

Development Element 2b

Instrument Essay

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Initial Idea - Polypeggiator

Originally my plan for this assessment was to create a rhythmic looping instrument... I called it the Polypeggiator. It would have been more so in the lines of a plugin where you could generate polyrhythmic structures and patterns merely from holding certain notes. The notes would trigger not only the correct pitch of sound on the midi keys but also, depending on the velocity would depend on which rhythm is played. For example anything from 1-30 in velocity would be a 3/4 time signature and from 30-60 velocity it would be 4/4 signature and so on. Holding the notes would be where the arpeggiator idea comes in, meaning that the notes themselves would continue to play for as long as the consumer held the notes down in the time signature pressed (and bpm which is set on their DAW.) Each note would have been the triad chord in its root position, such as if I played an Eb, this would trigger an Eb major triad chord (Eb[I], G[III], Bb[V].)

One thing I haven't added yet is that of course there are not only major chords in music. So I also had the idea for there being an option in the plugin menu for minor, dominant and m7b5 chords as well as major. This would be to coincide with each 7th chord in each key. Chords such as diminished, augmented etc. would not be added.

When creating this idea I first thought of only triads^[1] just so that I could figure out the basics of the plugin. Soon after this I realised that if using this instrument, I would want the velocity for its normal purpose when playing and adding variation to my music. This became my first issue. My next movement from this was to instead of having velocity depend on the time signature, I could have each octave as a new signature instead.^[2] This would limit my octaves in terms of playing, but in my head I was thinking then that instead of having this as an instrument that people use in the studio... It now could instead be a way of teaching younger ages or people who are unfamiliar with how polyrhythms work in an easy fashion. On the MIDI keyboard in my home studio there are 5 octaves, I used this as a base to divide each simple signature. Middle C would be 5/4, +1 from middle C would be 6/4 and -1 from middle C would be 4/4 etc.

After ciphering each time signature within 16 crotchets - 2 bars of a 4/4 time signature, this was done purely because every DAW opens up in 4/4 - I encountered my next issue... None of the time signatures fitted into 2 bars - besides obviously 4/4.^[3] Finding a common denominator for all five octaves (3/4, 4/4, 5/4, 6/4, 7/4) would help to solve my problem because then I could find a possible amount of bars for each note to be allowed to be sustained for until it cuts out. At this point I decided that it was better to move from triads to now sevenths. The only time signature that would remain a triad would be 3/4 simply because there are only 3 notes in the chord. This would make each time signature less repetitive because for example by the time the signature 5/4 has hit the fourth crotchet of C major (B) the triad from the 3/4 signature would already be back at C, which creates interesting harmony on top of the rhythm.

Once I wrote the times tables out for numbers 3-7 and spent an extremely long time calculating the common denominator in crotchets. I found number 420.^[4] This requires a maximum number of 105 bars - which is an exceedingly long amount of time.

Once passed this hurdle I went on to fit my notes into a table to see what values went where and how repetitive everything was.[5] It probably wasn't a good idea doing this stage on paper and would have been more efficient utilising Microsoft Spreadsheet for not only a quicker and immaculate table, but also to see a longer outcome rather than just a bar. Even so I wrote the tables out[6] and found that most of the notes were repeating the exact same ones.[7] This I struggled with for over a day and so I sought out inspiration online.[8] Here I found Polyrhythmus (maxforlive.com) and XronoMorph (Dynamictonality.com, 2018). These were both plugins like mine but far more complex and intricate. XronoMorph uses polygons to visualise the rhythmic patterns. Something such as this is a great way you can identify each time signature. It's quite disheartening to have been naive in thinking that my idea was an original one, particularly when the standards from these two plugins are at an expert level. Once I delved into the creation of these plugins and how one could attempt to create something closer to their ideas, I realised that this required a lot more work and time than I had anticipated. C++ was something that I had never come across and as discussed with my lecturer, it made this project quite ambitious. Spending the remainder of that day researching software that included HALion, MaxMSP, Pure Data and Sonic Pie I came to the conclusion that I had bitten off more than I could chew and should look at this project assessment in another angle.

If I'd have had time to achieve this original aim I would have spent many hours learning how to code and create a plugin that would allow me to not only use simple and compound time signatures, but also complex and irregular ones. I would have developed something that has a step-by-step guide also to show people who wanted to learn from my creation how to create and understand polyrhythms.

