Accessed July 04, 2019. <https://streamlabs.com/streamlabs-obs>.

designing in Blender as you only have parameters for panning, phasing and the shapes that you can design. Granted one can create complex shapes with software synthesizers, but is limited to creating one shape, whereas in Blender one can create multiple shapes to be displayed simultaneously.

Innovative Aspects

The main difference between the works of Jerobeam Fenderson, Chris Allen and this project, is that the aforementioned composers use the samples generated by the shapes, or sculpt the sounds to create the shapes with the intention of using them as part of the instrumentation. In comparison, this project merely uses the visuals as accompaniment to the music without utilizing the sounds as part of the instrumentation. In addition, Jerobeam Fenderson specifically uses other methods of creating sounds and shapes including visual programming languages like PureData and Max MSP, while also using Oscistudio's built-in programming interface, named LiveCoding which is essentially a terminal for programming with C++. Such methods were not implemented in the duration of this project, as it requires a deep understanding of programming to overcome the steep learning curve of these methods in order to properly manipulate these mediums to their fullest.

There have not been any composers, at the time of writing, that have used oscilloscope visuals to accompany music in the style of progressive rock/metal. Therefore, it is an ideal time to use this medium to creatively generate sounds from shapes and vice versa to add a visual aspect to the compositions through using 3D/2D modeling and sound design.

New Skills Acquired

When it comes to new skills, this project enabled the author to gain confidence when it comes to mixing. This was accomplished during the Hybrid Recording Methods and Strategies and Advanced Studio and Interactive Performance Mixing courses while also mixing the tracks of this project in parallel. This involved spending many hours in the school's studio facilities experimenting with plugins, mixing approaches, and making sure that the sonic integrity of each track was kept at a balance.

Another skill that was developed was a better understanding of sound design and manipulation, from a unique visual perspective as the sounds were designed with the intention of visual gratification, and thus experimentation was conducted on how each parameter of a software synthesizer affects the visual result differently. In addition, fiddling around with signal processors on the samples to see how they would 'look' was an enjoyable endeavor in its own right.

Furthermore, the composer came to this institution with little to no knowledge regarding 3D and 2D modeling. This project definitely enabled the author to attain a solid foundation when it comes to understanding how 3D and 2D modeling works from designing all kinds of models ranging from magic wands, cars, buildings, polygonal shapes, animals, weapons, explosions and a multitude of other objects. It also allowed the author to gain experience in animation while animating sequences in order to be synced with the music.

Finally, the composer has gained more confidence in composing, as the harmonic and melodic material featured in this EP are conceptually different and more advanced than previous

efforts. This improvement comes in the form of more complex rhythmic variations, more sophisticated textures and more virtuosic passages.

Challenges

This journey definitely had its challenges in both expected and unexpected ways beginning before the inception of the current project all the way to its closure.

Before this project was conceptualized, the composer had several ideas in mind when it came to the Culminating Experience project. First there was the idea of constructing a modern electrified version of the piano's predecessor, the harpsichord, by implementing modern pickups and then experimenting with signal processors such as distortion and flanger to see how it would affect the sound of this old instrument. This project was unfortunately abandoned due to practical reasons such as storage and budget. The next project that was brought up, was a portable keyboard workstation that would house a single board computer and capacitive touch screen in order to run musical applications on-the-go without the need of external peripherals. This idea was scrapped as well, as it was done before while being plagued with numerous compatibility issues.

At long last the current project came into fruition, and it was definitely the right one in terms of scope and ability while also enabling the author to learn new skills along the way. When it came to expected challenges, there was of course the challenge of composing the music and spending hours upon hours tweaking rhythms, melodies and harmonic content while also experimenting with new tools and ideas. Then it was time to learn how to create all the oscilloscope visuals. This was first managed by watching the tutorials created by Jerobeam Fenderson and Chris Allen, explaining the different approaches when creating oscilloscope visuals. The author then started experimenting with Sytrus, the synthesizer found inside FL studio's libraries, to see how basic shapes like squares, triangles and circles were formed purely

from sound design. Later, a vast amount of time was spent on creating many custom shapes using the aforementioned Oscilloscope Graphics editor, and then turning them into samples for use with the music. The most challenging period was by far, when Blender became the primary method for creating custom shapes. The composer would start by simply designing objects from scratch, with the little knowledge he had on the program while also importing different objects found from websites such as Free3D.com and TurboSquid and modifying them in order to even appear in Oscistudio, as it could only handle up to 2000 vertices at a time. This meant going through each object and start deleting vertices and edges while trying to keep the object's resemblance intact for hours without any guaranteed results. This was overcome by finding out that one could import vector graphics into Blender in the form of .svg files, which were abundant on the web and required much less modification in order to look visually pleasing on an oscilloscope. In addition, animation was a big issue as due to the artist's ignorance of the different Oscistudio mechanics and the fact that the documentation provided by the developer was and still is by no means complete, due to its early development status. For a period of time, animating, meant manually running blender and Oscistudio at the same time, and hoping for the framerate of the animation to be smooth in both programs, while recording the audio off of Oscistudio. Thankfully after being informed that one could easily send the animation from Blender to Oscistudio without running both animations in parallel really opened the possibilities of animation.

