

Name: Chong San Yick

Student Number: 1910002

Module: Development

Module Code: ADAD7005_LON

Instrument Essay – C1 synthesiser

Introduction

By the definition of Collins Dictionary, “A musical instrument is an object such as a piano, guitar, or violin which you play in order to produce music.”(Collins) However, when we read the history of humanity, we discovered that ancient human created a lot of different kinds of tools to make sounds and noises. These tools are the earliest instrument. For example, the drum is one of the oldest musical instruments in our history. People played the drums for scaring animals, communication and dancing. After years of cultural evolution, the human could produce some complicated musical instruments that we know nowadays such as Piano, violin, flute etc.

The music technology is always developing, and we are not satisfied with the sounds of the classical musical instrument. In 1929, Two Frenchman Edouard E. Coupleaux and Joseph A. Givelet demonstrated “Automatically Operating Musical Instrument of the Electric Oscillation Type” at the 1929 Paris Exposition. (Music synthesiser, 2020) This machine was the first electronic musical synthesiser in human history. At that time, it opened the new door to music. People found that we can produce music with new sounds and new technology. In the 21st Century, a lot of genius musician and engineers developed many synthesiser and plugin for generating high-quality sounds. And that is what I want to introduce my new instrument to you.

I created a plugin instrument called “C1 Synthesizer”. It is an Ableton Instrument plugin because I used Ableton Live a lot in my music production. I used Max 8 software to create my C1 synthesiser. Max 8 is a software for creating Instrument Plugins, Virtual Studio Technology (VST) Plugins and Effects etc. In Max, we can build any synthesisers and VST, which is suitable for Ableton directly. It is a compelling software that allows all people to create their ideas to real plugins.

C1 Synthesiser



(C1 Synthesiser)

Purpose of C1 Synthesiser

“Why should I design custom instrument software?” In nowadays, there are thousands of mature and commercial plugins, and it includes most the function that the musician needs. However, I want to convert my musical ideas and minds to a real and suitable plugin for the musician. “Software developers typically design a program’s layout to be accessible and intuitive.” (Manzo, 2016) When I was producing music, I found that sometimes the musician wants some tiny thing that the expansive VST plugin cannot do it simply. Therefore, I want to create a small Instrument plugin that is small and powerful. It does not need hundreds of buttons and a bunch of setting.

Under this situation, C1 synthesiser is my ideal instrument. C1 synthesiser is used for creating Kick, Bass, Snare and Noise sounds, etc. It is a multi-functional synthesiser, and it can produce unique and uncommon sounds. I hope my synthesiser is user friendly and achieve my ideal thinking.

Contents and Features of C1 Synthesiser

C1 Synthesiser has four main parts: Oscillator I, Oscillator II, Decay Noise and Noise Generator. They each have different functions and achieve various purposes.

Oscillator I



(Oscillator I)

Oscillator I is the main part of C1 Synthesiser. The user can change the sound to fold, wrap or clip three different modes. It turns the wave to three different waveforms.

The Thicker functions use to thicken the sound of oscillator I. When the user turns up the thicker slider, and the sound becomes more abundant and darker. It is suitable for making the bass sounds. The frequency dial controls the frequency of the sound; it changes the times of the waveform cycle. The resonance dial controls the resonance; but be careful to turn up the resonance to highest, which may hurt the ears. Phase dial adjusts the time of the phase wave. F.back dial is the

feedback loop which loop the signal back and fuller the sound. The Fold dial controls the wave folding that makes the sound squeezed and more vibration.

Also, there is a tiny pitch envelope which is under the On and Off button. It changes the pitch mighty. The bigger envelope section is not similar to other's synthesiser, which has the attack, decay and curve only (AD envelope). The attack stage means how fast for the sound achieve the maximum volume. Shorter attack time makes the sound has a bigger impact, and tight. (P.15, Cann, 2007) The decay dial controls the decay time, which means how quickly the sound drops after it has reached the full volume. The longer decay time in oscillator I mean, the sound will fade out slowly. This setting is useful for making kick and bass sounds. As setting the envelope, it is so complicated to set all the values with all ADSR, and I decided to keep the attack and decay only which make the sound has more impact and last smoothly. (P.146 Lyon, 2012)

Moreover, there is a frequency modulation section which also called FM in Oscillator I. Frequency modulation means the frequency of a waveform is changed by modulating its frequency with a modulator. (P.115, Dodge & Jerse 1997) "With FM, we get a uniformly "loud" signal that always retains the amplitude of the carrier signals." (P. 301, Farnell, 2010) The user can adjust the ratio of FM with the FM ratio column. Furthermore, there are two little dials which are the Bit, and SR. Bit dials represent the degrade of resolution in bits, and SR presents the degrade of sampling rate ratio.

