

MA Commercial Music Producer

Development Element 2b

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The Angel Synth

The Angel synth is a software instrument created with Reaktor based on three oscillators and a substantial and powerful effect chain.

The initial idea for the Angel Synth was to create a virtual synthesizer in which the aesthetics and the design matched the purpose and the type of sound of the instrument itself. The concept came from Dada Life's plugins: Endless Smile and Sausage Fattener. Although these two plugins sound and work in an excellent way, commercially speaking, their greatest strength is, without any doubt, the design. The graphic aspect of both plugins explains their purpose and how they work, and the interaction between knobs and wallpaper is the perfect hook to catch the eye and encourage people to purchase the product.

Into an oversaturated market dominated by well-known companies, in which a user can choose between hundreds of different plugins that look the same and do the same things, a product, in order to emerge, needs something extra, even if it is insignificant in terms of quality and functionality.

As a result, I decided to design something similar with the same concept: an instrument in which the aesthetic meets the changes on the front panel.

Unfortunately, I had to face my lack of graphic designing skills and, therefore, find a simple method to express the idea in order to then be able to realize it.

I chose Reaktor by Native Instruments to create the synthesizer, as it allows to customize the aesthetic in a very easy and intuitive way. Additionally, the customization of the signal path is very clear. Thanks to Primary and the possibility to extrapolate modules from other ensembles, realizing a synthesizer is not as hard as it seems.

With regard to the sound and the purpose of the Angel Synth, the name speaks for itself: dreamy pads, leads and ethereal soundscapes. The Angel Synth is an instrument in which FXs are more important than the source; the effect chain is built to help the basic structure of the instrument to enhance its power and its versatility.

Overview

I started by building the structure of the instrument, inserting the modules I thought would work well in order to avoid complicating the signal path more than necessary.

The synthesizer shows three oscillators and an additional noise generator with the choice of white and pink noise. Each oscillator features pitch and fine tune controls, the choice among different waveforms (sine, triangular, saw and square) and a sync knob useful for synchronizing (or not) the second and third oscillator with the first one.

It is important to note that the oscillators are not made from scratch, they are the default oscillators of Reaktor Primary.

