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Music technology as a tool and guideline for composition

Master's thesis in Supervisor: Carl Haakon Waadeland
Trondheim, January

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Music technology as a tool and guideline for composition

In this project I have gone through eight different compositional processes where music technology was an essential part. I have attempted a few very different ways of incorporating technology in my creative work, completed the compositions, and then recorded and produced them. I hoped to compare the different compositional processes to each other, and to see what part music technology would play in the different outcomes, essentially comparing the different methods to see the total effect on the final product. In this report I have gone through the different compositional projects and explained the tools and methods I've used, why I chose to use them, and what effect they had on the composition as a whole.

Applications of music technology in composition

Programming

For two of the compositions in this collection, 'Droplets' and 'Wind Chimes', programming and writing code was an essential part of the compositional process. There are many ways to use programming as a tool in a creative musical process¹, and in this project I have mainly used programming to generate numbers that could then be interpreted as pitches and note durations. These generated pitches and note durations were then put together to create a melody, chords, or a note sequence.

¹ Some which can be read about in Iannis Xenakis' *Formalized Music*

The main difference between these two compositions, in terms of programming usage, is that while the composition process for 'Wind Chimes' consisted entirely of programming, for 'Droplets' it was done as more of a starting point. These two compositional approaches have existed for a while, such as the difference pointed out by Maurer (1999) between Xenakis and, Hiller and Isaacson. Where Xenakis used the computer output as material for further composition, Hiller and Isaacson attempted to place the entire compositional process in the code.

Python

For the two programs written during this project I utilised Python 2.7 for 'Wind Chimes', Python 3.7 for 'Droplet', and PyCharm² as the integrated development environment. I also downloaded and installed the package MIDIUtil to be able to generate a midi file from running a Python program. MIDIUtil is a third party library, created to be used with Python, by Mark Conway Wirt³. The other library I used during this project is random, an integrated standard library. The main reason I chose Python as the programming language for this project is how simple and effective code for generating and manipulating numbers can be written, streamlining that part of the process which allowed me to focus more on the creative aspect of coding.

The keywords used in the main body of both codes several times are while loops, if/elif/else statements, and print statements. The while loops were largely used to generate a set of numbers using the same conditions, in order to either have a set of notes, a set of note durations, or to translate the numbers representing them to something more easily readable, such as letter notation. The if/elif/else statements are all contained within the while loops, assigning the number representing a pitch or note value based on the conditions set for the while loop, or rewriting a previously generated set of numbers to a more traditional representation of pitches and note

² Downloaded 03.07.18 from: <https://www.jetbrains.com/pycharm/>

³ (Wirt, 2016)

durations. After most while loops there is a print statement to give the result of the while loop as an output.

Generating a randomised note series and a midi file

To read the full code see the attachment 'Wind Chimes - Code.pdf'.

Python does not come with keywords and libraries specifically aimed at creating and working with midi files. Many third party libraries have been created to fill that functional gap, and they have very different levels of complexity, flexibility, and functionality. The MIDIUtil library was the one that stood out as the simplest to install and get started with, as well as having very straightforward and simple keywords, without losing any of the functionality I needed for this project. In the code for 'Wind Chimes' the parts that are exclusive to the MIDIUtil library are:

- Assigning the time to be counted in ticks as opposed to quarter notes which is MIDIUtil's standard.
- The option to create a midi file with a track name and tempo.
- Adding notes one at the time to the midi file with frequency and start time information
- Writing the file into the same folder as the Python file exists in.

Of the built in functions and libraries of Python, there is only one while loop written in this code. This loop generates both the pitch and the note start time before adding that information to the midi file. For every note that is generated, one out of six pitches is selected and the note start time is decided by how many times the while loop has been run, plus an added small number which is randomly generated. Within the while loop there is also a threshold included that a randomly generated number has to be less than, in order for the process of generating a note to happen. This threshold is decided earlier in the code by means of user input, effectively giving the user the choice of how many notes are to be generated in the given amount of time. The higher the number, the higher the threshold is, and more numbers will be generated. The given amount of time is also decided by means of user input. All

these functions add up to generate a series of notes, or the number representation of said notes limited to a selection of six different options, as well as a semi-randomised set of start times for when the notes are to be played.

Generating chords, melody, and a rhythm

To read the full code see the attachment 'Droplets - Code.pdf'.

The code written for 'Droplets' relies exclusively on built in functions. While mostly using the same method and functionality as the code for 'Wind Chimes' in order to generate a note sequence, it is a much longer piece of code simply because it was written to generate a more complex, yet constrained, rhythmic and harmonic piece, leading to far more variables. The option to write a program based strictly on classical compositional rules, for example sixteenth century counterpoint, did exist and would work quite well⁴, but I wished to give randomness a more central role in the hope that sequences would be generated that I would never think of by my own accord.

The seven main while loops in the code create, in order:

- Four different numbers between 1 and 12 .
- A rewriting of those four numbers to letter notation to be printed.
- Comparing the four different numbers to each other in order to find the sets of numbers representing various chords that match up with at least two of those four numbers and then rewriting them to letter notation to be printed.
- Creating four sets of numbers that represent four bars with the belonging note durations.
- Creating another four sets of numbers that represent the pitches to match up with the note durations.
- Rewriting the four bars of note durations to something more similar to actual bars by using ASCII symbols.

⁴ As shown by Farbood and Schoner (year unknown)

- Rewriting the four bars of corresponding pitches to letter notation for easy reading.

Because this code was meant to produce four readable and usable bars of music there had to be several constraints included. The while loop generating the four initial numbers is truly random (as far as computer generated randomness can be with 12 integers), aside from the part comparing them to each other to see if two of them are the same in order to make sure the four numbers are in fact unique. The remaining while loops are either entirely predetermined based on the four initial numbers, have significant constraints based on those four numbers, or in the case of the while loop generating the note durations, being further constrained each time the while loop is run. The result of these while loops are four numbers translated to notes in letter notation, four sets of numbers representing note durations and therefore a rhythm, and four sets of numbers printed as letter notation containing the same amount of notes as the four sets with note durations.

In the while loop generating the chords that are eventually printed the numbers are entirely predetermined by the four initial numbers. By comparing the four notes to each other and based on the difference between two of them determines whether there exists any chords that contains both. To generate the rhythm for the four bars, the while loop considers the four bars as 16 parts each and randomly generates numbers that are less than or equal to 16 until there is a set of numbers that add up to 16. This means that after the first number has been generated, the remaining numbers have to be less than or equal to the remaining parts after the previous numbers have been placed in the set. This eventually gives four sets of numbers that each add up to 16. Finally, the while loop responsible for generating the pitches to go with the rhythm of the four bars is firstly constrained by how many note durations have been generated, where many shorter lengths leads to more notes and longer lengths means fewer notes, and also constrained by the initial four numbers. Most of the numbers in these sets will be picked from the four original numbers, another big section will be numbers that represent the mediant to one of the original numbers, and a small part will be selected at random. The while loops that are denoted as

translators are by their nature predetermined as they only rewrite the numbers given to them as musical notation of some form.

