

Creative Technology - The Rhodes 'Donk'

MA Commercial Music Production

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INTRODUCTION

I wanted to create something unique rather than copy an existing model and I wanted something practical and useful for future music production projects.

Whereas I have experience with Audriono in 3d printing and have used game audio within Unreal, I felt a more practical learning experience would be to create a sample library and use it within a sample based instrument such as Kontakt or UVI's Falcon.

Sample based instruments have been in ever increasing use as computer processing and memory have increased and producers work more and more 'in box'. They involve repurposing audio for midi playback and allowing tweaks to the tone and features of the audio such as reverse, pitch shifting and time stretching as basic examples. They rely on a sample library of audio and these are often packed alongside a sample based instrument for convenience. Sample based instruments are often the only way to recreate the acoustic nature and articulations of real-life instruments.

First heard on recordings in the early 70s sample based instruments have become a staple in modern production. They are used to virtually recreate instruments such as guitars, horns, drums and pianos. I use sample instruments often for example, the free BBC Spitfire Orchestra, many from the developers and partners of Native Instruments such as Scarbee Bass. There are many companies in the market, for example Soundonsound lists over 1094 on their website. Some are commercial and some are freeware with professional examples ranging in cost anywhere between £10 - 500 with the more expensive examples combining higher quality samples as well as importantly recreating the nuances of the natural instrument. They often contain thousands if not tens of thousands of separate audio files to achieve this, that can be played back using midi controllers with use of triggers such as the modulation wheel or keys to trigger certain desired articulations. They also ship with a Graphical User Interface [GUI]. Not only does this look better artistically and style wise but allows the end user to tweak settings for the desired sound quickly and easily.

As each instruments relies on recordings I knew that this was the most important element. I would need to work out the best method of recording and I wanted to record something unique and not too abstract. I was initially inspired by the Labs soft piano that had sampled a regular piano using a thin strip of felt between the keys to produce a softer tone. I explored the possibility of using a material such as foil for a sharper and crisper sound. However I soon ruled this out as it was physically impractical and an available piano within a studio space was associated with a tuning cost.

Discussing with the engineers at TYE I was lucky to have the opportunity to sample Sean Hargreaves Fender Rhodes Mark 1. This Rhodes was in production between 1969 and 1975 and is an electric piano built to emulate the touch and action of an acoustic piano. Pressing a key results in a wooden hammer striking a thin metal rod called the tine. Therefore simply playing a Rhodes will produce a tone as well as the sound of the mechanical actions even if it is not plugged into an amplifier. Due to this design each Rhodes has a slightly different tone, timbre and characteristics that can be noticed by those who have had an opportunity to play multiple versions.

As well as this, the Rhodes has an iconic sound that has been made popular in countless productions including work by great artists such as Stevie Wonder and Herbie Hancock. It is still a valued part of the modern producers toolkit.

By accurately recording and sampling the instrument it would provide a practical and unique instrument that could be useful not just for myself but my peers in future productions and took to planning the task.

I have been fortunate to have experience recording vocals and needed to do further research in order to capture the Rhodes correctly. I knew proximity to source and correct gain levels whilst eliminating phasing were vital components. I sort research to help with the process and how sample libraries are organised.

I discussed this with my mentor, Brendan Cox, who provided me with practical tips, suggesting I start with two octaves and call it a Tiny Rhodes and stick to three layers of velocity.

I also discussed with my tutor who suggested that I capture the sound of the keys, mechanics and tone arm and made me aware of the importance of capturing enough takes for round robins.

I researched methods used in the recording process to maximise consistency of velocity and length of note. I understood that recording to a metronome would be useful to achieve a uniform delay and relied on my experience playing the piano to achieve a consistent velocity.

I had been made aware through lectures that a lot of sample based instruments do not sample every pitch, including premium sample packs from companies such as Spitfire, rather whole tones are captured than the software that are pitched down a semi tone. Pitching down removes information whereas pitching up adds information, so by using this method there is less destruction of the waveform and a more realistic result. Further more I was made aware that Spitfires 'North 7 Keys' instrument had sampled the exact Rhodes I was using. Sean Hargreaves had played the session while Simon Changer engineered. North 7 keys has a total of 21,806 samples divided between five different electric pianos, so roughly 2, 700 samples for the Rhodes I was using alone.