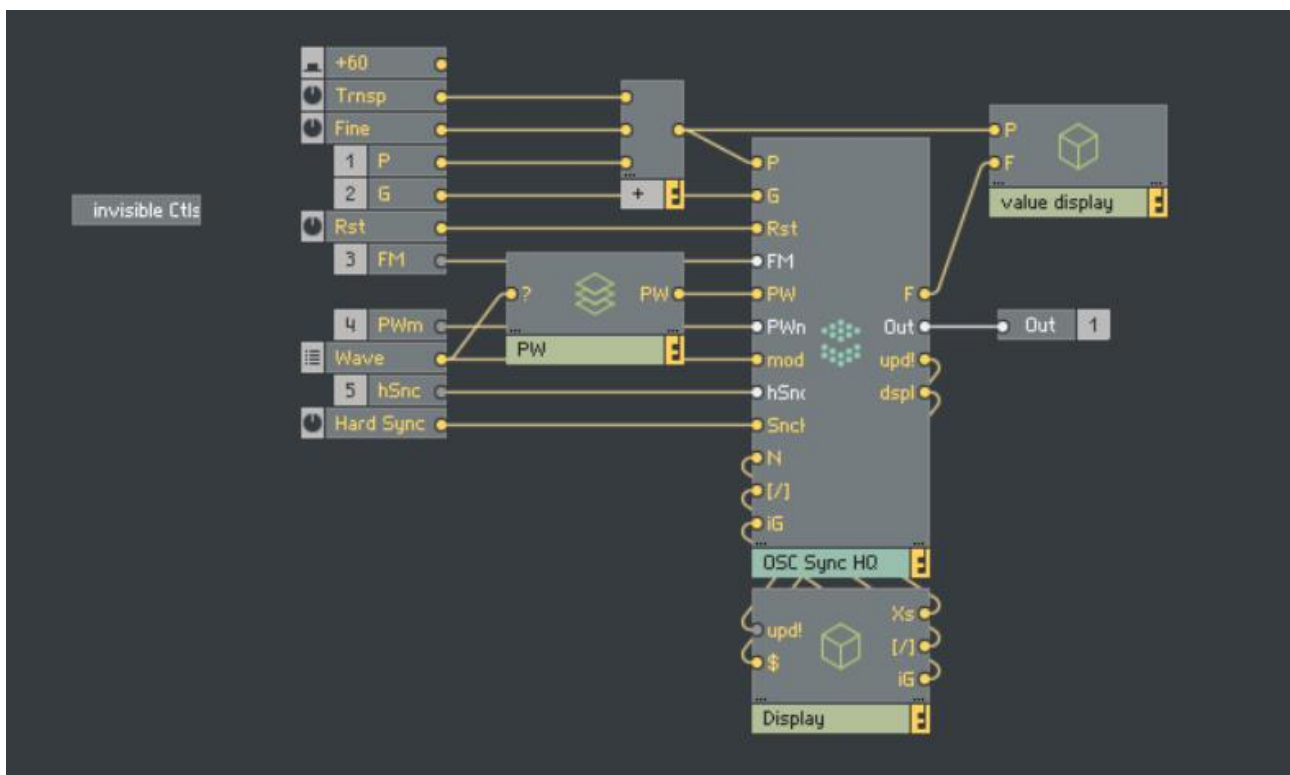


Fig. 1 Oscillator

All the oscillators converge into a minimal Mixer with level and mute controls in Minimog style. The Main out of Mixer goes to the VCF which is a low pass filter with Cut-off and Resonance controls, keyboard tracking and LFO. The kybd control allows the user to set the amount of keyboard tracking of the VCF cut-off frequency: this means that the cut-off frequency could change in relation to the note played, opening the filter and getting a brighter sound as the user plays further up the

keyboard. With respect to the LFO controlling the cut-off frequency, there are three different waveforms options one can choose from (sine, triangular, square) in addition to the rate and depth controls. The VCF out converges into the VCA input, which is none other than a multiplier, which multiplies the master volume control and the input signal.

The Angel Synthesizer features two envelopes: the first one is a classic ADSR envelope dedicated to the VCF, while the second one is a more minimal module with only the attack and release controls for the VCA. The envelopes allow users to control different stages of the module to which they are connected, and to be able to set the time of attack, decay, sustain and release.

Concerning the FXs, there is a tremolo, a chorus, a delay and a space reverb. They are all connected in series, though the reverb module does not appear on the instrument panel. This means that it cannot be switched off or being modified, it is intrinsic in the instrument and in its natural sound.

The FXs played a fundamental role in the sound design process of the synthesizer. All of them combined together offers to the user the immediate possibility to create wider and bigger sounds only by switching them on. This help to develop the desired sound from the first click, making the dry and rough oscillators more intriguing and particular. Especially the chorus and the tremolo mixed together offer a nice stereo image, very useful for generating enveloping soundscapes and airy pads.

The front panel is envisioned to be divided in different section according to the settings present in them, in order to appear clean and obvious from the beginning. No manual is needed to understand the structure and the operation of the instrument, all newcomers are able to start to play it after a few moments. Additionally, the presets represent a good starting point for those who do not feel confident to start building sounds from scratch.

