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Introduction

In this essay I will discuss the ideation, research, and creation process behind my instrument 'Ate08'. I will explore the thought process behind the initial idea, the practical need for this instrument commercially, the iteration of different versions and what I learned in my approach. I will critically analyse this process throughout and reflect on; innovation, opportunities, design choices, potential target audiences and improvements that could be made.

Concept and Approach

Finding the perfect 808 bass (or any of the numerous variations of it), can be tiresome and tedious when you are in the middle of an idea, especially when you want to add character and make something that fits your style of music and is unique. From its inception in the early 80's the Roland TR-808 drum machine, was immediately popularised with the rise of synthesized electronic music. However, one sound stood out from the rest and has long been used to blur lines between genres, the 808 bass drum sound. These days, more pop songs use the 808 bass than any other bass instrument available, due to its "deeper and more pleasing sound" (Burke, 2019). With more and more modern pop hits using this bass tone and all variations of it, the prominence, importance of this sound in modern pop music has never been more evident.

"Perhaps the most important of the 808's sounds for the emerging electronic crowd was the bass drum. This low frequency boom had nothing in common with the sound of an acoustic bass drum, but its adaptability and evocative low-end coverage have made it hugely popular in many different electronic genres." (mn2s.com, 2016)

With music production becoming so accessible, there has been an influx of new music producers who want to get to grips with the complications of synthesis and music production in general.

"Producing great music takes a lot of work and hours in the studio, learning from your peers, and yeah even watching a LOT more youtube videos. It's not as easy as it seems and any seasoned listener, A&R person or producer will hear a sample pack jam pretty quickly" (Ireland, 2018)

To this point, I thought back to the time when I wanted to get up and running as soon as possible and the steep learning curve I endured to take my music production to the level I was happy with. Understanding a virtual instrument's graphical user interface (GUI hereafter), can be challenging with many of the most popular virtual instruments hosting a series of filters, envelopes, knobs and faders, which whilst uniform across all VST's, can be intimidating for beginners.

This led me to my concept for 'Ate-08', as an easy to use and educational bitesize learning of electronic synthesis, which would be simplistic, educational and easy to use/experiment with. I knew I wanted to serve this audience in the most natural way and empower the user to create or modify, bass sounds heard in today's most popular music.

When first approaching this task and after learning to use Native Instruments 'Reaktor' (my chosen creation tool), I initially began working on a VST synth with including a healthy array of sound sources, LFO's, Envelopes, etc. As the screen began to fill with knobs and controls, I could not help but think about what an end user's perception of something like this would be and the seemingly infinite competition of VST's on the market. I began to think back to how daunting all these controls

were when I first started out as a music producer, many years ago and how technology is making the art of music creation so much simpler.

Before starting, I wanted to keep some core values at the forefront of my design and creation process, so I would lose track of my end goal. Firstly, this was an instrument aimed at beginner/intermediate music creators, who know the sound they want to create but did not have the technical ability to create them. Secondly, I wanted to help the user learn more about how synthesizers work, so that they could apply this knowledge in any other synthesizer they used. Finally, I wanted the learning curve to be as flat as possible, so that they could feel empowered and confident when experimenting with making their own sounds.

The idea of simplicity and being able to create something that would help newer producers to digest the concepts of a synthesis in a pragmatic way, was so appealing to me, however I knew I need to validate this concept by actually speaking with beginner music production enthusiasts.

Research & Prototype

I knew I needed to understand the market fit and to make sure I create a product that caters for the underserved needs of my target audience (Olsen, D. 2015). I also, needed to understand what products currently existed on the market, to understand how they worked and what elements I would need for my instrument to fit the users I was aiming for.

After reaching out to some of my followers on Instagram, I found two users who were at the level I required to help formulate my research and to the product's main features and willing to test my concept. I used an additional two producers, who were at various levels ranging from beginner to intermediate who would help form a 'feedback loop' with each concept/iteration of the instrument and test out my instrument. Initially I wanted this process to be quite hands off, in terms of instructions and for the end user to explore, discover and create in line with how they would naturally use an instrument like this. Before this however, I needed to understand the market and the competitors to the product I had envisioned.

Competition

Although there are many virtual instruments out there, I wanted to understand what competition I would face when looking for a bass generator/synthesizer, that were purely dedicated to creating bass sounds.

Future Audio Workshop's Sublab

This virtual instrument was probably the closest product I found to the type of instrument I wanted to create, very robust with a great user interface and presets for popular basses. Sound sources can be added to the overall output, giving the user a healthy amount of control for every layer of the instrument. Similarly to my concept, Sublab was designed with simplicity in mind and

Producer's Choice 808 Warfare

As I already owned this piece of software, in my experience of using this plugin was extremely buggy, with ADSR filters and other parameters acting erratically when attempting to shape

sounds. Similarly to my instrument, this was designed to be simple to use and mainly used for its pre-sets and for this purpose it functions really well.