So in conclusion I wanted to capture the stereo image of the keys and mechanics of the rhodes alongside the direct input signal. I also wanted to capture the pedal and planned to set loop points within the sample to recreate the sound of sustain. I wanted the end user features to include the ability to fade between the mechanic sounds and the amplified output to recreate either, an intimate up close feel, or an onstage performance.

THE RECORDING PROCESS

The Rhodes was set up in the middle of the studio offset by a length of two thirds to maximise acoustic properties by containing the reverberation and reflections to a golden ratio. I set up to maximise workflow in practical ways placing, my desk as close to the Rhodes as possible, and thus reduce noise from my movement to and from the work station.

Mic choice was an important factor to achieve the intimate recording of the keys and tone arm. The lid of the Rhodes was removed to remove dampening and increase the audible volume of the mechanics and I chose a pair of Cole 4038. This was based upon the flat frequency response and exceptionally low hum pick-up of these microphones.

By using mono ribbon microphones as a stereo pair I could achieve a much closer feeling than using a single omni direction microphone in the centre. The mics were placed in a figure of 8 horizontal blumheim to reduce possible phasing whilst capturing the maximum stereo width possible. Held in a central position roughly 50 cm above the mallets was mathematically ideal. I was aware that my movements would also be picked up and tried to remain conscious of this to minimise impacting the recording negatively.

The output of the unit was routed first to a Direct Injection [DI] box to boost the signal without excessive humming and converting the signal from an unbalanced 1/4 inch tip and sleeve jack to a balanced TR and Sleeve and then directly to my sound card and I tested the results before proceeding further.

Following my testing it was immediately evident that my Focusrite pre amps were not amplifying the DI sufficiently and an additional pre amp was needed. Fortunately I was able to use an API 3124+ which has 65db of gain and I proceeded to route the signal from the DI and the Coles back into the Focusrite.

I then spent 2.5 hours recording into Pro Tools [PT] at 48khz 32bit depth. I decided to amend my original plan to only capture the whole tones because I could hear the unique character and resonance produced by each key. I used a metronome at 81 bpm to try and keep the decay of each note uniform and went with four bars of decay. I started to record each key at maximum velocity and held the note til no longer audible. I then repeated the process aiming for a consistent minimum velocity. This was followed by a mid range velocity that I felt was in-between the level of the first two takes. I then recorded each key again thrice with the aim in mind to use this audio for round robins on the key mechanics. I adjusted the length of these round robin notes to 1 bar as I was limited in available use of the studio and had already spent the majority of my time on the first three takes.

I also captured the pedal on and off by recording it numerous times but didn't add a round of key strikes with the sustain pedal. This was because of time restraints and I felt that I could use loop points within the chosen sampler if needed.

My original plan was to record just two octaves and call it the Tiny Rhodes, however the project developed and I wanted to focus on the unique selling point that I had captured the mechanics and the name developed into the 'Rhodes Donk', This came as I listened to the 'donk' and 'plonk' of the keys hitting the tone arm and release. The 'donk' would represent the release and the 'plonk' the key press.

THE EDITING PROCESS

Once the recording was completed I began editing the waveforms with the intention to create a transparent and faithful set of audio files to then load into a chosen instrument sampler.

I knew this would be a painstaking process so looked for ways to maximise efficiency. I decided to slice the audio within Protools and utilise the tab to transient function. I also used the zoom presets and trim shortcuts. Following this I planned to use the batch rename function and the commit function to bounce the audio into separate organised folders.

I also wanted to uniform the level of the various samples as recommended by Native Instruments guide on sampling. I used the iZotope maximiser and set the threshold accordingly with a peak output of -2db.

Unfortunately it was at this point I noticed a few errors with the recording process. Firstly I had left the air conditioning in the studio on and this had produced a background noise that was particularly audible once the gain had been increased on the audio recorded at minimum velocity. There was some instances of noticeable breathing and sometimes the noise from chair movement or desk was captured more than I would have wanted.

Also there was a hum from the direct input signal so I needed to treat the audio using noise reduction software before proceeding.