Classical composition

In the era of computers, music technology has become more and more common in the process of classical composition. That said, many of the methods used in music technology oriented compositional processes were fully possible to do by hand and have been used for centuries, such as the automated composition technique in Mozart's 'Musikalisches Würfelspiel' (Maurer, 1999). While still using many of the same techniques and methods today, there are now digital tools available to assist in the process. Among other things there now exists composition and notation software which makes creating sheet music a very different task. In this project, on the two compositions 'Droplets' and 'After Rain' I have utilised the program Sibelius both to compose and arrange, as well as creating sheet music for the musicians that would be playing the different parts.

Sibelius

Sibelius is a music notation software that can create, edit, and print scores, as well as play back the written music using software instruments. That Sibelius can play back the composition while you are working on it, is very helpful for anyone who find themselves unable to fully audiate, that is imagining the final sound, purely based on the sheet music itself. Sibelius also has built in functions that are common techniques in composing for sheet music, such as retrograde which has the literal meaning of "backwards and upside down", inversion which essentially means to flip or mirror the notes on the staff around the third and central line, or randomising pitches and rhythms. An example of inversion and retrograde can be seen in Figure 5-7.

The core melodic idea behind 'Droplets' was created by the program I wrote, while for 'After Rain' it is a melody segment I simply thought of and wrote down. After this point the compositional processes were very similar. Using traditional compositional techniques, helped by the built in functions in Sibelius, I used the four bars as they were, and after running them through various functions, to build up a melody and a counter melody by piecing the melody sections together. I also used the function in Sibelius that would read and name the chords that were spread between the different instrument parts, to make sure I had not overlooked something or made an unintended harmonisation or dissonance. Once I had completed the composition it was an easy task to format the individual parts to prepare them for printing.

Post composition

What I have chosen to call post composition is the result of taking the idea of sampling to its logical conclusion while only using new material. That is, creating a composition after the recording process has already been completed. In this project there are two compositions that fall under this category, 'Out Of Time' and 'Water'. For both, the main compositional process took place after the recording sessions had been completed. 'Out Of Time' was recorded as an improvisation where the musician made all musical decisions, and for 'Water' I had created a soundtrack for the improvisation to be based off of, thereby giving some guidelines and instructions for the performance. After recording the improvisation I then cut and reordered the sound files to create the composition you can now hear.

Composition after recording

For 'Out Of Time' there were several months between the recording session and the mixing and compositional process. For the recording I gave no strict instructions to the musician, only explaining what and how the sound material would be used. I also set up and worked with some mixing software to do some live processing in order to collaborate with the musician during the recording process. After a longer session of

collaboration on an improvisation, I put away the sound files for some months before working on them in post. The main technique of this process was cutting the sound files into several smaller pieces and reordering them to create a composition, using several tracks to create harmonics and other interactions between the parts.

Placing guidelines and working with the result

As with 'Out Of Time', 'Water' is a result of improvisation and making selections and cuts in the mix, after the recordings had been completed. The main difference between the two is that for 'Water' I had created a sound file that was played for the musicians while they were improvising. By creating a sound file with different textures and development I could steer the improvisation in a certain direction before I got to the mixing table. Because of this, when it came time to create the final composition, I opted to not move around the different cuts I made, but rather make a selection from different takes and different instruments to build up a composition that corresponded to the sound file I had originally put together. This post composition was more a process of selecting away parts of the different tracks in order to get a composition that kept the development from the original sound file at the same time as making space for the different instruments and combinations that strengthened each other as opposed to drowning each other out.

Vertical composition

With the term 'vertical composition' I am referring to the standard view in a DAW where the different tracks are stacked on top of each other and you work on the composition horizontally, following the timeline. By composing vertically I have focused on one track at a time, slowly building upward, without planning beforehand what the horizontal end result would be. This process essentially means to compose a complete tune on the one instrument and track that you have and record that, to then reconsider this composition and add another track that is complementary to the

first one, and so on. The one composition created in this way for this project is 'Layers', which consists of three different instruments on three tracks.

Singer songwriter

The singer-songwriter method of composing music is a long standing tradition, and is usually describing a musician who writes their own lyrics and music, as well as performing it themselves. Traditionally this has most often been done using a simple acoustic guitar, piano, or some similar instrument that can be used for chords. However, as with other more traditional composition methods, digital tools and equipment has brought this style of composition to music technology as well. One of the simplest examples of this is the use of a loop machine in order for a single musician to be able to play several different parts.⁵ Many musicians and artists now also own their own recording equipment and are able to create a complex composition by using this equipment.

Writing a song with only a piano

The initial process of writing the song 'Traffic Lights' followed the traditional way of sitting with an instrument, writing some lyrics, and jotting down some chords to go with the song. In the process of recording this composition I worked with the musicians and we listened back to the recordings in order to make adjustments for a second take. For the piano, playing the chords, we also recorded many different variations that I could cut and choose from to create a more dynamic piano track. Essentially, while the composition felt complete before getting to the studio, the creative process and developing the song was not completed until the final mix was settled.

⁵ Such as Jarle Bernhoff's 'Cmon Talk'

Co-creating a song in the studio

The process for creating 'She sang' was similar, in many ways, to that of 'Traffic Lights', with some clear differences, the main one being that this is the only composition in this collection to be created by two composers. Instead of sitting with a single instrument and writing lyrics or finding chords on a piano or with some strings, we actively used the studio equipment we had available during the composition process. If we had an idea, we would record it and add it to the list of little sound files, and eventually we could pick and choose from those ideas and try to put them together to see what would fit. This workflow continued into and through the final recording sessions.

Studio and software instruments

All of the compositions in this project, save one, were recorded in a studio, and all were processed and mixed in a daw, a software program called a digital audio workstation. Practically any composition created today that ends up as a sound file, will have been through one of the many daws that exist. For all the compositions I have been working on for this project I opted to work in Pro Tools, a DAW particularly recognised for its good handling of recording and processing audio files, as for the most part that's exactly what I would be using the DAW for.

There are many schools of thought on microphones and microphone positions. In general I will rely on my own ears far more than any technique or theory. The stereo set I used for the vast majority of recording sessions consisted of two Neumann TLM 67s⁶. I chose this pair in particular mainly because I have used this pair in many previous projects and am very familiar with its characteristics and knew it would give an authentic representation of the music recorded, that it would be able to capture the sound of the instruments I would be recording, and I wanted to use the same microphones for all the instruments recorded for one composition to create a better

⁶ <https://en-de.neumann.com/tlm-67>

sense of being in the same room despite being recorded separately. Outside of that I have used a Blue Bluebird SL microphone for a couple of improvisation sessions, another microphone I am very familiar with the characteristics of, it gives a very clear and smooth sound.⁷ Lastly I used two Sennheiser MD421-U-4 microphones as an overhead set for recording tams, mostly because they were the two microphones out of the selection I had available at the time that would do the best job.

Pro Tools

Pro Tools is the DAW I have used the most in the past and have the most effective work flow in. It also just happens to be the DAW which is the most commonly used in various recording studios, and is widely recognised as one of the better, if not the best, option for recording audio and handling audio files. This meant I could easily jump between recording studios and transfer the work between the different machines without much trouble.

Logic Pro and software instruments

There is one instance when I chose not to use Pro Tools, and that was for the composition 'Wind Chimes', because it was purely midi based. While Pro Tools is a great DAW for dealing with audio, the software instruments that come with the program can be lacking. For that purpose Logic Pro, or Logic Pro X, is a DAW where it is significantly easier and more effective to work with midi information. The library of software instruments that come with Logic Pro is a rather large one, and all the software instruments have a lot of controllable parameters, essentially giving you endless options for creating sound.