Native Instruments TRK 01

A fantastic virtual instrument that allows you to create kick and bass sections and lots of parameters for manipulation. The plugin has a up to 5 different oscillators and a host of different effects that incorporate some of Native Instruments best effects.

Seeing the competition was quite sobering and I immediately wanted to begin building my instrument in the leanest and most simplistic way possible so that I could begin iterating on features and design.

Initial prototype and iterative development

I began by creating a mock-up of the instrument in Balsamiq, a basic user interface tool that is very popular amongst the design and product management community, to get feedback on the features and design I was going for. Taking what I had learnt from the competing products, which had varying degrees of learning curves, I kept the first design clean and simple. I wanted to make the language used for controls easily digestible, so that new producers could understand the ways in which the sound they were creating could be manipulated.

My goal for this was to not have a finished product, but for users to get an idea of what to expect in the final build and so I used a program called “Balsamiq” to create a mockup of the final instrument. Initially I thought a very minimal approach would work, however as I began to understand how some of these bass sounds are created I quickly realise a number of parameters would be necessary to shape the sound the presets used.

In order to allow flexibility I wanted the user to be able to create any variation of an 808 Bass as they wanted, so I decided to add different waveforms and have the user select the one’s they liked.

I also wanted to give the user the flexibility of using their own samples in this instrument and then encourage them to shape, tune and create a new sound. Keeping the principles I had formulated in my initial thoughts, I decided to use natural language and clear controls, as not to disorientate the user and actually encourage them to experiment with the tools I would create for them.

Design, choices, Feedback loops & Iterations

To keep my opinions to a minimum and serve the end user’s needs, I decided to form a very small test group of 4 music producers at different levels. As with the audience I had identified earlier, my group consisted of three beginner to intermediate music producers and an additional two, that were much more experienced, to make sure that I was covering a range of different needs in my final product.

I began having a one to one conversation with each member, demonstrating the mock-up of the functionality proposed in my product, to gauge interest from the users and discover their underserved needs. These conversations were less to demonstrate what I had created and more to generate the interest and understand the user’s perspective and problems from my initial mockup of

the instrument (see Fig. 1). The feedback I heard from the less advanced producers was that it would be highly beneficial if it did what I was claiming it would and they could see themselves using it day to day.

The more experience producers were impressed by the simplicity of the tool but felt that they would still need to use additional plugins to achieve the specific sounds they were after. After speaking to this subgroup at length, I discovered that there were opportunities to close this gap by providing some go-to features that would otherwise be achieved through the use of external plugins, such as a distortion effects, glide and the ability to manipulate existing samples.

This was extremely beneficial as it allowed me to be more create with my list of features and these additions were highly likely to help beginners, not only through their presence in my instrument, but moving forward, give them an idea of the types of plugins they may need if they were to understand how to create sounds in other programs. Although I suspect this would be the case with all other virtual instruments used, it led me to collate the kinds of 'go-to' bass sounds they were looking for and try to recreate them using my instrument.

To recreate the more gritty or saturated sounds of some pre-sets I created my own distortion macro. After some research, I realised that this could be done quite easily with Reaktor, however the created effect did not have the same impact as a dedicated distortion tool (such as Soundtoys Decapitator). Fortunately, I was able to use the built in 'Overdrive' module within Reaktor and turned up the setting, I think made a horizontal fader to regulate the amount of this effect in my instrument. The issue I encountered with this was that the output of the instrument began to clip, even at the lowest levels and produced an unwanted result. I added a multiply module and set a constant and experimented with different values which seemed to rectify this. (See Fig 4)

From the feedback I had from the second design (Fig), I knew that the idea of a flowchart could work and was easily digestible for the beginners. I decided to use very large arrows and clear signal path to help the user understand the oscillator's flow and labelled each following step to guide what needed to be manipulated produce a specific sound. I decided to make this a highlight of the overall design of the instrument, but clearly labelling the sound sources and directing the user to start at this point, like a flow chart. The design of the GUI was replicated whilst building the instrument as you can see from the screenshot provided (Fig).

To satisfy the requirements from my test group, I researched how to add a field that would allow samples to be used and came across an article on the factory macro 'TF Sample Drop'. I decided to attach a 'TF waveform display' to accommodate for .wav and .aiff files to be loaded using familiar drag and drop functionality, however I was unable to test this due to my set up at home. I could not get Reaktor to allow me to add the sample and was unable to test this functionality within my instrument, so I decided to omit this feature.

