

Evangelos Alexiou – 2007915

Development – Instrument Essay

The present essay aims to reflect on the process of research, creation as well as experimentation with the musical instrument that we were required to create as part of the assignment. It will point out specific aspects of the research that have influenced the creation of my digital instrument, describe the thought process behind some specific choices I made throughout as well as various issues that came up and had to be encountered or adapted to. Furthermore, it will reflect on the results, what has worked in favour or against me, and future adjustments that I would make in the process if I had to create an instrument once again. Having previously used both Arduino and Max for similar purposes to this assessment both hardware hacking and sound design I realised that I prefer to use instruments, whether analogue or digital, rather than hack them or build them myself. However, the knowledge I gained while researching that field helped me realise simple aspects of synthesis that I was not aware of before. Lastly, as a result of the material I researched on I understood in depth the vast capabilities of the sound design field and improved my problem-solving skills by figuring out different solutions to problems that arose in the building process of the instrument.

In the beginning, as soon as I started doing my research, I was overwhelmed by the vast amount of information, related to the subject, available online which although useful it can sometimes feel intimidating and chaotic. Building an instrument from scratch I believe was the most challenging assignment I have had so far in my academic career and submitting a complete instrument before the deadline seemed to be impossible. It has been a challenge from the earlier stages of deciding upon what instrument to build until the very last stage of both presenting and branding the instrument. After receiving the assignment brief, I found myself in a creative block when I realised that I was required not only to create a music portfolio but to create an instrument, write an essay about it and prepare a marketing campaign for it as well. It is the reason why I started working on this assignment at a relatively late stage which was one month before the deadline and the lesson taken from my experience was, no matter how hard the task is, to organise and methodically plan exactly what needs to be accomplished for the final result to be both functional and submitted in time. Lastly, it is worth mentioning that even if it seemed to be hard to achieve the assignment in the first place, I managed to come up with an instrument that can be used creatively both in a production scenario and at a live performance.

Nowadays, musical instruments can be found all over the world. Different kinds of instruments can be found not only at music shops but also, as virtual instruments or VSTs. The imaginary line between sound design and music production in terms of the process has all but disintegrated in the modern-day. Debatably, it has disintegrated since the notion of using “non-musical” sounds in a musical framework launched by Luigi Russolo (1913), in his remarkably futuristic manifesto, called “The Art of Noise”. According to Russolo, musical art aims at the shrillest, oddest, and most discordant of sounds. Therefore, we are approaching noise-sound. That revolution of music could be paralleled to the growing proliferation of machinery. Following that, music has developed into a search for a more complex polyphony and a better assortment of instrumental tones and colouring, thus paving the way for Musical Noise. Additionally, John Cage’s music, as well as his paper, “The Future of Music – Credo”, also went out of the ordinary and gave validity to additional experimentation, as no figure has a more thoughtful influence on contemporary musical

thought and practice than John Cage. An interesting part he mentioned throughout his essay was that the unique estate of electrical instruments would be to provide entire control of the overtone composition of different tones, as opposed to noises, and to make those tones accessible in any frequency, amplitude, and duration (Ouper, 2014).

Based upon the research I previously conducted on the theoretical work mentioned above, any sound can be characterised as music according to a variety of viewpoints. With regards to sound design, it involves the specification, actualisation, and creation of auditory features using audio production techniques and tools, according to Cipriani & Giri (2010). Being a music producer and knowing in-depth the development and production of creating content, I believe that building one's instrument opens up new avenues of thought in the music creation process. Developing this knowledge is not vital, though it could be beneficial for several reasons, throughout my music career, as a producer and artist. Therefore, I will provide you with a description of my involvement, thought process, and experience using Reaktor by Native Instruments. Having said that, out of all the options we had to choose from I was more familiar with Max than I was with Reaktor.

However, after having some experience with Max in the past two years I realised that it was hard for me to understand the way it works and use it creatively in the production process. Also, even though a software with many capabilities, using Max I was only able to use the instrument as a stand-alone or using Max for Live in Ableton, which limits the DAW usage flexibility. There are different ways to record the signal in from Max into any DAW however, but it is not as convenient as being able to use the instrument as a third party plugin in any music production software, a feature that Reaktor does have and it was one of the reasons why I decided to use it. Another reason is that I found the user interface of Reaktor to be more appealing and user friendly than Max. I have considered creating an instrument using Reaktor's built-in Blocks in the first place, however this option, although useful seemed to be less CPU and GUI friendly when it comes to creating a complete instrument. For example, in Reaktor primary, if the user is willing to create a multi-oscillator synth, he simply has to create a Macro and add the oscillators inside of it, pilling them all together under the same unit. On the other side, if the user is willing to do the same thing in Reaktor blocks he will need to have a different Block unit for each of the oscillators, causing the interface to be overcrowded or in other words chaotic. Furthermore, in the Primary interface of Reaktor the user can use his custom user interface to make the instrument unique and give it its own identity, which is useful when it comes to the marketing and branding of the synthesizer.