Second Idea - Reversed Steel Tongue Drum

For the final time that I attempted this project, I decided to try something melodic rather than rhythmic. Sampling an instrument was my best bet. Being as I was, like everyone else, pretty much confined in my bedroom. I found myself eager to sample something that was in my close vicinity. Rather than having myself tap on random objects and creating a drum sample pack, I wanted to have something melodic and interesting. After searching in my box full of random musical pieces I came across my portable steel tongue drum. Once tapping on it I noticed the incredible amount of duration/reverb that is projected from the overtones once you hit a note.[9] This inspired me to want to create an instrument that is reversed as well as processed just enough for the sound to still be recognised as a steel tongue drum, but to have some kind of effects on them to create a unique sound. My initial thought would be modulation plugins such as chorus, flanger or a phaser. These are all familiar effects but are not necessarily that familiar in regards to adding them to this instrument, making both the reversed sound and this effect idea the USP.[10]

Decisions had to be made on where I would process and modulate the samples, as well as what modulation to do. Some parts and issues in regards to this included adding effects before/after the steel drum is reversed and whether or not to run the recorded sound through a sampler. Other options included using another sound on top of the reversed steel tongue drum - perhaps a percussive element or new instrument altogether to highlight the uniqueness. One thought I had would be whether or not to have the original recorded sound processed with no effects, and then have the reversed sound come through at the tail again (with processing and modulation) which would then essentially have two of the

exact same sound. This was disregarded because it then clashes with my USP. My final decision was to record the samples, process them once recorded with a small amount of chorus as well as reverb and then to reverse the sounds.

In preparation for recording I noticed that the eight notes on the instrument weren't that of every note of the key. The key of this instrument is C major and it had the values of C, D, E, G and A. C, G and A had either an octave higher or lower as well as another value; which meant that notes B and F were missing.[11] This would result in once the final recordings and processing is done, I would need to pitch either a note down or up just to create the notes of this one scale. I would pitch the final processed version of E up one semitone to create F and then pitch the recording of C+1 down a semitone to create B. I'd do it in this manner because it is the only way in which I can pitch the samples up or down without losing too much clarity and quality of the sound. After this thought, I knew already that I would need to repeat the same idea already on every other note to create the sharp/flat notes in able for me to have them on the 12 notes of the octave on a keyboard. This again would be something that I'd do once the samples were recorded and processed.

When coming to record the steel drum I had several issues. The first was that my microphone wasn't the best to record an instrument - and not even the best vocal mic in the world. So I knew straight away that there would be a problem with the quality of sound and possible hiss noises in the audio that I would have to eradicate when coming to the processing. Looking back now it would have been better to have purchased a microphone that was more suited to a percussive sound such as a Zoom H1n Portable Recorder, SM81, or even an AKG C414EB - with sufficient funds. Researching on blogs (Gearslutz.com, 2016) and a handbook (Sigismondi, P. 34) guided me as to what condenser microphones I would need in order to possess greater quality of sounds for next time. Despite the steel tongue drum not being a Latin styled percussive instrument, after reading an article (Soundonsound.com, 2006) I should have researched my microphone placement for the most effective way of recording. At times when getting takes I found that the audio clipped due to me hitting the instrument with force. Another way in that I could have improved the recording would have been to use more than one microphone (Soundonsound.com, 2015). This provides an even better quality of sound due to there being double the amount of information. I suppose that my sounds are all in mono and being as this is a musical instrument, I'd want the sound to be stereo. Recording with two mics would achieve this. An option from Paul Drew (Pro-tools-expert.com, 2020) suggested that using ribbon microphones in a Blumlein array can add "extra dimension" and "realism" to a dynamic instrument. Once that stereo technique is completed and the samples are recorded, I could use a stereo spreader or widener to improve the sound vastly.

Unneeded noise from people outside of my room was a concern.[12] Due to me living on the same road as a primary school as well as having multiple neighbours getting work done to their homes meant that my recordings were done on different days. This shouldn't be too much of an obvious change in sound but perhaps when I had been out and someone came into my room, they may have knocked my microphone stand ever so slightly, that would have changed the positioning of the mic that was in line with the steel drum. Potentially that could result in the sound changing. Following on from this another physical issue with recording is the room that I recorded in itself. My bedroom is quite large and even though I made the decision to record my instrument in my wardrobe and used material such as clothes, my quilt and sound proof walling, it still wouldn't be as

efficient as recording in studio with a vocal booth. To correct these obstacles for next time I would hire a much better quality microphone, go into a proper recording studio with a vocal booth and record there. Even just booking a room in Tileyard and utilising the equipment would have been a much better plan than recording at home.