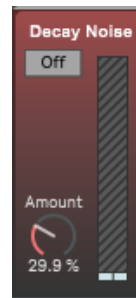
Oscillator II



(Oscillator II)

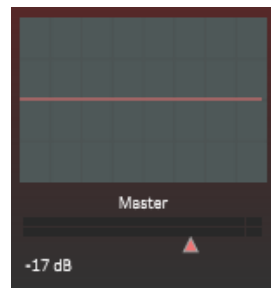
Oscillator II has tuning, pitch envelope, envelope and noise four parts. Tuning is used to changing the pitch of the Oscillator sound. The range starts from 0 – 5000. The pitch envelope allows the user to modulate the pitch sound. The pitch envelope has an Amount dial and decay dial. It controls the amount of the envelope and how long of the pitch decay. The Envelope section has Attack dial Decay dial and a visual diagram of the envelope. The user can modulate sounds with it. If we push the noise up, which will produce a slight noise and it uses to create background noise.

Decay Noise



(Decay Noise)

Decay Noise is two channels of noises with a decayed envelope generator. I used the newest function of Max 8, which is a multi-channel function. It means we can set up to 100 channels in one object. I multiplied the decayed noises channel to make it thicker and stereo. Decay Noise is beneficial for making snare sound with Oscillator I or II. The user also can add some Decay Noise with the music, which makes the sound more realistic and stereo.



(Visual diagram and Master)

There are a visual waveform diagram and Master slider after the Decay Noise, which is used to look and control the volume of Oscillator I, Oscillator II and Decay Noise. The Noise Generator has its own gain control in its section.

Noise Generator



(Noise Generator)

Noise Generator has White Noise and Pink Noise two options. The time dial means the period of the noise, which is between 0 seconds to 10 seconds. There are three options to modulate

the noise with waveform, frequency and resonance. The range of the frequency starts from 300 Hz to 5000 Hz. The range of the resonance begins from 0 to 50. The X-axis of three boxes is the time of the noise. The spectroscope box will show the visual sonogram of the sound. Noise Generator is good for making FX sound and riser. The user can change the noise to whatever they like.

I used Red, Pink and Grey as the primary colours of the interface. The colours separate all the sections which make the interface clear and funny.

Advantages of using Max 8

The advantage of Max 8 is easy to use. It is suitable for any people. The user does not need any professional knowledge about programming. The interface is clean, and the tools are convenient to use. During creating the C1 synthesiser, the 'Help' function is beneficial that I can learn and understand all the object easily.

The user can assign and map any midi controller or devices through the Max 8 program. Max 8 could make visual music with Jitter, which makes the project looks professional. The real-time programming and open-ended connections to other devices make Max 8 is unusual to other software.

On the other hand, it has an excellent tidy up function and makes the interface look excellent. There is a button called presentation mode which allows the user to drag the useful message and switches to the interface. It means the time of learning is short and fast. Also, User friendly is one of the selling points of Max 8.

After finishing the project, the user can use it in Ableton directly and sell it to the Max shop. The user can earn some income from the shop.

The disadvantage of using Max 8

However, Max 8 has some limits too. Most of the objects have already defaulted; it means the user cannot do more changes to it. It is because Max 8 is suitable for Ableton only. It is not a VST that can be used for other digital audio workstation (DAW). Max 8 limited itself in Ableton, which is not friendly for other DAW users.

I also found that Max 8 possessed a lot of CPU usage and GUI usage. I needed to close all other software and windows when I was programming Max 8. My Max 8 crashed a lot because my laptop does not have a high setting.