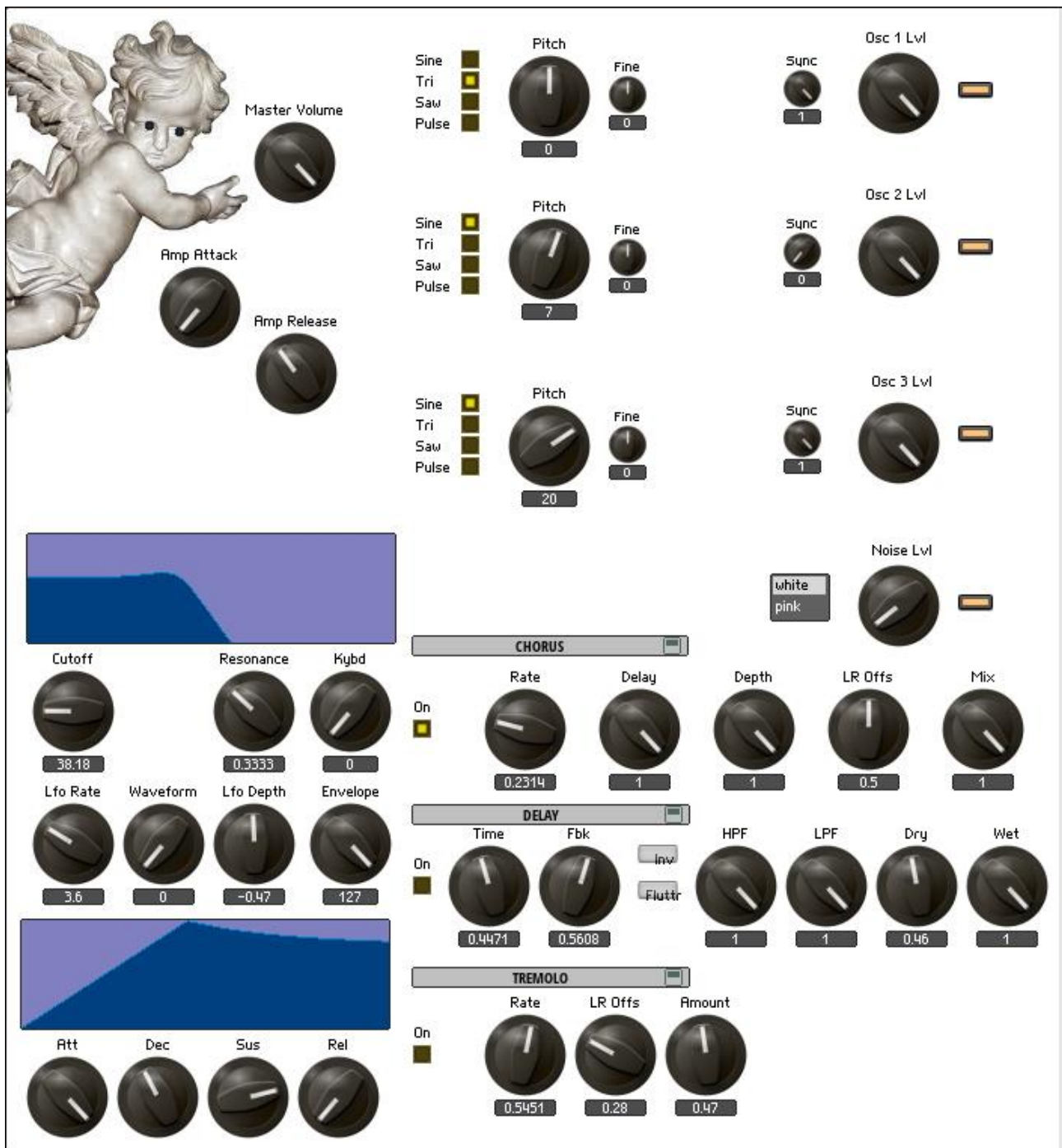


Fig. 2 Front Panel of the instrument

All the effect are located on the right side of the panel, above the three oscillators, the noise generator and the mixer. On the left side there are all the settings regarding the VCF: the filter with its own display, followed by the LFO's controls and the envelope of the VCF.

On the upper left part of the front panel are placed the VCA control setting such as the attack and release of the envelope and the master volume knob, indicated by the hand of the angel.

With regards to the aesthetic of the product, I tried to combine the initial idea, respecting the ethereal and dreamy concept, with a minimal design that allows me to complete the project despite my lack of graphic designing skills. I opted for a white wallpaper and a marble angel which matches well with the purple and blue of the displays of the VCF and the envelope.

The LFO rate is linked to two lamps placed as eyes of the angel. In this way the angel's eyes flash according to the speed of the LFO rate creating the visual effect of an angel with laser eyes.