A software instrument can be a synthesized recreation of a real instrument, or an entirely unique instrument sound generated by the software. They can be a great way of working with sound when you are unable to record for whatever reason, or for composing and creating music without having to rely on including other people in the

⁷ <https://www.bluedesigns.com/products/bluebird-sl/>

process. For this project I only had need for one software instrument, and I used one that was fairly similar to the sound of a real wooden instrument, in order to keep the sound closer to the source material for the inspiration.

The compositional works

‘Wind Chimes’

(no ensemble)

Attachments:

Wind Chimes.wav

Wind Chimes - Code.pdf

Composition:

‘Wind Chimes’ is the one composition in this collection that was purely generated by a program, which means there were no musicians involved, nor any arranging or composing by me after the program had been run. That is to say, all the creative work in the composition process was already completed by the time I heard the instrumentation and the rhythm. In some ways it felt as though I had little creative control over the final result because of the randomness I had written into the code. The inspiration behind this composition is, as the title implies, wind chimes. I wanted something that could generate a series of notes that would be reminiscent of a wind chime, preferably based on wind speeds. I did not expect to be able to realistically recreate the way a wind-chime acts and sounds, at least not without sinking in a huge number of hours for incremental improvements, which might be an interesting project for another time.

The program was very much written in steps, which are shown by the different sections in the code. I wanted to be able to create different variations of the wind chime rhythm based on wind speed, so I implemented that as a user input. I went by the Beaufort scale for wind speeds to decide which wind speeds to include, and I chose this scale as the mps denotation gave an easy to use range of numbers, 1mps to 15mps. For ease of use I also included user input to decide roughly how long the

composition should last for. These parts can both be found under the header “Getting user input for duration and wind speed”. Once that was sorted I went on to write for the code to generate random notes from a B major pentatonic scale, generating more notes the higher the wind speed, and this section is under the header “Creating the notes for the MIDI file”. This is done by randomly generating a limit, given the variable “measure” in the code, and if the wind speed is higher than the limit, the program generates a note. If it is not higher, it skips the note. This evaluation is done four times whatever number the user wrote in for the duration. If a note is to be created, another number is randomly generated that will be matched up with one of the six notes from the pentatonic scale, including the tonic and its octave. Then, deciding when the note is to be played, the program keeps a count of how many times it has run through this process, and adds a little bit of randomness to the current total in order to avoid sounding too precise or static. This is all written within the while loop.

The most challenging part of writing this code was getting it to produce a midi file. I have in the past written codes that generate this information in such a format it could be placed in CSound and made into a midi file through playing that new file. However, I wanted this program to be self-contained, and not have to go through a different program all-together. There are many versions of how to do this, but I opted to use the library called MIDlutil. It had the options I required for my finalised midi file. The code language for this pack is fairly easy to comprehend and straightforward to use. After importing the pack into the code, I had it generate a midi file, and then add one note after the other as they were generated, before finally writing it to an actual file and have it be created on the desktop.

As I had written this program to only accept one static wind speed as an input, I decided to run it five times at different speeds to show off a greater range of what it is capable of creating. All together I eventually ended up with about 30 minutes of material, that I then made selections from to created the composition you can now hear. Had I spent more time on writing the code I would have included both volume and attack variation based on the wind speed, as well as an option to create an

envelope with various wind speeds. That would have made the final sound file even closer to the sound of an actual wind chime, but it was not a necessity to show the main idea behind this composition, creating a note sequence that emulated the behaviour of a wind chime to some extent.

Recording:

As there are no acoustic or electric instruments involved, there was no recording session in a studio for this composition. However, a midi file has no sound on its own. The sound you can hear in the final wave file came as a result of placing the midi files in a daw, choosing a glass marimba instrument and a common marimba instrument to mix, and tweaking some of the settings to make it a bit closer to the sound of a wooden wind chime. I then bounced the files and took them to my own workstation to mix.

Mixing:

The main thing done at this stage was choosing which sections of the sound files to include in the final result. While most of the sound on each file were very similar across the board, there was the odd place where the randomness would accidentally make a small repeated rhythm, or hit the same note five times in a row and little accidents like that. The selection process was mainly about weeding out the few times this had happened. To create a bit of a development I chose ten different parts, two from each section that originally had its own wind speed, and built up from the slowest to the fastest, and back down again. As I had more or less created the sound I wanted with the settings for the software instruments I have not really done any processing beyond that.

'Droplets'

Ensemble:

Bass flute - Ivan Ushakov

Bassoon - Jørgen Vie

Trumpet - Øyvind Mathisen

Piano - Marianne Austvik

Attachments:

Droplets.wav

Droplets - Code.pdf

Droplets - Full score.pdf

Droplets Musical Menu.pdf

Composition:

A big part of the work with this composition was done with coding. I wanted a program that would generate four notes, and give an output based on that which could be used for a full composition. The output should be a set of chords, based on those four notes, and four bars of a melodic monophonic line. For the sake of simplicity I opted to stay within one octave, both to only have one version of each note to work with within the code itself, and because I would be arranging it for different instruments with different ranges. I considered having the code generate a musical menu, like the one used in the compositional work on 'After Rain', but it would not have added much useability for this particular composition as I would be writing it in to sibelius where these options are more or less automatic. The code as is now generates a list of all the chords in the directory that contain at least two of the four notes, and four bars with a mostly randomly generated rhythm and notes, and rests.

Si litt om musikalsk motivasjon for koden, - og vis til koden i beskrivelsen nedenfor

The code behind the program for this composition has four main sections. *In the first section* the program generates four different notes by randomly generating one number at a time, and as long as the new number is not equal to any of the previous ones, it gets assigned to a variable. Once the four different notes have been generated the program prints them out using letter notation as the first part of the output. To make things simple I opted for only using sharp notation for any black keys on a keyboard. Translating one number to two letter notations seemed counterintuitive when the program could generate from a 12-tone scale. *In the second section* the program generates a set of chords, if any are applicable. By taking the four notes generated in the previous section and comparing them to each other, the program matches them up to the set of chords the code contains and if any chord contains two of the notes, adds the chord to the set to be printed. These chords are X, X5, Xm, X7, Xmaj7, Xm7, Xmmaj7, Xsus2, and Xsus4, where X can be any note. Once the set has been generated it is printed as the second output of the program.