Another issue that I had in the process of recording was noticing that certain notes I'd hit would ring out other values as well.[13] For example I would play the A and it would also be playing a C ever so quietly in the background. Due to the instrument being relatively cheap I unfortunately could not change this without swapping the instrument as a whole. The purpose of it is more for "meditation" (Amazon.com, 2021) rather than for straight musical causes, which merely demonstrates that the quality of sound will be poor. Rather than sampling a 'pocket' version of this instrument, it would be better in future to get the actual, proper steel tongue drum to achieve maximum quality of an instruments sound before anything else. I feel as though it would be impossible to EQ out the other notes and instead went along with the slight chord feel mainly because whatever note that rings out in the background will still be in the same key as the notes played. However, this will be a struggle when the consumer wants to play for example an Em7b9 chord due to certain qualities of that chord are not all in the same key. Once again it would be much better for next time to sample a proper instrument so that matters such as this will not be an issue.

Recording myself hitting each sample in different velocities was an idea I wanted so that there was more of a human feel to the instrument when playing it.[14] As studied in the reading week (Tileyard Education, 2021) the round robin method provided the timbre and texture of my samples to have "natural variations" (Help.ableton.com, 2021) in otherwise static patterns. Omnisphere uses this technique with instruments like the mallets and even guitars where certain velocities create not only varied timbre, but also sounds such as slides up and down are implemented as well from the 'Glide Legato' option depending on the speed and force of the notes played (Support.spectrasonics.net, 2021). Splitting up each hit into four velocities I thought would be a sufficient amount. I labelled these in my project as SOFT (0-31.75 velocity), SOFT-FIRM (31.75-63.5 velocity), FIRM-FORCE (63.5-95.25 velocity) and MAXIMUM FORCE (95.25-127 velocity.) Much later on in the process when I was doing research on how to put samples into Native Instruments (Youtube.com, 2011), I found out that once you imported each sample in the correct manner, you are already given 127 velocities of that one sample. Meaning that my work wasn't necessarily needed to be done after all. The only issue with doing this is that the timbre is still the same to an extent, meaning that it feels less human. Even so, due to being short for time, I took the option of having the 127 velocities provided for one sample and decided to use that just for each note, rather than four per one. As I've said, this decision was done due to me being conscious of the time, implying that if I would have had a longer scale to meet the deadline, I would have imported each sample and chosen the four velocities per instrument to give it that human feel as mentioned before.

Even after I went through all the hours of recording and hitting each note in different velocities, not all of the sounds were the same volume. This information was given to me when receiving feedback from one of my peers. Additionally to this issue, some of the notes were also not in the correct order musically. My G# somehow was mixed with my G in the first octave and the highest B note was in the C note instead. This was an obvious and thankfully easy correction to make with some tweaking of going back into Kontakt and dragging the notes to the right places. As for the volume issue, using gain to decrease or increase certain takes of the samples singularly would of helped to create an all around

balanced sample instrument however there was not enough time for me to complete this action. This again is something that I would work on given the chance to repeat this assessment.

Realising that 12 notes on a MIDI keyboard wasn't much for an instrument, I researched other synthetic steel tongue drum instruments to see what they did. Cloudrum (AmpleSound.net, 2021) is a VST which covers just under 3 octaves. The sounds are all very clear and impressively have different options for ADSR envelopes, a synth option in the background, different timbres of the sound, options to sustain or mute sounds (for variation of timbre) as well as mixer options. I'm intrigued to know how the creators managed to get a sound as clear as that through three octaves. Perhaps the sound is more synthetic and the synth option highlights that this sound isn't recorded but more so recreated through synths. Tank Drum (AudioThing.net, 2021) was another VST. This is made up of eight notes but is only tuned in the Em pentatonic scale... Meaning that like my instrument, they could only sample 5 notes from it. Being as the notes produced are limited, the creators for this instrument provided seven different timbres to add variation. Some of these timbres, similar to my idea, have different effects on them. Coinciding with the other steel tongue drum there is a four band EQ and an ADSR envelope, however being as I am not making a VST plugin and just a patch, I was not worried about that sort of thing. What's interesting to hear in the Tank Drum is that when the notes are played the overtones and qualities from other notes ring out in the same way that mine do. Even though the quality of sound from the recording is better than mine, this suggests that perhaps eradicating these sounds from other notes is unavoidable with this particular instrument. One thing I will say is that in terms of volume my patch is up to scratch with these plugins. It's apparent that my creation isn't as clear of a recording, however I have more notes than the AudioThing VST; which is better for someone playing it on a MIDI. I can safely say that my idea is more original than just having the exact same replicant sound as a live steel tongue drum though, which therefore demonstrates that my USP makes the instrument successful to a degree.