I would have loved to make this an interactive button with pop ups to show what input was required one the main oscillator was turned off, however this did not seem like a necessary step for my final product and more of a 'nice to have'. To help the user to identify this across the whole instrument, I incorporated the natural language wording into the design of the GUI. This was a difficult task as music production jargon is universal, but I decided to use the labels that were the closest representation of the parameters they controlled.

I also wanted to incorporate a very clear and easy to use preset search function which also became more prevalent in the final design, based on the feedback obtained. I created a mixture of 9 presets, which incorporate a range of the tools within the instrument

When I began my research on to generate a low 808 tone, I did not think it would be as easy as a basic sine wave at a low register. I decided to analyse a range of songs to determine the different types of bass sounds I would need to include as part of my list of presets.

Top of my list would be the good old untouched original and appropriately named "O.G.". I took a similar approach with the other synths, by alluding to the song or producer's signature sound, for instance "Baby Suge", is modelled on the heavily distorted and overbearing "Suge" by DaBaby.

The process of building the Instrument, was quite organic. When I heard a bass sound in the list of reference songs I had chosen, I decided to recreate and build the aspects of the synth I was using. For instance to recreate the Bass on I needed to create an ADSR filter to shape the Sine wave, a retrigger to turn off overlapping sounds, distortion to add width and grit to the sound and finally a portamento control to allow the sliding of notes up and down on the sustain and release.

With all knobs and faders, I decided to create the notch values on the GUI and customized the text to be more in line with the overall theme of the instrument and consistent simple design.

A common use for a plugin like Ate08, would be for the user to load in their own samples and use the engine to transform or change the tone to fit with their composition. I received some 808 .wav samples that were user created, from my test group. Interestingly, when testing these sounds in a sample, I found that a lot of them were either mislabelled with the wrong key, had a great deal of unwanted frequencies below 200Hz or saturated elements in the higher end.

To cater for this feature, I would need to find ways to detect the pitch of key of the sample, an EQ to filter out unwanted frequencies and the higher saturation that would contribute to a less clean sound.

Ideally like the TRK-01 and Sublab instruments, I would have liked to build in an internal pitch detector, to clearly indicate the key to the sample used, but this was a complicated task to program from scratch. I opted for a 'Fine Tune' dial so that sound could be moved up or down by half a semitone and another dial to move up and down by one whole semitone which I entitle 'Change Key'. I programmed the second dial with 12 notches which defaulted to 0 but could be turn up to 6 semitones or down to -6, to accommodate for changes in key, which was another feature that the more intermediate producers in my test group had requested.

Often as these frequencies are low, and producers may decide to play the bass parts along with a song at a higher register to make sure they are playing in the same key as the song. To make this easier I decided to add an octave up/down switch through another custom macro so they can play along with a composition and quickly move between higher and lower octaves. This function was programmed by changing the pitch of an input signal up or down by 12 semitones (one octave on a keyboard), with the flexibility of moving up or down by three octaves.

Many of the instruments I researched would use a radial knob to switch between different waveforms but require a basic understanding and visual representation of what these looks like, I experimented with this, however Reaktor's GUI editor was quite limited, so I had to create one from scratch in another program, and then later aligned my controls with the design. This was an extremely frustrating task and would probably not be a likely concern for many Reaktor users, but as

my intention for Ate08 was to be manual-less, I needed to pay extra attention to this step.

To familiarise the user between different wave forms, I created a macro with four waveforms, sine, triangle, saw and pulse, which were assigned to a switch, so that the sound could be turned on or off. These shapes and sounds are universal within other synthesizers and I saw this as a good opportunity to help the user understand this concept and encourage them to experiment.

Some of the sounds I had heard in my research seemed to be either a culmination of two wave forms, so I added an additional oscillator in the beginning of the signal path, to allow both sounds to be heard at once, with the functionality to turn each one off. Additionally, I added a level control for each sound source so that the user could allow more or less of one waveform in the signal path.

The basic assets in the Reaktor library were not as aesthetically pleasing as what I had in mind, after all, I wanted this instrument to be inviting and feel good to use. I discovered a website called 'Knobman' which allows you to create your own button faders and knobs for Reaktor and replace the factory defaults. As much as the standard buttons and layouts were functional, I wanted to emphasise the user interface as a unique selling point for my product and decided to tweak an existing knob but adding a slight variance to fit with Ate08's styling.