The four bars first appear *in the third section*, where the rhythm is generated. Again, for simplicity's sake, there are always four bars and they are always in 4/4. This could of course be expanded upon. The rhythm is generated by dividing a bar into 16 parts, or 16 sixteenth note values, and randomly generate note values until the bar has been filled. The program keeps randomly selecting between whole notes, half notes, quarter notes, and sixteenth notes, and as long as the randomly selected note value would not make the bar contain more than the total 16 sixteenth note values, it is appended to the bar. This continues until the bar has been filled completely. This process is then repeated another three times and results in four bars worth of note values. *In the fourth and final section* these four bars of rhythms are assigned notes. While randomly generated, the generation is skewed in favour of a harmony based on the four initially generated notes. Statistically speaking, over half the notes will be one of the four base notes, another third will only consist of the mediant to the original four notes, a small part are completely random, and about 5% get assigned as rests, represented by an 'r'. When all four sections have been completed the

values for the four bars are translated into something readable and printed as the last output of the program. One thing to note is that while there exists ASCII symbols for some of the note values, this is not the case for whole notes, half notes, or single sixteenth-notes. This is why the program prints an 'o' for a whole note, a 'd' for a half note, and the ASCII symbol for a double sixteenth note when it should be a single one. The output from the program that I ended up using for this composition is as follows:

The four notes: E D A F#

Selection of chords:

Em7 Esus4 Esus2 E7

D5 D Dm D7 Dmaj7 Dm7 Dmmaj7 Dsus2 Dsus4

A5 A Am A7 Amaj7 Am7 Ammaj7 Asus2 Asus4

F#sus4 F#mmaj7 F#m7 F#7 F#m F#sus2

Note values for the four bars:

[♪ ♪ d ♪ ♪] [♪ ♪ ♪ ♪ ♪ ♪ ♪ ♪]

[♪ ♪ ♪ ♪ ♪ ♪ ♪ ♪] [♪ d ♪ ♪ ♪ ♪]

Notes for the four bars:

[D D F# F# D D] [B C A A r G E B E]

[D B F# r D C E G] [D A A E E r E]



Figure 1



Figure 2



Figure 3

I chose to use this output as a starting point for a composition, using it as an inspiration or as guidelines rather than strict instructions. For one thing, this is the second output I ran and then tried to work with. Shortly after starting to compose and arrange based on the first output I decided to re-run the program as I strongly disliked the way the first one was sounding. After this output was printed I modified it in fairly subtle ways, as seen in Figure 2 to make it an easier piece to play and practise for the musicians that would be playing it, but also to make it somewhat more harmonious and interesting to listen to. A couple of notes got deleted, the rhythm got slightly simplified, and I opted to write the piece in double speed with the note values doubled, as seen in Figure 3, to make it easier to read on account of all the syncopated sixteenth notes. From the beginning, the selection of chords was always meant to be an inspiration or light support in the composition process, something to glance at when feeling stuck or struggling with a chord progression.

After the output had been manipulated to suit my work process and wanted final result, I progressed much in the same way I composed 'After Rain'. By inverting and rotating the four bars I built up a melody which I let wander from instrument to instrument. The counter-melody was made in a similar fashion, though made to fit the main melody. Unlike 'After Rain' all the instruments are playing continuously

throughout the piece, which gives a greater focus on chord progressions. In 'Droplets' there are two main chord progressions, seen in Figure 4, that are repeated, with some variation. While the melody wanders through the four instruments, so does the tonic and other harmonic parts, to give the impression of movement even when all the instruments play fairly similarly through the whole piece.

Figure 4 displays two musical staves illustrating chord progressions. The top staff shows the following chords: D, Bm/D, C⁶/E, G^{maj7(omit3)}/F[#], Bm⁷, C, D/F[#], and G. The bottom staff shows the following chords: G⁵, E^{5(b13)}, D⁷/F[#], G/D, A^{m(add2)}, D/A, Em/G, and G. Both staves are in G major and show the progression of notes on a staff with a treble clef and a key signature of one sharp (F#).

Figure 4

Recording:

As the melody begins with the toy piano, that is the first one I recorded. This was to better instruct the other musicians and lay down the guidelines for the style and feel of the piece, in order to best represent the composition. Recording the toy piano first would also ensure that the other instruments would have a basis to intonate from. This one instrument was recorded via direct input, while the other three acoustic instruments were all recorded with the same microphone stereo set. As with 'After Rain', each part was recorded individually, and I made sure to have a few recordings to cut from in the mixing process, something that would not be possible in the same way if I were to record them as a group.

Mixing:

The main job when it came to mixing 'Droplets' was the cutting process. While the vast majority of recordings were of good quality, I wanted the versions that best fit together and gave the most accurate representation of the composition. As this composition and recording were done in a very traditional way I opted for keeping

the processing to a fairly low level. Aside from the EQ and reverb there is only a little bit of pitch correction in a couple of places. Otherwise the mix sounds fairly similar to how it did right out of the recording studio.

'After Rain'

Ensemble:

Piccolo flute - Ivan Ushakov
Western concert flute - Ivan Ushakov
Alto flute - Ivan Ushakov
Bass flute - Ivan Ushakov
Bassoon - Jørgen Vie
Flugelhorn - Øyvind Mathisen
Tuba - Stein-Martin Tilrum Fagerland
Piano - Marianne Austvik
Violin - Emma de Ljister

Attachments:

After Rain.wav
After Rain - Full Score.pdf
After Rain Solo for Bass Flute and Piccolo.pdf
After Rain Musical Menu.pdf

Composition:

'After Rain' was composed in a traditional way, but music technology was very essential in the creation of the piece. The musicians I had available for playing the various parts would not be able to practise together, nor appear in the studio for recording at the same time. This is the main reason the composition has these obvious sections to it, denoted in the sheet music by boxed letter, seen in the attachment 'After Rain - Full Score.pdf'. Focusing on and recording a set number of bars at a time makes it easier to piece together part by part. By necessity I had to compose in such a way that each part would be possible to practice and play by itself and still achieve a good result, and it had to be easy to play with any previous recordings of other instruments. That meant I had to make considerations for

intonation and style in particular, and that the first musician recorded would be setting the tone for the whole recording and end result. As the piece was initially conceptualised as a piece for bass flute and piccolo, as seen in the attachment 'After Rain Solo for Bass Flute and Piccolo.pdf', before I expanded it to the finalised composition, I decided to start the recording process with the flutes, and make sure it was tuned to the piano that would be used later on.

During the composition process I had to make room for the possibility that some recordings would be harder, or even not possible, to complete. The flutist, Ivan Ushakov, who played the four flute parts had a western concert flute as well as a piccolo flute. There was the possibility we would be unable to track down an alto flute and/or a bass flute that was available during that time window for recording this particular musician. Because of this, I wrote the alto flute and bass flute part so that the composition would function without them, or that parts could be played on the western concert flute and then processed in such a way to make them sound more like the flutes it originally intended for the composition. We were, however, able to acquire both, the alto flute by adding an extension to the western concert flute, and could go forward with the recordings of the flutes as planned. Neither did I initially have a musician ready for the flugelhorn part, and wrote the part in so that it could be played by a trumpeter and still reach some of the same effect. In this case as well I was able to organize a recording of the part as planned, with Øyvind Mathisen playing the flugelhorn. The other parts in this piece I was fairly certain could be recorded as planned without too much trouble, and therefore let them have more essential roles in the overall sound. Whilst it was not necessary for a complete sound to be achieved, 'After Rain' was recorded with the instrumentation as originally planned.

The more traditional aspect of this composition has many similarities to the method for creating 'Droplets'. After creating four bars of a melodic line, as seen in Figure 5, I created a musical menu to use through the rest of the process. This is the attachment 'After Rain - Musical Menu.pdf'. This was done through some fairly simple techniques, such as reversing the melody altogether, only reversing the rhythm or

note values, mirroring the four bars through the central line, as well as expanding or shortening the rhythm, or focusing on a counter melody. Most of the material for the composition comes from this menu. aside from later work on the chord progression. The same melody and counter melody are repeated throughout the piece, wandering between the various parts.