Due to the fact that I had a minuscule amount of notes to record. I decided to have the same notes hit with different timbre. I used the mallet provided with the instrument as well as the other side of it to give a more metallic sound. This already doubled my span of numbers from 12 to 24 just from the timbre. Using only two octaves is quite uncommon in instruments. Again this was only due to the short amount of time that I had left. In repeating this method, I would have processed the instrumentation in a variant amount of ways to fill the octaves. It would be extremely difficult to have different octaves of the instrument in terms of pitch due to the fact that it would lose the quality of sound and no doubt stretch the wave sample. If this were to happen then the samples (which were recorded and chopped to fit over two bars at 120bpm) would all stop at different points and sound immensely messy.

Once everything was recorded, I chose the right audio takes, cut, then aligned them so that the samples started exactly where the sound starts (and end exactly where the sound ends), faded in and out all of the audio regions and gain staged the samples (so that they peak at the same level), I started to process the samples. Implicating low-cut and hi-cut filters in the EQ was the first step in discarding unwanted frequencies. Compression was used to have the impact of the tail end so that there was punch. The build up of the reverse sound (the ringing) became more present after using compression as well. An exciter was used to add brightness to the samples because after EQ'ing certain frequencies the samples started

to sound slightly muddy and dull. A tone shaping tool was used for the high end (Fresh Air from Slate Digital and Sculptor from Izotope) which brought a slight more amount of sheen and clarity to the samples. The reverb (FabFilter Pro R) gave the space and feel of the reverse sound that I wanted. After using different presets and manipulating them to achieve a sound that I wanted, I trial and error'd different reversed sounds to find my overall favourite. Native Instruments Choral enhanced my USP by adding subtle changes to the samples original sound. Echo Boy from Soundtoys was a finishing touch I used to give a slight jagged, almost shuddered side-chain feel when hearing the reverse reverb seep through. Removing certain "hiss" sounds was done with RX8 from iZotope, which was also another way in which I cleaned the samples and attempted to give the sounds more clarity. After all the sounds were processed, I used a limiter on each one to push the volume up to the maximum overall loudness (whilst avoiding clipping) so that I could get the closest in volume to other samples (the two VSTs mentioned previously) and then bounced the files to the highest quality.

One thing that I am guilty of in the processing of the samples is using only one sample as a base to process and then copying the same settings into all 23 other tracks. Something as obvious as the frequency chart would suggest that this idea isn't accurate (pages.mtu.edu, 2021). Rather than only using one sample as a base, going through each individual sample and boosting each one at the correct frequency would give a more precise and coherent result to my sounds. Given more time, I would have pursued this task in the processing stage.

Upon playing with my preset on my MIDI keyboard, I noticed a few things. Not all of the sounds were completely similar. Of course I wouldn't necessarily want them to be exactly the same - because then it loses that human, real instrument aesthetic. However I feel as though the differentiation between certain notes (such as B3 and D3) are a little too obvious. Regarding the situation my only improvement for this would be to rerecord each sound with more takes to establish better results to compare with for the final audio takes. In spite of me utilising RX8 I noticed that I could still hear hissing in my samples. This would need to be improved by either dedicating more time to processing or simply as specified before, due to the poor quality of recording equipment and the environment, I would have to rerecord the whole procedure again to achieve the best quality of sound. Something else which bothered me when coming back to playing the instrument was that the notes B and A are a lower octave in comparison to the rest of the notes. This is a poor mistake which I didn't have time to correct, yet I know what needs to be changed regarding this error.

Unfortunately I had no time to cover the design for this sample pack. I've noticed that certain plugins in Native Instruments alone have their own style and aesthetic. Take the keys plugin The Gentleman for example (Native-instruments.com, 2021), the background image is of a piano, the text and buttons are all suited to the overall appearance and everything is carefully laid out in a pristine manner. Rather than have just a patch that you place into Kontakt, to have that final, professional and presentable look of the pack, I should for the future invest time into going about making the sounds look unique as well.

Finally I will say that I don't believe this instrument to be a success. The audio isn't completely clear as you'd expect when the notes are touched, the sounds which are

Appendix



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