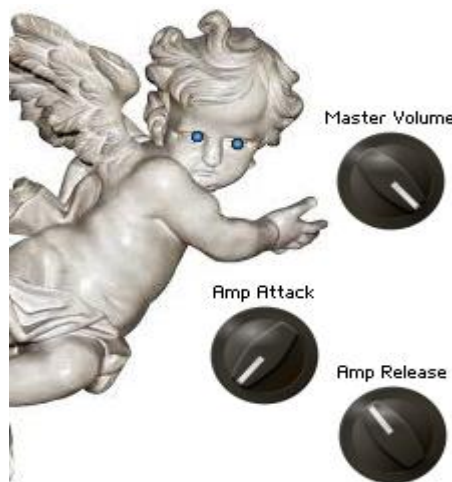


Fig. 3 The Angel with laser eyes

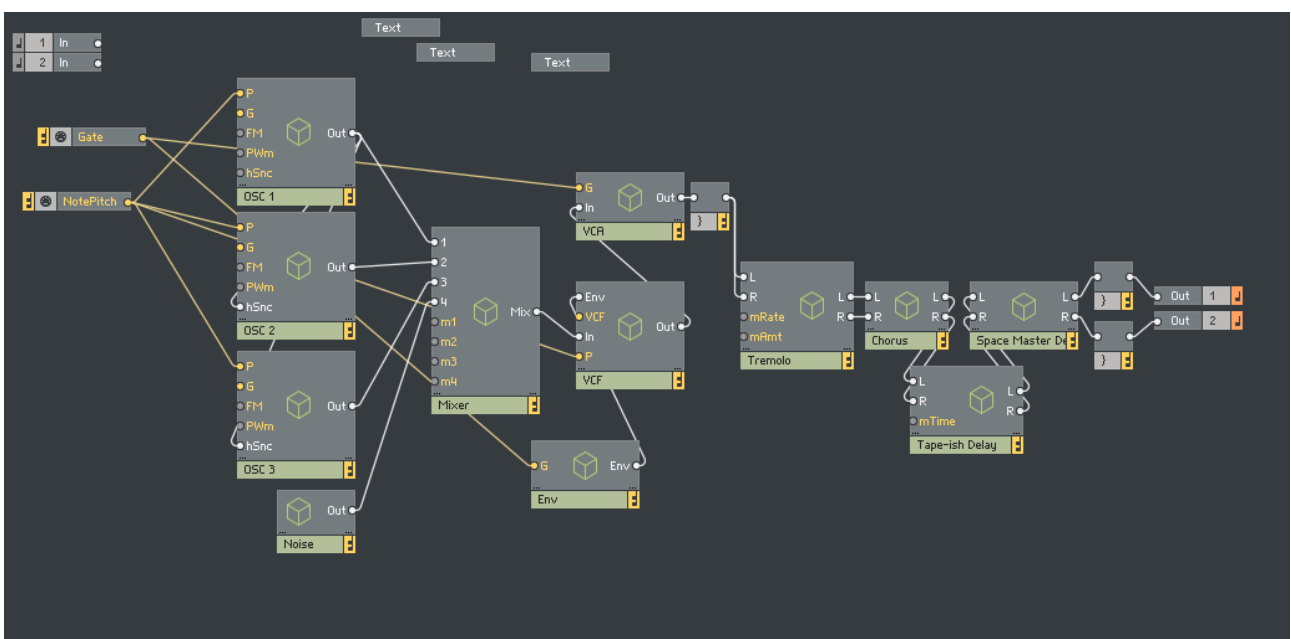


Fig. 4 The instrument inside

Design and Manufacture

I started by choosing three oscillator and the noise generator from Primary. These oscillators are very complete modules featuring all the connections that you need as Pitch, Gate, Pulse width, Sync and FM. I decided to connect the output of the oscillator 1 to the sync input of the oscillator 2 and 3 in order to make a control of hard sync between the oscillators. Next, I plugged a Note Pitch module into the oscillators for sending MIDI Note On events.

All the oscillators and the noise generator converge into a Mixer. The Mixer incorporates two main modules: Modest Primary and Mod Mixer. The first one is a very simple module with 4 inputs and 1 output in which I plugged the output of 4 Amp modules. These modules are multipliers that multiply an amplitude knob (x2) for level control and an on/off switch for mute. The outputs are plugged into both amplitude control inputs of the main modules. The Modest Primary contain GUI data, so the actual mixer is Mod Mixer which is a Core Cell (Core programming language) plugged into the VCF.