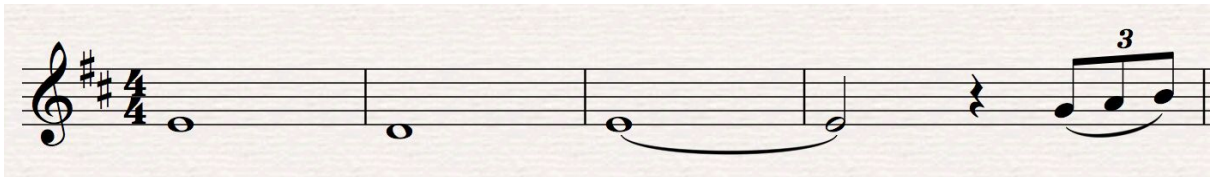


Figure 5

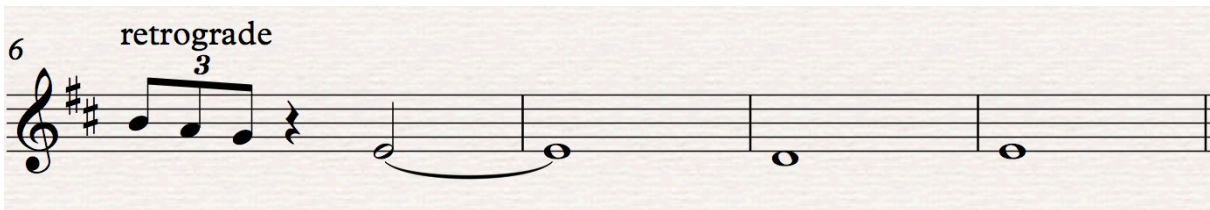


Figure 6

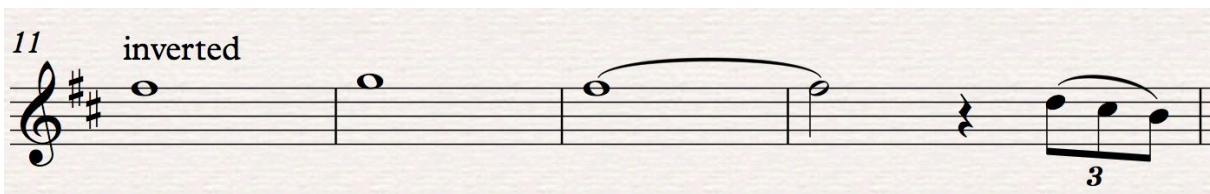


Figure 7

Recording:

As mentioned, the work of recording this piece was started off by recording the flutist. To be exact, the first instrument that was recorded was the western concert flute. Initially I had written the last section in the bass flute to be played by the western concert flute as well, in case a bass flute was unavailable. That section of

the western concert flute has since been removed as we could acquire a bass flute for the second recording session, but it was immensely helpful in supporting the piccolo flute when that was being recorded. In the first session we also recorded the piccolo flute part as well as the alto flute part, giving a good basis for the other musicians to base their performance on. After this the musicians had separate recording sessions and all the parts were recorded one by one. In order to make it feel more like the instruments had been played together, I recorded them all with the same set of microphones in the same studio, studio Olavskvartalet. The only instruments that were not recorded by the stereo-set consisting of the Neumann TLM 67s, and only used one of them, were the two brass-instruments.

Mixing:

Because this was more of a traditional composition, and it was recorded using acoustic instruments, I opted for a light touch in the mixing phase. However, I was fairly heavy handed in cutting from various takes in order to get the best performance overall, but this again allowed me to step back from feeling a need to more heavily edit them later on. In this mix I have mostly limited myself to making good use of EQ, a couple of limiters, and some simple reverb, all in order to bring the instruments together into the same room and make a space for each of them. Unfortunately there was also some noise picked up on a couple of the flute recordings, but this was mostly mitigated by the EQ. I also made a decision to leave in parts like wind instrument musicians breathing, noises from the pedals on the piano, and clicks and pops from the instruments themselves, as that is more of an authentic representation of a classically composed piece and performance.

'Out Of Time'

Ensemble:

Dobro - Liam Rogers

Attachments:

Out Of Time.wav

Out Of Time - recording one.wav

Out Of Time - recording two.wav

Composition:

This is what I would call a post composition, a composition that is created during and after the recording session. Without deciding on any guidelines before recording, I had a recording session with the dobroist Liam Alexander Rogers where I simply told him to play freely and that I would be doing some live processing and use the recordings to piece together a composition at a later point. That meant that my influence on the composition process was to influence the musician with my live processing while he was playing, and choosing and putting together samples from the recording to create a full musical piece, which means that the majority of the compositional work was done in the mix.

During the recording session the musician and myself interacted and cooperated throughout the recording. He by improvising on and playing the dobro, and myself by processing the sound input while he was playing and feeding it back to his listening. The main tool I used in this part of the process was various reverbs and their settings, sometimes extending the reverb time to be long lasting enough that anything quick and rhythmical would sound like a soup of notes, and sometimes cutting it short enough the dobro itself had a longer decay which allowed for a more bouncy playing style.

After the recordings were completed and I had cut the recordings into small pieces, I built up three parts that together is the composition in the final sound file. By spreading the recorded pieces between three parts I focused on having them talk and respond to each other, making a continuous movement and interaction through the piece. To build dynamics through the piece I chose the calmer pieces to fill the beginning and a midsection, as well as a short part at the end; And I packed the louder and faster pieces a bit into the composition, as well as having more of them overlap and interact. I did consider pitch changing or further processing some of the pieces to create a bass line or chord sequence, but I wanted to show the live processing that was done during the recording session as part of the composition.

Recording:

In order to make the live processing varied and easily done, I used several microphones covering the length of the dobro to pick up the frequency hot spots. For the processing I patched the sound through various hardware and back to the daw, and used the manual controls for the software part of the hardware. The recording session ended up being in two main parts, as the musicians felt he had more to express after completing the first one. How we interacted developed throughout the recording session, and we were much quicker to respond and adapt to each other during the second recording. I still opted to use most of both of the recordings, as they were very different and combined gave the opportunity for a much more interesting musical development.

Mixing:

The composition was created in the mix. I started out with two longer audio files, and had to cut and compile them down to a single composition. The most time consuming part of the process was cutting up the two recordings into small pieces and sorting them into groups of similar sounds or styles. Once that was completed it was playing around with different combinations and sequences, which led to having three distinct parts. You can hear the three different parts by how they are panned, one square in the centre and one on each side. However, the pieces from the recording are often spread in such a way that a theme will wander from part to part,

much like a call and response, and as it is all played by the same instrument in the same recording only moments apart, it creates the effect of one instrument moving around at times.

Because I had done live processing during the recording I have not done much in terms of processing after the recording was completed and I had created the three tracks. There was some necessary work done when it came to cleaning up noise, as the five microphones amplified any unwanted noise between them. In some parts one or two of the microphones had to be removed completely, while harsh EQ fixed it in other places. That was also mostly it. The processing had been completed during the recording and was done before the composition process.