Apart from Max 8, I tried to use SynthEdit to do my synthesiser. Compare to Max 8, SynthEdit is simpler to use, but the bad thing is also it is too simple. SynthEdit has all the functions of a synthesiser that you need and the creator just connect all the object. It limits the creation and bad

for making a unique synthesiser. SynthEdit also had some lousy artwork and image of the objects, which makes the project looks old.

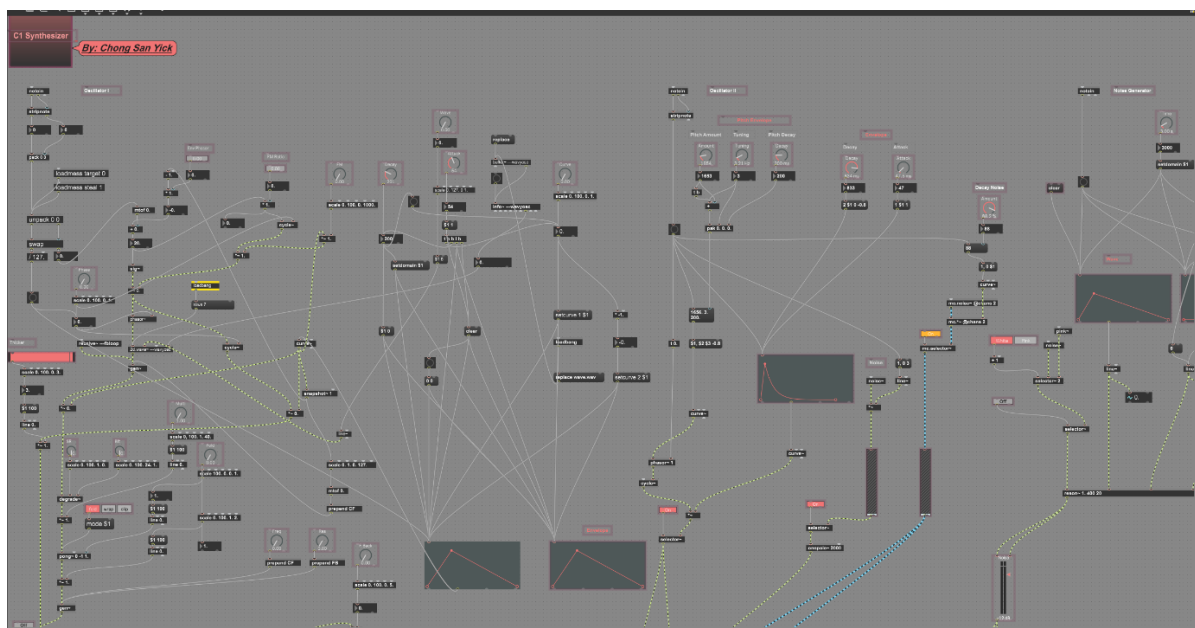
Issues in creating C1 synthesiser

In the beginning, C1 synthesiser was not my original project. I wanted to do a paper synth or paper piano for the project. Because of the coronavirus, my delivery of the raw materials did not arrive at my UK home, and I needed to go back to my home in Hong Kong. Also, I was isolated for 14 days by the government at a building for observation. This virus ruined all my plan for the project, and I could not buy any materials to build my paper synth again. Under this situation, I started to create a virtual synthesiser with Max 8.

I did not know what I want to develop and achieve. It is because there is thousand and thousand mature Ableton plugin in market or website. It is so easy to make some plugin that it is already created or similar. After talking with the tutor and researching on the Internet, C1 Synthesiser is my final decision. I learning discussion and communication is essential when you want to improve your idea.

The first problem that I met is that I do not have any experience of programming, coding and making any synthesiser. Max 8 is new software to me, and I had no idea about it. The only solution is to take more times to understand and learn within a short time. So, I watched many tutorials on YouTube and read the manual on the official website.