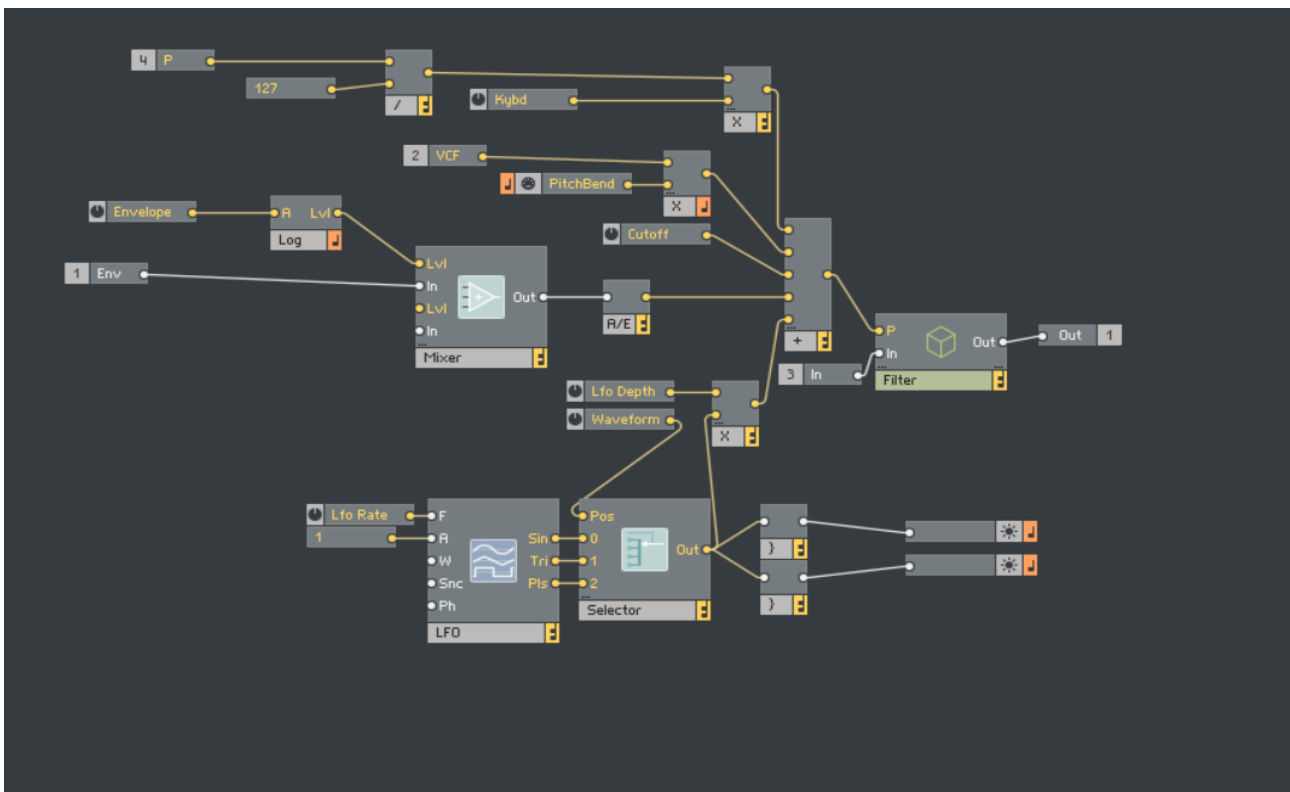


Fig. 5 VCF

Further, the VCF it is a low pass filter to which has been implemented an LFO by an adder module before the pitch control input of the filter. The LFO output is separated into two voice combiners and then into two lamp units. These are the lamps that have been placed as the laser eyes of the angel.

The structure of the filter consists of a filter macro to which an adder for multiple signals before the pitch input has been added. The latter incorporates the LFO, the envelope, the cut-off knob and the keyboard tracking knob. In such manner, all these elements affect the cut-off frequency of the filter. In the “P” input the note out of the keyboard (0-127) is plugged. The note values are divided by 127 in order to obtain values between 0 and 1; the result is then multiplied by the value of the knob called “kbyd” (0-50). In such a way, whenever I play a high pitch note, the first multiplication result will be 1 multiplied by the kbyd knob value which decides how much the note that I am playing will affect the cut off frequency. It is important to mention that the value of the kbyd knob cannot be set higher than 50, otherwise the final result of all the multiplications will be higher than 20k Hertz, which would certainly be useless.

The VCF is connected to an ADSR Envelope by the gate input of the filter, so that the envelope will restart every time it is triggered, which is whenever a note is played. The envelope knob is plugged into the “log”, which allows to convert linear amplitude to logarithmic level values in dB and then into the mixer; this is because the level input of the mixer expects a value in dB. The output of the mixer is processed by an A/E module which converts the audio signal of the envelope into a MIDI signal (event).