I began to research what would be too much and what information would not be enough. I did not want the end user to feel like they needed to read a manual to understand how to create the sound that they wanted, or had to trawl through lesson on the internet to learn about synthesis and sound design to be able to use Ate08. Instead I aimed to encourage the user to explore the instrument and feel comfortable tweaking parameters, knowing what the effect would be.

Problems and future considerations

Overall, I am pleased with my instrument and received some good feedback from my small test group. I managed to create something that I could personally use every day, as a quick and easy tool that was design specifically for the purpose of creating deep bass tones from scratch. The presets I created whilst functional were limited in number and I would like to include even more bass types, such as dubstep wobble (potentially with its own button). Although you can achieve a similar sound through the LFO and some tweaking of parameters, I wasn't able to add this to my instrument effectively in time.

I came across a few challenges throughout this process which I could not rectify in the final build due to my limited understanding of Reaktor. I also struggled with the parameter controls for some of the functions, for instance the volume faders for each waveform that would not set to 0 with the faders assigned to them. As a result, I found myself turning off the second sound source whilst creating some of my presets, to get the right tone I was looking for.

As modern music has evolved bass and drum patterns have become more prevalent in music production than melodies, with bass now a great deal of movement in some sub genres of Dubstep, EDM and Drill. As a result, I would have liked to add a step sequencer that gave the user an idea of how the sounds moved up and down in a melody at higher and lower tones. After reviewing this theory with the test group, it did not seem like a good idea as 1. They were comfortable programming these melodies in their DAW, and secondly, they would also want the ability to drag and drop the midi into their project files, which did not fit the scope of this project.

I would also have like to include a mod wheel automation parameter, which would allow the use to control the LFO in real time, resulting in the famous '808 growl'. However, I think that Ate08 gives

the user a good sense of control and provides an easy way to design the sound through basic parameters. This is absolutely in line with the simplistic design I had sought at the beginning of this project and

Conclusion

When I first started making Ate08 I had a very ambitious outlook on what it could be and how it could benefit beginner/intermediate music producers and I kept this goal at the forefront of my mind whilst creating the final iteration. My test group were extremely beneficial in helping me mould the instrument into something that could easily be used to get the sound they were looking for. The limitations of my instrument were caused mainly by my hardware not displaying the correct modules (TF Sample Dropper) and my lack of understanding to control some of the parameters within Reaktor. Although the instrument works well, I would have loved to have a better understanding of Reaktor as there were elements I think this instrument could have benefitted from such as chorus and reverb, but overall I was quite pleased with the end result.

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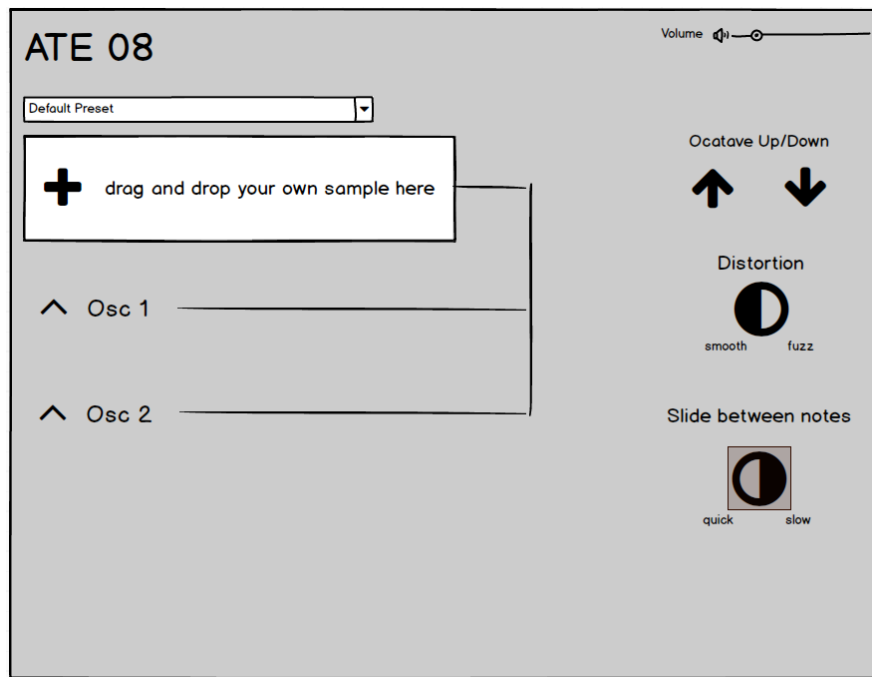
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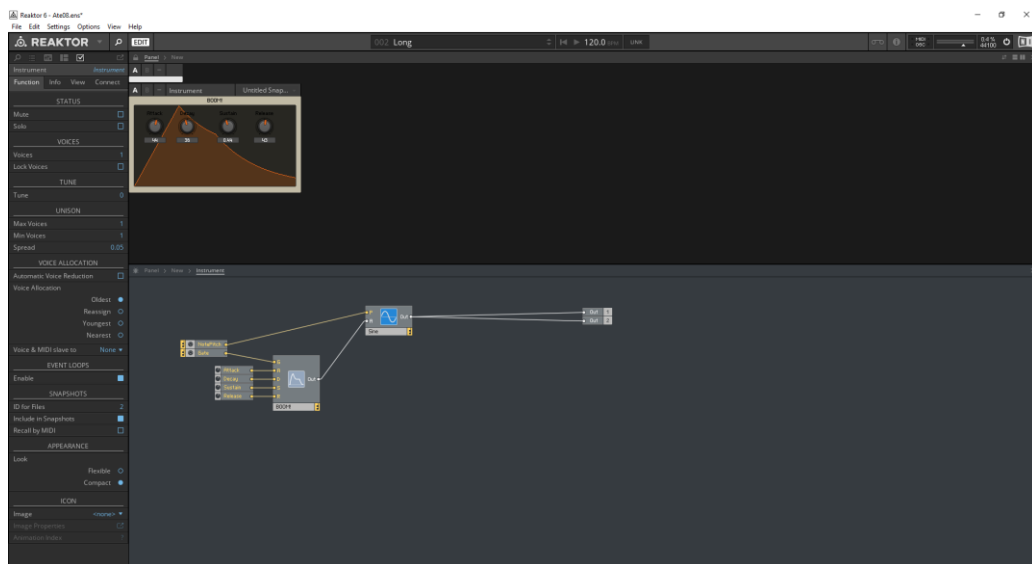
Screenshots of different iterations