‘Water’

Ensemble:

Trumpet - Øyvind Mathisen

Percussion - Carl Haakon Waadeland

Attachments:

Water.wav

Water samples.wav

Water samples and instruments.wav

Composition:

There are many parameters that can be controlled for an improvisational piece, in order to create a direction for the composition. While I freely let the musicians improvise in terms of what rhythm, tonality, sound type, and any other musical decision, they had to improvise based on a sound file I had previously put together. I did not give any strict instructions on how the improvisation should be performed, or how the sound file was to be interpreted, I was most interested in the musicians’ reaction to the audio sequence I had compiled. I also let the musicians decide whether to only hear the initial sound file, or also include one of the previously recorded tracks. This meant that my greatest effect on the compositional result was in how the initial sound file was built up, and in the mixing process where I decided what parts were to be included, making this partially be a post-composition.

In the process of creating a soundscape I decided to limit the source of the sounds to water, as the title implies. Pulling from some water ASMR sources online⁸⁹ I built up a span of sound that had an interesting development over time. There are many

⁸ Published under ASMR PPOMO (2018, 16. May) *All of Liquid ASMR*
Gathered 04.10.18 from: <https://www.youtube.com/watch?v=THpGyYNnwzs>

⁹ Published under ASMR Magic (2017, 9. April) *ASMR Umbrella Water Spritzing all Around & On You, Brushing, Tapping & Rain Sounds (No Talking)*
Gathered 04.10.18 from: https://www.youtube.com/watch?v=3oxyARXD_RM

varied and distinct sounds in this compilation for the musicians to react to, and based on the samples used there is a defined development in volume and expression throughout the composition. I specifically went for samples of water that had a very different expression, texture, and envelopes. Among other things there is water being sprayed from a bottle, drops on an umbrella, pouring from a cup, and squeezing a piece of cloth drenched in water. This can be heard in the attachment 'Water samples.wav'

The main part of the composition process was the improvisation, that was the deciding factor in what the final sound would be. Because I could not predict what the two musicians would decide to do while recording, I did a couple of different takes and made the decision of what would be included in the mixing process, giving me a bit more control over the final result and the presentation of the compositional idea. The percussionist, Carl Haakon Waadeland, played four different takes in order to interpret the performance with different percussion instruments, an african xylophone, a set of bells, and a set of toms. In the final cut, all three instruments are represented at various points. There were also a few takes for the trumpet players, Øyvind Mathisen, in order to give different performances based on which percussion instruments were included in the sound he was given to improvise from.

Recording:

First, the percussion was recorded, in the order the percussionist decided. The set of toms were solely played with a pair of drum brushes and recorded with a simple stereo setup. Last, the African xylophone was recorded with the same microphone that the bells had been recorded with, this time with only the water sounds playing from the beginning. The trumpet was recorded using the same microphone as used in the recording sessions for the other compositions. We did initially record using only the water soundtrack for him to improvise based on, but did add in various percussion tracks to see how that would affect the performance.

Mixing:

When the recordings were completed I decided which takes were going to be used in the final mix at all, and landed on the toms, some of the bells, some of the African xylophone, and most of the trumpet part that had been recorded with the toms. While I found both the interpretation with the bells and with the African xylophone to be very interesting, they did not fit together very well, and I removed parts of both to make space for each other. The trumpet part was mostly used as is, though I removed a couple of sections to keep the development of the sound that can be heard in the water sound file. Because the percussion and the trumpet had been recorded separately with different microphones, the main focus of the processing was to bring the two together into one room. (Something something EQ & reverb.)

'Layers'

Ensemble:

Glockenspiel - Esca Jensen

Piano - Esca Jensen

Drum - Esca Jensen

Attachments:

Layers.wav

Layers - Build up.wav

Composition:

'Layers' was, as the name might indicate, a result of composing vertically as opposed to horizontally, or layer by layer. That is, composing one and one part, only considering the current instrument/layer and any that have already been recorded. Always considering the past, while trying to ignore the future and what you might add and compose for later on. Most often, and as I have done in my other compositions, the work of composing is done with regards to what instrumentation you will finally have, and how the different parts interact. Even if you are working on the melody line in one instrument, it is done with consideration to what part the other instruments will play. With this composition I explored building a complete sound instrument by instrument, and finishing recordings at each step, only taking consideration to what was already completed, with little regard for what would be added after.

The compositional work, as well as that of recording, was completed within a day. I wanted to force myself to work with the composition in the way I had planned, and not give myself time where I might create ideas of how the completed sound should be. Over the span of a few hours I created and recorded the three layers, fully focused on the instrument I was working with at the time. Because the process of creating this tune was the way it was, I made the decision to play all the instruments

myself, as I could not plan beforehand what the instrumentation would be. Had I attempted to compose for one instrument, book a musician and the studio, record it, and then work on a second part, it would have been far more difficult to avoid planning for the future parts or what instrumentation it should end up being.

Regardless of intention there were a couple of things I was unable to avoid planning. The first layer, composition and recording, is that of the mini glockenspiel. If I was going to use the mini glockenspiel I had available, it would have to be the first instrument by virtue of having a very limited set of keys as I wanted a harmonious composition, and not one based on dissonance. The other factor planned beforehand was which studio the recordings took place in. I specifically chose a studio, studio Olavskvartalet, that had, among other things, a piano. There are many instruments I have available to record at any time, but a piano is more placebound, and I assumed I might want to use one at some point, which I did end up doing as the second layer, composing and recording. Beyond these two ideas all the work was strictly focused on one layer at a time.

To me, this was the most difficult composition process. In particular, I found it very challenging to keep my thoughts in the creative process strictly to that of the instrument I was currently working on and those I had already recorded. Your thoughts do sometimes wander without your full control over them, and it was simply not possible for me to keep my mind empty of any trace of planning, though I did make an honest attempt. While I was fully in control of every aspect of the final sound, with no algorithms or other outside sources having an effect, I was unable to fully avoid making considerations for the parts that had not yet been included. However unintentional, each layer was created as something fairly simplistic and sparse, leaving space for what would be created later on. While removing the drum and the piano track would still leave a composition and sound that feels complete, the style I went for is by its nature forgiving to later additions because of its sparseness and many silent moments. This was not something I had planned to do, but I came to realise after I had finished recording that a different style would have

been much harder to work with in this way and that I had unintentionally leaned toward an easier option.

There was also no sheet music involved, as I was the only one playing this piece I felt it would hinder me more than help, just making the compositional process take a longer time and giving me more time to unintentionally plan. I simply worked with the mini glockenspiel for a while, before settling on roughly what I wanted to play, and then recorded straight away. I did also play for a longer time than intended, so I cut out a few bars in a couple of places before I went on to do the same process with the piano. However, with the piano, and later on with the drum, I composed while listening to what had previously been recorded, making sure it fit in and built up what I had already created.

Recording:

The composition process was very heavily tied in with the recording process, by the nature of the workflow I was using. I first recorded the mini glockenspiel, only getting two takes, and then cut it together to the length the piece now is. Using the same stereo-set I set up for recording the piano, and then used that setup to compose and practise the piano part before recording. Finally I took one of the microphones from the set to use for the drum, again composing and practising before doing a final recording. While I did two recordings both for the piano part and the drum part, I ended up using a single take for both.