During creating the synthesiser, there were lots of bugs and non-working point in my program. I felt frustrated and depressed when I met these situations. I need to learn whom to calm myself down and solve the issue effectively. The hardest thing is the logic path in the Max program. I needed to try the range of the values and find a suitable one. Also, the input and output cables confused me a lot. If I connect the output to the wrong input, the whole instrument will not work, and it takes times to find it and solve it. Moreover, when the program has more functions, the programming screen is full of objects and cables. It looks very messy and unclear. So, I learned that I need to tidy up the wires and objects all the time.



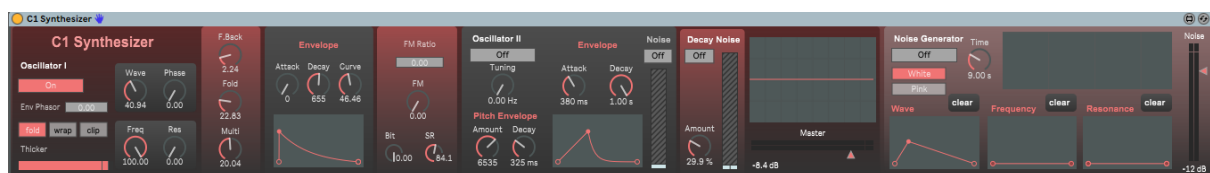
Another issue is time management. I found that I put too much time on doing research and testing other plugins. It is not a productive workflow. I should put more ratio on testing and modifying. Moreover, I always do the project until midnight, which is not healthy. So I used the timetable function in Max 8, which forced myself to exercise and to sleep regularly. Better time management makes work effectively and efficiently.

Reflection of C1 Synthesiser

I am so happy that I can create an Instrument within a short time. Although I spend a lot of time learning and reading. I learned so much during creating C1 synthesiser. It improves my patient, hardworking, focus, creative and time management.

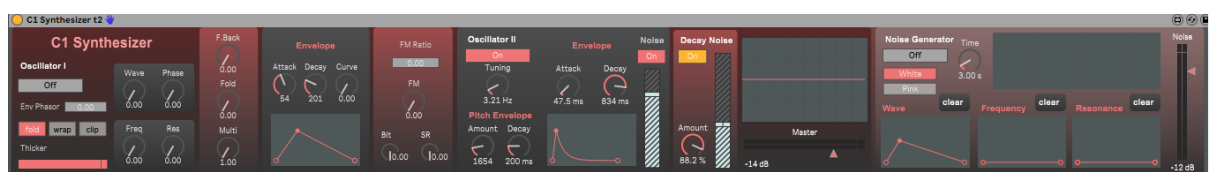
As a musician, I used a lot of VST plugins during music production. I know that it's hard to build the bassline and percussion. And I am happy to create C1 synthesiser that achieved most of the function that I expected. It looks small but mighty. All four sections do their jobs tremendous, and it can create some awesome sounds.

Example 1,



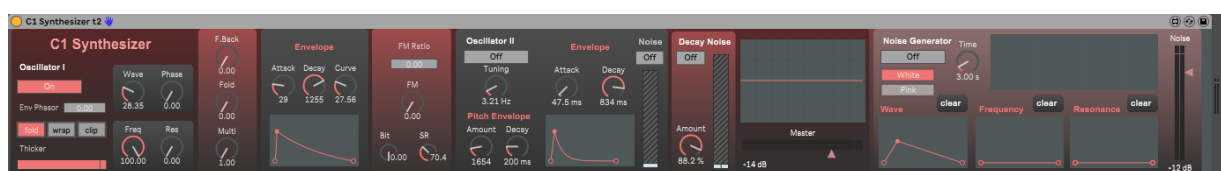
This setting can produce high-quality progressive bassline. Through testing the Oscillator I, you will find lots of fun in designing your own sound. If the user adds some oscillator II, it will make the sound more powerful and more bass sound.

Example 2,



This setting produces an excellent electronic bass kick sound. The different setting of the pitch envelope provides the different texture of the kick sound. Meanwhile, turn on some decay noise make the sound more realistic.

Example 3,



This setting generates a sweet and smooth lead sound. With slightly changing, the user can convert it to different lead and pad sounds.

Example 4,



This setting can simulate ocean sounds, which is suitable for ambient music. Choose Pink Noise option. Draw the sound of the noise that you like. Give some frequency that makes some changes to the sound.