I did not have access to the industry standard iZotope RX so looked for alternative and settled on using the open source noise reduction function within audacity. I took a noise profiles usually from the start of the recording and applied this to the clips reducing -12db of background noise and this had a positive effect without significantly affecting the tone or quality of the audio. I also minimised the gain on particular problem areas to reduce artefacts.

I put the noise reduced files back into PT and continued with editing. Finally I added 0.3 ms of silence to the start of the DI signal waveforms to introduce a realistic delay between notes pressed and the signal output. I then exported the files and organised them into folders ready to load into a sample based instrument.

CHOOSING THE RIGHT INSTRUMENT SAMPLER AND PROCESS

The market for high quality virtual sampled instruments has become increasingly competitive and there are many options to choose from. Logics EXS24, UVI's Falcon and Native Instruments Kontakt were the three I had access to and all would allow me to load my custom files, map to key ranges and playback with Midi for the desired result.

To meet my aim of making an instrument that could be widely used I decided to use Kontakt because it has the largest user base. It also allows programming of a customisable graphical user interface [GUI] that would be an important part of the presentation of the instrument. Specifically I chose version 5 because if it was made in 6 it would not be backward compatible and therefore limit user base. Kontakt has advanced scripting technology that allows developers to bring a level of 'hyper realism' to their sample libraries and as I was making a virtual representation of a real an instrument this was a key factor.

I started to load the files into Kontakt using the auto batch feature. This did not work as expected because I had labelled the files starting with each octave at Gb whereas Kontakt understands each octave at C. I discovered that each key has an associated midi number so my E0 would be midi number 28 and F0 29. I used batch rename in mac finder and added prefix where possible but also had to manually make amendments but was soon able to map each sample to the appropriate key range.

My plan was to create one group for the DI signal layered according to velocity and then three groups for note on and three groups for note off to use as round robins for a more natural sound. I set this up and immediately noticed that my round robin audio for note on was not consistent in length with the DI samples and the pleasing resonance of the tone arm cut that short was not desired. I therefore only used one group of samples for the note on 'plonk' recorded in symmetry with the takes capturing maximum velocity.

The round robin 'donk' were mapped to random because I felt this introduced a more realistic and natural result then cycling through the three available slots. In some cases the round robin event was more noticeable than desired and I looked for takes that were closer in similarity for a more even effect.

I wanted the end user to be able to easily control the volume values of the mechanics and had to learn about scripting. I had never looked under the hood of Kontakt in this detail before and there was a learning curve involved. I was able to script the volume of the note on as this was contained in one group and with the round robin groups I made a bus and then a script to create a knob for this also.

Then using graphic editing software and pictures taken of the Rhodes when recording I made a basic GUI and loaded this as background. There was trial and error involved to get the dimensions correct but found 700 x 625px close enough.

I wanted to use custom knobs to keep in match with the custom background created above. I used the popular Webknobman website and looked for publicly available graphics that the website would then export as a png file using an animation script that I could use in Kontakt. However it was not as simple as pointing the script to the button graphics as Kontakt only allows custom graphics on sliders. I therefore needed to amend the script to look for sliders and create a resource folder to store these in with a text file to instruct Kontakt how to use the png file.

In keeping with the aim of a realistic feel to the instrument I wanted to pan the mono direct input files and used the panning function within Kontakt to achieve this. Rather than panning each key zone I was able to achieve this effect more simply using the key position modulator on the amplifier within the group.

The resulting sound between velocity and change velocity was too extreme and needed smother and gradual. I created Authentic Expression Technology morph layers and experimented with the results. I found that as the layers superimposed on each other the sound characteristics became distorted and the result was a loss of dynamics. I implemented a velocity script and made adjustment to the linear curve. By setting a velocity faded midi loop in Pro tools I was able to experiment until I had the best result possible.

CONCLUSION AND REFLECTION

Undertaking a project for the first time is always a challenge but also an exciting opportunity to learn new skills and develop. The foundation of this project was the recording process and the success and quality of the instrument was built upon the quality of the audio samples.