Mixing:

As I had already cut down the mini glockenspiel part, and decided to use a single take for the other two instruments, the mixing process for this composition was mostly focused on removing noise and fixing any problems with the recording. While I had fully composed a drum part, I ended up removing a couple of bars from the recording because the sound of the drum wavered for a brief moment. Aside from that the recordings are mostly intact as they were. As I do not normally play any of these three instruments I had to fix some parts that were a bit out of time, mostly the mini glockenspiel, which meant that a majority of the mixing work was cutting up the tracks and moving around a few of the notes to make up for

any bad timing. While I sorted out some of the more egregious timing issues, I have not gone through and quantified the recordings, as it would no longer sound organic or human.

'Traffic Lights'

Ensemble:

Vocals - Karoline Nygård Jermstad

Piano - Marianne Austvik

Attachments:

Traffic Lights.wav

Traffic Lights - Lyrics.pdf

Composition:

This is a composition I would consider to be fairly standard of the type singer-songwriter. The whole song, the text and chords, were conceptualized and written down simply sitting in front of a piano. The main focus are the vocals, and the chords were created to support the main melody. The compositional focus was on the lyrics and feel of the text, so the melody was made to fit the words and their natural rhythm, and came out fairly simple. As I had not put much thought into how the chords should be played I decided to let the pianist interpret the chord sequence in conjunction with the melody and lyrics, deciding the voicing, rhythm, and development. That put part of the composition out of my hands, though we did a few takes so I later could choose which interpretations I thought was most fitting.

Recording:

So the vocalist would have something to intonate to, and an easier time following the rhythm of the song, the piano was recorded first. As mentioned, I had not set down hard and fast rules for how the chords should be performed, and simply gave a tempo, the chord sequence, and a general feel for the style of song. We then recorded a few variations of the piano part, for me to mull over and piece together later. The piano was recorded with the same simple stereo set as what had been used for 'After Rain'. After I had created a piano track the vocalist was recorded.

Again, I recorded a couple of different interpretations of the vocals, allowing the vocalist to influence the final composition.

Mixing:

As I had to create the piano track in order to record the vocals, part of the mix, namely the piano track, had to be worked while still in the recording process. In the final mix I have given the vocals the central role, and placed the piano in the role of support. This is a recording limited to two instruments, which meant I could let both occupy a fairly big space, not being as heavy handed with the EQ as I have been for bigger productions. The one challenge in this particular mix was distinguishing the second vocal part in the choruses, because the vocalist sang both the main vocal and the supporting vocal. I achieved this mainly through the use of reverb and panning.

‘She Sang’

Ensemble:

Vocals - Karoline Nygård Jermstad

Keys - Marianne Austvik

Guitalele - Esca Jensen

Composed and written by:

Esca Jensen

Vebjørn Haugnes

Attachments:

She Sang.wav

She Sang - Demo.wav

She Sang - Lyrics.pdf

Composition:

‘She sang’ was completed in a singer-songwriter manner, though doing so by using recording as an active part of the composition process. While bouncing ideas back and forth My co-composer and I recorded some of them and eventually pieced together a tune, the lyrics, and the underlying instrumentation. Because we were only two people, it was not possible to play all the parts at the same time, and we compensated for this by recording various parts to see if they would fit together as we had thought. Because of this composition process, sheet music or chord charts were never really made.

This is also the only composition in this collection that was created as a collaboration. This piece is the result of a very evenly divided creative process, unlike the other pieces in this project. The recording and mixing process was still completed by myself, but this time keeping in mind the creative ideas and angles of

my co-composer. Unlike the other compositions, this piece had a much more complete sound in mind at the end of the composition process, in particular because we had essentially recorded a demo-version. While I would make small changes and adjustments through the recording and mixing process for the other compositions, that was not so much the case for this piece.

After brainstorming we settled on the general idea of a piece that would sound vaguely like a British folk song from the 19th century, which meant that the melody and instrumentation would be fairly stagnant with the story being told through the lyrics being the main focal point. After writing a couple verses we settled on a melody and what tonality the piece would have, before we workshopped the lyrics and wrote down all the verses. I have since reworded a couple of the verses as we both agreed the rhythmic of those particular sentences did not fit with the rest. When we had settled on the lyrics and the chords that would be played on the toy piano, we did a quick recording so we had something to work off of. With that done, we kept discussing and adding to the composition, going for a simple bass line on a string instrument, and filling some of the chorus slots with an improvised bit on the toy piano, using a different sound. The chorus slots that were meant to be vocal remained empty as we never did come to an agreement on what the chorus should be. This is the one part I fully created myself, working in conjunction with the vocalist to find a final sound. The demo-like version, which can be heard as the attachment 'She Sang - Demo.wav', we recorded ended up being the final representation of the composition before the recording sessions began.

Recording:

As I already had a recording of most of the composition, it was fairly easy to instruct and show how the different parts were to be performed. Keeping with the toy piano, as the sounds used seemed fitting, I had the chord sequence and the improvised parts recorded first. As the chord sequence is very repetitive we simply recorded a section of bars a few times and I pieced it together to the whole sequence later on, in the mix. The improvisational parts we went over half a dozen times so I would have

some to choose from later on. Once I had pieced together the chord track I recorded the vocals and then the guitalele, a small guitar, using the same microphone.

Mixing:

Aside from piecing together the chords that were recorded for that toy piano part, not much has been done in the mixing process. In order to keep the feel of a folk song I worked in such a way as to not create the impression of something that had been edited or heavily worked on, trying to achieve a more authentic feel. For one thing, the guitalele part (which functions as a bass line), is at some points slightly out of tune. This is simply the consequence of using an instrument which had a tendency to quickly detune while being played on. While I initially planned to tune correct any big problem areas while mixing, I found that it took more away from the overall sound and mood than it added. There is also the improvisational parts on the toy piano which have a couple of notes that can be heard to be slightly out of time, but again, going in and correcting made it no longer sound improvised or have that mood to it. The main thing I have done is working with reverb to create a sense of room and at times a bit of dreaminess.

Discussion

The main thing I kept attempting to do was approach composition with music technology tools from different angles in order to see what the result would be and how I handled the process. Because of that I had a tendency to pick whatever I felt was the most essential part of the composition process I had just completed, and do the opposite of that in the next one, while still staying within very similar framework. Good examples of this are how after I had completed the composition for 'After Rain' I went on to write the code for 'Droplets', the big change being the source of the initial melodic idea. While 'After Rain' had started out as an entirely classical composition, using traditional composition methods, the initial melodic idea for 'Droplets' came as the result of a random based program I had written. Going from the strictly traditional to something that was to some extent randomly generated seemed like a big change in strategy. After this code and composition had been completed I turned writing the code for 'Wind Chimes', now going from using programming as a way to create an idea, to using programming to create the entire piece. The same connections can be drawn between all the compositions. After I had recorded the sound material for 'Out Of Time' I created another improvisational piece, this time with instructions and ideas when we got to the recording session. 'She Sang' was written after 'Traffic Lights', being both a collaboration and a project using the available studio equipment throughout the creation process. 'Layers' was created after 'Wind Chimes', this time creating track upon track instead of focusing on a single note sequence.