C1 synthesiser has a thousand combinations which give a massive amount of sounds possibility. Moreover, it is easy to use. All buttons, dial and diagram, were named, and the user can see the difference within the visual diagram.

Improvement of C1 synthesiser

In the future, I would add more functions to C1 synthesiser because it is not perfect and mature.

C1 synthesiser has limited function. Its lack of completed ADSR (Attack, Decay, Sustain, Release) envelope, which limits the possibility of sound modulation. I could add the filter section in my synthesiser, which is very common in other VST plugins. Moreover, I want to upgrade it to a wavetable synthesiser something like Serum. I know it is not easy, but I will try it.

I think the preset manager is a good idea. Look at other commercial synthesiser plugins; they have the preset manager that includes thousands sounds preset. The user can choose the sound quickly and save their sound designs. One step further, the user can build a sound bank for it.

As a mature synthesiser, FX effects are essential. C1 synthesiser can add the delay and reverb section. They are necessary for all kinds of genres.

On the other hand, I want to change the C1 synthesiser to a real VST plugin which is compatible with other digital audio workstations. I had done some research on the Internet which is possible, but I do not have enough time to do the conversion.

Better graphic and interface design makes the synthesiser more professional. Be honest; the interface may look dull and dark, which may not quite fit the synthesiser.

Inspired by my tutor, I would like to try to connect the synthesiser to a real device. For example, use the micro bit device to control the buttons and values in C1 synthesiser. I think it makes the sound design funnier. It may be suitable for the kids, and non-musician to use it. To achieve it, I need to learn more about micro-bit coding and DIY hand working.

Cost and Promotion

The standard permanent License of Max 8 is 399 US dollars. The student and teacher permanent License of Max 8 is 250 US dollars. Alternatively, you can pay 9.9 US dollars monthly. Max 8 is not cheap, but it is powerful. Everyone can learn it really quickly and sell it for profit.

After finished the Max 8 Plugin, it will export a file with the format .amxd. It is the plugin format suitable for Ableton only. Users can upload their product to maxforlive.com, which has thousands of Max plugins. This website is used for promoting your stuff, and you can earn some profit if you want.

C1 synthesiser is free for everyone. It is because I know that it is not mature and perfect enough. However, I am making the C2 synthesiser which will be better than the first version, and I hope I can get some tips if possible.

Comparison C1 Synthesiser and other instruments

Before I think the ideas of C1 synthesiser, my ideal synthesiser is NI Massive and Serum. These VST plugins are popular and influential. NI Massive is excellent for making the bass sound, and Serum is great for making monster sounds. They both are unique VST plugins.

I refer a lot of functions with NI Massive and Serum, and I tried to combine their good things to my C1 synthesiser. Of course, my final synthesiser is not as good as anyone of them, but I think I did something unique too.

Compare to NI Massive and Serum; my C1 synthesiser is much smaller and fewer functions. Massive has too many controllers and challenging to use. The user needs to spend a lot of time reading the manual and understand how to use NI Massive. With C1 synthesiser, it is simple to use. It simplifies all the functions and produce similar things.

On the other hand, my noise generator is unique, which I did not often see the same thing. I think the white noise and pink noise are essential in electronic music. It also can simulate some ambient sound such as raining and background noise.

NI Massive and Serum are expensive, but it is totally free with C1 synthesiser. I will upload C1 synthesiser to maxforlive.com and it's free for download. I just want to help other musicians who have the same favour as to me.

User Feedback and beta testing

I am quite satisfied with my C1 synthesiser. I like the Oscillator I and the Noise Generator the most. I used it to create the kick, snare, bass sounds with the oscillators. The Noise Generator produced some FX sounds. I am so happy that I can use it for creating a new song. However, I also found some unsatisfied points. Some sounds are not evident in some setting. When I tested the oscillator I, the sound sometimes is low quality.

I sent my synthesiser to my two-musician friend, and they responded to me some feedback.

The first musician is an Ableton user. He thought the synthesiser could produce some unique sounds. C1 synthesiser is not similar to other synthesisers. It has its position. He said the 'Thicker' function is excellent for making the bass sound.