For a long time, when trying to capture the oscillation visuals from Prettyscope within the DAW there was always an issue with the framerate of the outputted video, which was always beneath 24 frames per second. This meant that the visual fidelity of the visuals during the first and second prototype presentations was subpar at best. Then with the help, of the IT department,

the author realized that he was loading the computer a heavy amount of processing to bear when running a DAW with 100 tracks all loaded with MIDI instruments while also trying to capture the visuals at the same time! The problem was mitigated by exporting the audio used for the visuals and the music and importing them in a new session and then capturing the footage from there.

Finally, when it comes to the last expected challenge, was the process of mixing the tracks and making sure that they all maintain their timbral integrity no matter where they were being played. This involved countless hours inside the school's studios, and cross-checking the tracks while also holding into account the different frequency responses of each studio.

On the category of unexpected challenges, one day came an issue regarding the Prettyscope plugin while using it to check if the visuals were properly aligned with the music. Whenever the author would close one instance of the plugin within the DAW, the plugin would crash, and bring down the entire program along with it, for no apparent reason. The artist tried communicating with the development team behind the plugin, to see how the problem could be resolved but apparently it was a one-man operation and at the time of communication he was absent. As one would expect this was a very frustrating problem, and one that had to be solved immediately before any of the deadlines were met. One day the artist realized when viewing the task manager as the plugin was running, that the plugin was using the computer's GPU for resources which was not what it was optimized for, therefore it was time to switch the program from using the GPU and make it run off from the CPU. When that was changed, the issue was completely resolved.

Future Ramifications

The composer is planning to feature the four tracks in this EP in a full-length album. In addition, it will be an interesting endeavor to create progressive metal music while using the samples created from shapes as part of the instrumentation like Chris Allen and Jerobeam Fenderson do instead of just being an accompaniment for the music like it is at present. The author will also keep in touch with all the skills acquired, especially 3D modeling and mixing, to help in his artistic development down the road.

Conclusion

This project has enabled the artist to gain tremendous experience regarding 3D/2D modeling, mixing and sound design, skills that will be used to propel him to greater aspirations and achievements in his artistic career. The solid foundation on 3D modeling and oscilloscope visuals can become the basis of visual effects featured in future shows. The mixing experience attained, will be a step in the right direction for sustainable employment in the long run. Last but not least, composing and becoming more confident in his own brand of creating will be the pivotal force behind creating a unique artistic identity in pursuit of serving his Creator, Who gave him that talent in the first place, thus giving back to Him what is rightfully His to have.

Appendix



Appendix 1 Creating a circle with serum

Reset Stop Audio L <-> R A2 110.00 Hz
 Save Drawing Load Drawing: Choose File No file chosen

Left Channel:

Save Left Channel

Right Channel:

Save Right Channel
 Save Stereo File

Number of samples: 436
 Current sample rate: 48.00 kHz

Appendix 2 Oscilloscope Graphics Editor

Bibliography

- Allen, Chris. "C. Allen | Domination (Oscilloscope Music)." YouTube. November 23, 2017. Accessed November 27, 2018. https://www.youtube.com/watch?v=HwBUHu36M_I.
- Dark Tranquility Official Website. Accessed December 19, 2018. <http://www.darktranquillity.com/>
- Fenderson, Jerobeam. "Jerobeam Fenderson - Blocks." YouTube. October 03, 2016. Accessed November 27, 2018. <http://www.youtube.com/watch?v=0KDekS4YUy4>
- Galneryus Official Website. Accessed December 19, 2018. <https://www.galneryus.jp/ja>
- Hickler, Elan, and Alejandro Hernandez. "PrettyScope." Soundemote. March 30, 2017. Accessed July 04, 2019. <https://www.soundemote.com/plugins/prettyscope>.
- Dream Theater. *Metropolis Pt. 2*. BearTracks Studios, October 26, 1999, <http://dreamtheater.net/discography/metropolis-pt-2/>.
- Moiz, Ali, and Murtaza Hussain. "Streamlabs: #1 Free Set of Tools for Live Streamers and Gamers." Streamlabs OBS. Accessed July 04, 2019. <https://streamlabs.com/streamlabs-obs>.
- Opeth Official Website. Accessed December 19, 2018. <http://www.opeth.com/>
- Periphery Official Website. Accessed December 19, 2018. <http://www.periphery.net/>
- Theocracy Official Website. Accessed December 19, 2018. <https://theocracymusic.com/>
- Thomerow. Oscilloscope Graphics Editor. April 28, 2017. Accessed July 04, 2019. http://bummsn.de/osc_txt/.
- Townsend, Devin. "About Devin Townsend: HevyDevy.com: Devin Townsend's Official Website." HevyDevy.com | Devin Townsend's Official Website. Accessed July 05, 2019. <https://www.hevydevy.com/about-devin/>.