There was a variety of approaches that I could have taken in terms of synthesis, including FM, Subtractive, Additive, and Wavetable synthesis to name a few. Two of these approaches were considered as the main ones for the creation of the digital synthesiser, Subtractive and FM synthesis. It had been considered to experiment with combining FM and Subtractive synthesis in one synthesiser, however this option was rejected due to both lack of familiarity with the software as well as lack of reasoning, in terms of usability, behind the creation of such an instrument. After having experimented with using both types of synthesis I realised that it would be more beneficial for me to use one instead of the other. Subtractive, also known as Analogue synthesis, can produce grittier and more synthetic sounds than the FM synthesis based on my experience working on both of these. Thus, it is more suitable to the specific genre that I am personally interested in. The instrument I decided to create provides the user with a library of pre-sets that include low-end rich sounds that can be used for the creation of basslines, lead sounds that can form the composition of melodies and harmonically rich sounds for the creation of anthemic chords and pads. Examples of such sounds being used in a composition are provided with the Logic Pro example I included for this assignment.

There are two main aims in terms of usage of the instrument, the first one is for production and sound design purposes and the second one is for live performance. The reason why I decided to create an instrument that would focus on these two aims is first that I believe being able to create my instrument enhances the variety of sound sources available to me as well as eliminates the budget constraints of investing in third party plug-ins. However, the synth is not as sophisticated as most of the third-party plugins I use for the production of my music but being involved in the process of creating this synth has enlightened me in terms of the sound design capabilities of the user in software such as Reaktor. While undertaking the process of researching and creating my instrument I realised that sound design helped me with the creativity block as well, in a way that during the process of synthesis and having to test the sound playing different rhythms and melodies. I noticed that simultaneously I was getting closer to the desirable sonic outcome and I was playing melodic ideas that I could record and use for the creation of the music portfolio. The second aim is for the instrument to be used as a live performance interface in a similar way to a guitarist using a loop pedal for his performance. However, I believe that some features will need to be added as well as some fixes on the instrument in order to make it function properly in a live event situation and make it as convenient for the user as possible.

As a starting point I used the Subtractive Synthesiser example demonstrated by Hutchinson (2020), in addition to it I added four independent audio loopers, an example of a phrase looper shown by ADSR (2013), in a way that all four of them are able to record and loop independently the signal input coming out the synthesiser. Finally, I added another audio looper which is used as the sum of all the other four recorders offering the user the ability to record them all as one, hence offering the capability to add four more additional elements to the recording which makes a total of up to eight different recordings being played back simultaneously. The idea behind the creation of this specific instrument was inspired by a combination of both a live performance and the concept of the guitar pedal loop. The inspiration came from an artist named Jacque and his Against the Clock challenge held by Fact Magazine (2018). The set-up of his equipment is way more complicated than my digital synthesiser but the principle behind it is similar, recording loops on top of each other in order to create different parts to be used in a composition or even to produce an entire track. However, in that particular example, the user is able to record the sounds using both a microphone and an external input, in the case of my creation the user is able to only record sounds coming from the subtractive synthesiser. It is worth mentioning that the user is also able to use the instrument for the recording of individual sounds that are included in the pre-set library or synthesise a sound from scratch choosing from a variety of different oscillator signals and a noise wave.

According to Hahn (2020), subtractive synthesis is based upon using harmonically rich sound waves and using filters in order to shape or sculpt the sound, hence a filter could not be left out of my instrument. In fact, there are two available filters that can have different settings from each other and the signal between filter one and filter two is controlled using a crossfader in order to blend them together. Additionally, there are independent ADSR Envelopes for each oscillator and a Mixer that controls the output of the signal produced by the synthesiser as well as the volume of each independent looper, giving the user full control over the elements recorded. Finally, and in order to enhance the sound design capabilities of the instrument, I decided to provide depth and movement to the synthesiser by connecting one Delay and one Reverb effect to the signal of the synthesiser before it gets to the speakers. Both of these effects were used from the Reaktor Blocks library under the Rounds folder.

Interacting with the instrument from a user's point of view, one could argue that instead of having four different loopers the synthesiser could have had one looper only with an overdub function available. However, I believe that having included five individual loopers offers more flexibility in terms of adjusting the levels or removing some elements using the mixer when they all loop together, thus using the overdub was not considered as an option. Also, it could be argued that the audio loopers would be a lot more efficient if there was a quantisation function available, however even with guitar loop pedals the player has to play using a metronome in order to maintain the same tempo, which is also the same principle behind the instrument I created for this assignment. In fact, I noticed that using the instrument as a plugin in a DAW rather than as a stand-alone instrument makes it easier to play in sync with a specific tempo. Finally, one could argue that any or most music production software offers the ability to record different loops and have them play simultaneously but again the idea behind this instrument was to be able to use it in a similar way to a guitar pedal loop with the only difference being that instead of limiting the user to the sound of the guitar this instrument offers a wide variety of pre-made sounds and huge capabilities in terms of sound design.