However, he felt it is not very user friendly. The interface is a little bit messy. He pointed out that I should improve oscillator II which has fewer modulation as the oscillator I. He also thought I should add some effects and arpeggiator in C1 synthesiser.

The second musician does not use the Ableton a lot, but she has tried it. She loves how the C1 synthesiser looks. She liked the noise generator the most that she could use it as the riser and impact sound. She felt disappointed that it just runs in Ableton. Furthermore, she agreed that I should simplify the synthesiser.

Although some advice is entirely opposite, they gave me a lot of opinions and ideas. I cannot improve C1 synthesiser as good as they think, but I will try to improve it in the future.

As a result, it is an acceptable plugin. Although it is not as powerful as other famous plugins, it is unique and useful. As an Ableton user, I will use it in my future works.

Bugs

After multi-time modifications, there are still some bugs in C1 synthesiser that I could not fix it. I would keep finding the methods to fix the bugs.

In oscillator I and oscillator II envelope diagram, if you turn both the decay and attack to 0 in the envelope, and then change the attack and decay to any value, the output sound does not work correctly. The solution is changing the attack and decay one more time again after it, and it will generally run again.



In Noise Generator, if you do not position the last point to 0 in the wave diagram, the noise sound will last forever. Therefore, make sure to draw the wave hit the 0 at the end.



Conclusion

Because of technology developing, music technology is getting better and better. The musician can convert their ideas to a real thing easily. I believe the musician knows the musician more. They know what the musician needs.

C1 synthesiser is my first VST plugin creation. It combined my favourite setting and thinking. I believe it is suitable for making electronic music and other genres. I created it for everyone that I hope C1 synthesiser can help the musician during music production. It is small, but it is useful. It is not perfect, but it is unique. Give it a try, and you will have fun with it.

Reference:

Collinsdictionary.com. 2020. *Instrument Definition And Meaning | Collins English Dictionary*. [online] Available at: <<https://www.collinsdictionary.com/dictionary/english/instrument>> [Accessed 20 April 2020].

Encyclopedia Britannica. 2020. *Music Synthesizer*. [online] Available at: <<https://www.britannica.com/art/music-synthesizer>> [Accessed 21 April 2020].

Vail, M., 2014. *The Synthesizer*. New York: Oxford Univ. Press.

Cycling74.com. 2020. *What Is Max? | Cycling '74*. [online] Available at: <<https://cycling74.com/products/max>> [Accessed 28 April 2020].

Batchelor, P., 2020. *Max 7 Tutorials: 4.2 Basic Synthesis—percussion synth (basic)* [online] YouTube. Available at: <<https://www.youtube.com/watch?v=JO8OwdE-Rzw>> [Accessed 22 April 2020].

Cann, S., 2007. *How To Make A Noise*. New Malden: Coombe Hill Pub.

Tune4media, 2020. *Max | Snare Synth [Full Lesson]* [online] YouTube. Available at: <<https://www.youtube.com/watch?v=5VBmqk9v4Kk>> [Accessed 25 April 2020].

Farnell, A., 2010. *Designing Sound*. Cambridge (EE. UU): MIT Press.

Lyon, E., 2012. *Designing Audio Objects For Max/MSP And Pd*. Middleton: A-R Editions.

Manzo, V., 2016. *Max/MSP/Jitter For Music: A Practical Guide To Developing Interactive Music Systems For Education And More*. New York: Oxford University Press.

Cipriani, A. and Giri, M., 2017. *Electronic Music And Sound Design*. ConTempoNe.

GitHub. 2020. *Cycling '74*. [online] Available at: <<https://github.com/Cycling74>> [Accessed 21 April 2020].

GitHub. 2020. *Build Software Better, Together*. [online] Available at: <<https://github.com/topics/maxmsp>> [Accessed 20 April 2020].

Rothwell, N., 2020. *Max For Live*. [online] Soundonsound.com. Available at: <<https://www.soundonsound.com/reviews/max-live>> [Accessed 23 April 2020].

Dodge, Charles; Jerse, Thomas A. (1997). *Computer Music: Synthesis, Composition and Performance*. New York: Schirmer Books.