While this process has lead to many varied methods that have obvious comparisons to it, there is also such a wide field of methodology that defining it as a single issue is not a realistic option. So while there are many interesting comparisons to be made and discussions to be had based on the material I have created during this project, I am limiting this text to a few topics in the interest of conciseness. Comparing the nature of a composition process based on a digital origin and one based on more

traditional methods, can you hear the difference between a pre composition and post composition, comparing pre determined algorithms to randomness, and

Synthetic versus organic origin

In this project there are two compositions that have what I would call a synthetic origin, namely 'Droplets' and 'Wind Chimes'. While the two codes that were written were indeed creative work done by myself, I could not perfectly predict what the outcome would be, and only have a rough statistical understanding of what was most likely to happen. I found this way of working with composition to be incredibly exciting, as I wasn't reliant on coming up with melodies or rhythms from scratch, and for both compositions I felt the final pieces were something I could not have come up with, without writing this particular program. It was as if collaborating with an unseen partner. For me, I have found that I much prefer the compositional process when there are other impulses involved than purely those from my own mind. In a way, I suppose you can't surprise yourself if you know yourself well enough.

The compositions that then fall into the organic category I would re-divide into two new categories, the pre-compositional pieces where I lined up the pieces and instructed the musicians in exactly how I wanted the result to be, and those that were a result of letting go of some of that control and having other people contribute. While both are very interesting processes, I do as mentioned find it much more interesting to work with other impulses than my own. For 'After Rain', while it is a composition I am very proud of, it was a very lonely process to create. While I had to come up with an initial melodic idea, the rest of the process was simply applying the rules that go with this type of composition, not very different 'Droplets', yet I found 'Droplets' to be the more interesting composition to work on, simply because it felt like it wasn't my own material.

The starting points might have seemed very different, and the process itself was certainly experienced as very different on my part, but judging by the end result, it

would seem that whether the starting point is a generated one or one that came to you as an idea, the difference between them can be very minimal and will often not be the most deciding factor in what the final sound will be. There were bigger differences between the compositions that fall in the organic, or manual, category, than between the two categories themselves. At least in this sample set.

Pre- and post composition

The main difference, experience wise, between pre composition and post composition were the constraints placed upon me by being limited to the sound resources I had collected. While a pre composition that is planned to be recorded will be limited by practical things like timing, available musicians, and available instruments, I was in theory free to create whatever melody, rhythm, and ensemble I wanted to. In a post composition process, particularly in one where I gave very few instructions to the musicians playing, such as for 'Water' and 'Out Of Time', I was fully dependent on what they decided to play. Yes, there is much you can do with sound material after it has been recorded, but there is something to be said for what kind of inspiration you get from the material you have. That being said, there is often more creativity sparked if there are some constraint you have to work against, as opposed to having a world of options available. I find that if I have no limits or guidelines I have to follow I will often end up using the same techniques and methods in the composition process. This meant that the work process of a post composition method pushed me further into creative directions I otherwise would most likely not have ventured into.

In addition, while the music technology aspect of a post composition cannot be denied, it is entirely possible to do a pre composition without any technological tools or with any thought for music technology. The challenge there become being able to see and find the inherent possibilities of using music technology in a compositional process even if it is of a more traditional kind. For compositions like 'Droplets', it had a very technological starting point before veering into more classical territory. 'After

Rain' on the other hand had the classical component from the get go, but was fully composed with music technology in mind. How this exactly affected the end result is hard to quantify. However, it is fairly easy, to me at least, to hear the difference between the post compositions and pre compositions on this point. While the vast majority of the pre compositions I have worked on end up being a piece with a fairly set tempo, tonality, and structure that fits into the western musical tradition, the post compositions will be more free floating and without concrete anchors like a bar signature. While it's something that is possible to do with the material of course, I much prefer being pushed in an uncomfort zone of fewer to no rules.

Predetermined algorithms or randomness

An algorithm doesn't have to be on a computer. Mozart used algorithms in some of his works. The even of computers and digitalisation of this process just made it much faster and much easier. Randomness is a bit trickier. There is currently no true randomness digitally, nor in the real world. While we can create something that feels like randomness, it is in fact predetermined. However, I would favour randomness on a computer over the randomness of a coin flip, simply because a program written for randomness will most likely be written to be statistically even. There are no slight advantages for one of the options due to a dented coin. With all that said, I have only ever used randomness in composition through programming. It is not something I've attempted to do by hand, and it seems like and incredibly tedious process that I don't wish to undergo. Algorithms on the other hand I have created and used both digitally and analogue.

Randomness is, by its nature, less predictable than algorithms, at least to the scale I have been creating them. In many ways I find the unpredictableness more interesting, as it will create new ideas and methods I couldn't have predicted. While I would get much of the same result for an algorithm, it will never leave the box it was created in. While the randomness can create more interesting things by virtue of not having the same limitations, that does also mean that a good chunk of it will be very

displeasing to the ear. That is the case for the code for 'Droplets'. I ended up running the code three times before settling on a set of bars and chords that I thought were interesting enough to work with and develop. All in all, while randomness has the potential to come up with something truly new and unique, that doesn't mean the new and unique will have any positive aesthetic value to it.

Working digitally or traditionally

Throughout all of these compositions I have continuously switched between working digitally or working in a more traditional analogue way. The analogue part of working with music will always be a part of music technology. You couldn't record something in the studio if you do not have the instrument to record. Nor can you use a midi file if you have not put any notes on it. In this project, if I had a classical starting point I would quickly incorporate technological perspectives in my work, and had I started with something out of a program or an idea based around technology, the more traditional components would soon sneak back in. With the compositions I have created it's not possible to separate them as either digital or traditional, because all the composition processes contain elements from both. I personally enjoy this back and forth, as a change in work environment can create new and unexpected directions for the music to go in, and whether you are in front of a computer or an acoustic instrument there are valuable tools from either process to use in both settings

Conclusion

Working with music technology as an essential part of the composition process is the art of combining the analogue, the traditional, and classical, with the modern, technological, and digital. Attempting to artificially divide these essential pieces of the modern compositional process has only shown me how tightly knit they actually are.

While there are different segments and steps that are possible to place mostly in one camp or the other, a fully realised composition and creation will, by means of being created, no longer stand solely as one or the other. The line for what is technological and what is not, is a very fine one, and it is possible to argue that line a little bit further out, or a little bit further in. These days, music technology is such an integral part to the vast majority of musically creative processes, particularly the compositional one, that separating it seems counterintuitive.

I can readily admit that my abilities when it comes to composing and creating new ideas are limited and promoted by the culture I grew up in, that is not something anyone can get away from. However, by using music technology tools and methods it is possible to push those subconscious cultural boundaries I have just a little bit further out. By letting technology either help me on the way or act as a guide in the creative process, it is possible to create a much more unexpected and unique sound. That said, from an outside perspective it can be incredibly hard, quite likely impossible, to tell what parts were done with or created by technological tools and techniques, unless it is made painfully obvious on purpose. Had I been presented with this set of compositions and known nothing about them prior to this, there is very little I could with certainty say was done in a technological manner or not.

The main difference between these compositional methods, in my opinion, was the experience of working with them. While a piece based on a code might sound similar to the classically composed piece, they were very different work processes that inspired different artistic choices and processes. Attempting to go very different routes in terms of compositional processes forced me into some techniques I might otherwise have passed on, and pushed me beyond my comfort zone, and the most interesting new ideas and thoughts come at the times when you're outside that safe space, forced to think in new and different ways.

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Droplets - Code.pdf

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