I had access to a world class studio and an immaculately maintained Fender Rhodes. The microphone setup and pre amps were of top quality and I couldn't have wanted more in this regard. However a 'school boy error' was completing the recording with the studio air conditioning still on. In addition the input levels through the DI had made a hum that wasn't noticeable until I maximised the gain. On reflection this crucial step of ensuring a clean recording should have been more diligently pursued and I had to rely on post production techniques to rectify and save the project.

Also I thought my recording was sufficient but upon reflection and in comparison to professional libraries, where typically four or five days of recording is dedicated, I could have made use of extra takes to produce higher quality samples with less artefacts and produce a more realistic round robin effect. I feel that the round robin in some key ranges is still too noticeable and didn't really appreciate how similar each clip should sound with only fractions of a difference making a huge contribution to achieving the desired effect.

My methodology in recording also presented further challenges when editing. I had recorded each key one after the other in a continuous manner. Had I recorded each key onto a single take then proceeded to the next it would have made editing a more efficient process. Instead I had to constantly check what key I was editing which became troublesome when I started to make hundreds of edits. Additionally I would have had more usable audio for round robins. In the end I spent a far longer time editing the audio than the recording process itself despite the use of shortcuts and functions available within my DAW.

I wanted to make an instrument that was usable for myself and peers but didn't give enough consideration to the commercial prospects and the space in the market. Had I have considered this thoroughly at the outset I would have made decisions such as what features and unique selling points to focus on.

My mentors advice to start small would have been well headed. Instead I saw the challenge and desire to capture each key enticing and undertook what would usually be taken on by a team of engineers. By focusing on perhaps two octaves I could have captured a more detailed and natural balance of the desired area. Perhaps five levels of velocity and eight round robins would have resulted in a more realistic representation of the instrument.

I also did not appreciate that labelling according to midi number was the correct method until it came to trying to load the samples into Kontakt and the auto-batch settings not recognising correctly how I had labeled the files. My E0 was actually midi note 28 and therefore I had to spend time re-naming all 511 files and because of the way I had labelled in the first place I was not able to simply rename in finder.

The scripting was a challenge and I used the KSP reference manual alongside online tutorials and forums to finalise the instrument. There are a number of elements that I could improve given further time and more knowledge. Key amongst these would be to add additionally features such as mapping audio samples to the

sustain pedal. It was not that simple and option of ticking the release button that I used when assigning the donk group. It required an in depth scripting because Kontakt has a historic bug that means all midi notes are released when the sustain pedal is released and although there is a script to work around I did not understand it sufficiently to customise it to use. Also I would have needed to set loop points as I did not capture recording of each key with the sustain pedal and this would have been key to recreate the natural sounding expression required.

I would also like to add a switch to represent the amplified input on the real Fender Rhodes. This would enable the instrument to be played as if there were no amplifier connected and the user only hear the mechanics and action of the keys. This would involve a button script with a custom graphic of an input jack, a quirk of the Fender being that the input is actually the output. To implement this the script would mute the output of the DI samples when not activated however I only thought towards the end of the project and did not have time to program with a corresponding .png.

COMPARISON AND CONTRAST WITH EXISTING INSTRUMENTS

I am pleased with how the GUI looks and the knob's function. It is simple and easy to use with only two options at present. I have tested with both playing and using publicly available midi clips and the results are pleasing. In my opinion I have created a virtual instrument that is a close representation of the actual instrument it represents and I hope that I and others will be able to use it within future productions.

The audio competes with paid for competitors such as the mark1 included in the native instruments library however it lacks the amount of tweakable options but on the other hand offers a more simple and easy to user interface which is fun to use. Having looked at 'Off the Beats' all-time best free rhodes VST's it is clear that there are many high quality options available each with a multitude of tweak able options such as ADSHR, Bass Boost, Tremelo, Stereo/Mono. I decided against these options as there are ways to manipulate these features already within a users daw. I think the most important aspect is how it sounds and and is it fun to use.

Initial feedback via dropbox has been positive and I look forward to distributing the instrument to peers and professionals and taking into consideration ideas to implement further features.

The project has been a worthwhile experience and I would like to develop further sample based instruments in the future. I would develop suitable marketing strategies taking into consideration of the four p's of marketing, product, price, promotion and place. Alongside this would be a marketing timeline to strategise implementation to maximise chances of commercial success.

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