One of the main issues that arose during the process of researching, experimenting, and deciding upon what would the creation be, was the time limitation. In fact, I believe that I could have started considering the idea behind this creation at an earlier stage than I did, this would have offered me more time to research upon the subject and come up with potentially a better functioning idea. However, this is not to say that the current creation has not been useful or could not be used in music production. Another issue that I came across was to decide on what type of instrument I would like to create in order for it to be useful in other projects as well. Browsing through the Reaktor User Library one is able to find a wide variety of instruments with all kinds of different features which was one of the reasons why I found it hard to decide. I believe that being limited to a few options only can sometimes be more beneficial than having access to a plethora of information about a specific subject. Additionally, having played with a few of the examples available online, I questioned myself in terms of creating an instrument in general as many of the ideas I had were already available with the click of a button. Hence, I decided to combine different instruments together in order to create a unique device that I could use for myself or anyone else who will be interested in using it.

In terms of technical issues, the instrument was functioning properly until I decided to add the fifth looper that would sum the other four. The main issue was the signal routing of the ensemble since while using it, I noticed that the sound from the synthesiser could be heard both when the Synth fader and the Looper fader were turned all the way up. This issue I believe is also a disadvantage for this particular synth since the user has to bear in mind to turn the looper fader down in order to avoid getting the signal volume duplicated and the output signal peaking. However, that particular issue did not seem to affect the overall functionality and effectiveness of the instrument. Furthermore, when I first built the looper on its own the device seemed to be working in an appropriate way and the loop function to keep going until the Loop button was switched off. This function was affected however when I had to duplicate it in order to add the rest of the four loopers, it came up with an error on the structure between the Record button and the Loop functionality. While experimenting with the synthesiser during the composition process I noticed that after a certain period the loopers stopped playing back the recording which I, later on, realised that it was probably the error that arose in the structure of the instrument. However, the duration of the

looping process lasts at least a few minutes before it stops working which is enough time for the user to record the final outcome inside the DAW and process it further from there.

All in all, the final result for submission was beyond my expectations and the insights gained out of this process have been and I believe will be beneficial for my career going forward as a music producer. The final outcome was a Subtractive Synthesiser with build-in recorders that can loop back the sound recorded, which has already been used as a third-party plugin in one of the productions included in the portfolio. Personally, the fact that I was actually able to use the instrument creatively and incorporate it into the process of music composition was very beneficial since, in some of my undergraduate assignments, similar to this particular one, the instrument was used only for submission purposes and not incorporated in the creative process. Aiming to use this instrument both for live performance and in the studio, I started building it with the ambition that it would be easy to use in both situations. However, after using it for a certain period of time I realised that when used in music production the instrument is more effective rather than when used as a live performance. The reason is that in order to achieve a good sounding result whilst performing live requires spending more time getting to know the instrument itself. An aspect that has worked out well throughout the process was getting to know the software as quickly as possible and begin to build the creation required. Fortunately, there was no need to change my mind on what the purpose of the instrument will be since I managed to find enough useful resources to help me create this digital synthesiser.

After completing the creation of the synthesiser and looking back on the process of making it and researching the subject I noticed that I could spot certain areas that needed improvement and situations that could have been dealt with more reasonably than on this occasion. If I was required to undertake the same task once again, I would approach it differently in terms of what the overall creation would be or what purpose will it serve. I believe that if I had focused more on the subtractive synthesiser itself, I would be able to create higher quality sound and add more functionality such as adding modulation and effects inside the instrument. The implementation of the recorders took me more time than I had considered whilst understanding the structure of them and connecting them with the synthesiser. Another different approach to it would be to add the ability to record inside the instrument using a microphone or an external input such as an electric guitar.

In conclusion, the reflective experience as well as the sound design skills I have gained during this module were outside of my expectations. Furthermore, my organisation skills have improved as well as the ability to figure out solutions for specific problems that might arise. The research I conducted helped me to extend my knowledge further in a field that I would previously avoid, which is Synthesis. Although, it is worth mentioning that throughout the period of the creation of the instrument there were plenty of moments of self-doubt and sabotaging of my own skills and capabilities. It cannot be compared to the production process which most of the time I find as a pleasant task, the creation of this instrument has not been pleasant in any way apart from the end when I was able to use the sounds generated from the instrument. However, I believe this experience has offered me a variety of skills and useful knowledge that I will be able to implement in my future career as well. This instrument will be added into my arsenal now and it will expand my library of sounds even more. Finally, getting to know Reaktor helped me develop new ways of thinking in terms of what the software is able to offer in a creative environment, as well as clarified to me in a way what is possible to achieve using the software and what is not.

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