Fig 1.



(Initial sketch)

Fig 2.



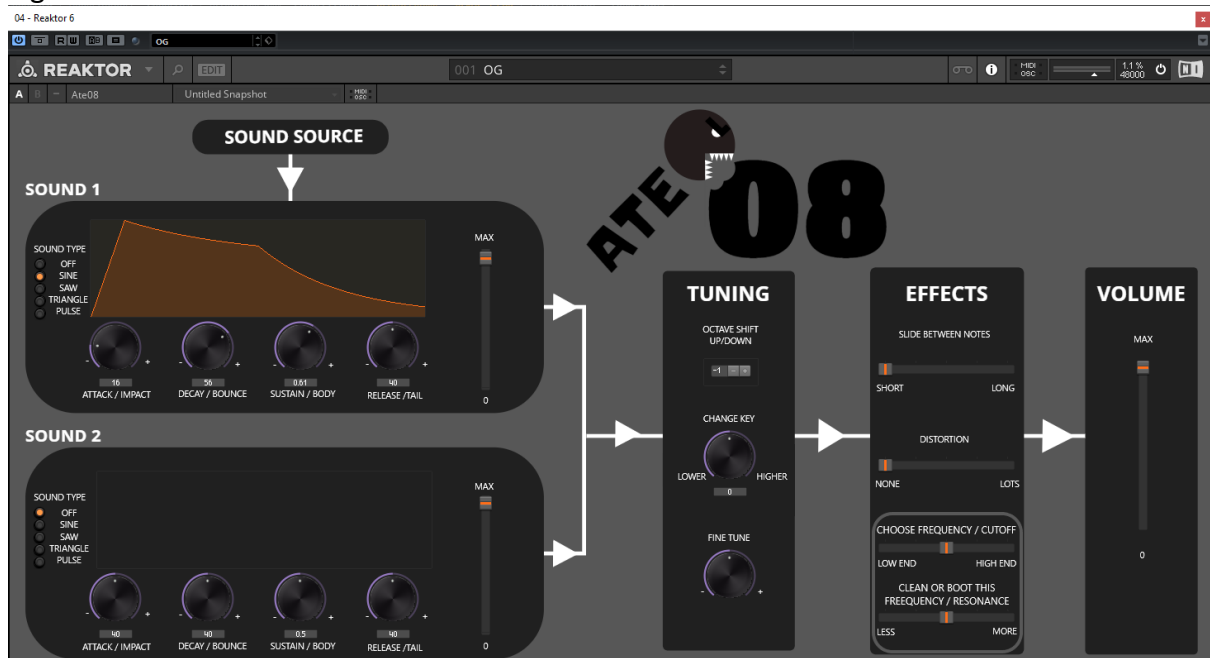
(Early layout choices)

Fig 3.



(Latter stages of development)

Fig 4.



(Final Design)