The Envelope macro is made of the ADSR-Env module in which three shapers for the control signal of attack, decay and release are plugged, alongside a knob for the sustain level which does not require a shaper as it represents the value of an amplitude. The shapers allow to create different areas with different responses in terms of values on a single knob, so it is not linear for the entirety of its range.

The VCF converges into a VCA module similar to the ones already mentioned in the Mixer with an Attack/Release Envelope implemented. After the VCA, a voice combiner helps to combine all voices into one single signal before going through the FXs chain.

For the FXs chain I opted for the following macros: Tremolo, chorus, Tape-ish Delay, Space Master Reverb. These are all connected in series and followed by two voice combiners before the main output of the instrument.

The Tremolo offers classic controls of rate and amount, and an additional control of left-right offset which allows to introduce a phase shift between the two channels. In

doing so, the effect is not perfectly aligned on the left and the right thus helping to create a wider stereo effect.

The Chorus has controls for rate, delay and depth of the effect, plus the left-right offset control similar to the one previously mentioned in the tremolo module and a mix control to blend the dry and wet signals.

Time and feedback are the two main controls of the Delay. In addition to this, two filters are featured on the module: a high pass filter and a low pass filter, which allow to modify the repetitions generated by the unit by creating a tape delay effect. Furthermore, there are two switches concerning a flutter effect for a more faithful tape feeling and an invert button to invert the feedback phase.

The Reverb, which doesn't appear on the front panel, is a space reverb with a long decay and the mix knob set to 50%. I decided on these settings so as to have a recognisable and powerful effect that is not too intrusive and mismatched with other eventual instruments.

Regarding the design of the ensemble, I started from editing the knobs by installing a software called JKnobMan, thanks to which I was able to download my favourite knob style in different sizes.

Later on, I found the angel photo on the internet and, after resizing it, I imported it into the ensemble and placed it on the upper corner of the front panel.

The preset bank contains 10 presets that show all the different ways in which the synth can work and its practical applications. For this reason, the presets are varied, which can be a good starting point for the users who are looking to create their own sounds, which can be saved as well as snapshots. All the names fall within the sphere of God, sky, church and mystery.

The final result is satisfactory, the instrument works well and I think it could be used in a professional production. Although the front panel should be tidier and clearer, it sounds good and it is very easy to use and understand. The design could benefit from further improvement, as it does seem undeveloped. A better look could help catching the eyes of the users.

Moreover, the structure and the signal path of the synth could be better and perhaps more original. It is basic and it does not have its own distinct trademark yet. At the moment the instrument offers good possibilities and variety of sounds, though nothing more than other synthesizers available on the market. With more in-depth knowledge of sound designing with Reaktor, many more sophisticated ideas could be developed.

Beta users' feedbacks and possible improvements

After recruiting four beta users for first feedbacks, I received the same response from all of them: the synth is fully working and it sounds nice, but the preset recall does not work. This error might be due to the fact that I edited the signal path of the synth, or perhaps changing the name of the ensemble makes Reaktor struggle to locate the files.

After trying to open the preset files in different ways, I opted for creating a program change knob with Primary, hoping that the synth would allow me to navigate through the presets with that; unfortunately, it did not succeed in solving the issue.

I chose to recreate similar presets from scratch and save them as Snapshots in a bank.

I once again sent the instrument and the users could now navigate through the presets. I could have gotten a better result introducing the snapshot modules. By saving snapshot normally without the snapshot module, I only saved the setting of knobs without considering any alteration of the value of the knob that could be caused by operations such as multiplication or sums. If I had added a snapshot module before any input, the saved value of the knob would be the result of the operations at the moment when I saved the preset.

All the beta users appreciated the design even if minimal and bare, which is a great result. Honestly, I think that many improvements could be done on the aesthetic of the synthesizer in order to bring the sound and front panel interaction to the next level.

For instance, creating an angel specifically designed for the instrument instead of using a png file would create the possibility of designing more sophisticated and processed graphic effects.

With regard to the sound and the structure of the synthesizer, there are many things that could be done. I could create an FM mod using the FM inputs of the oscillators or implement a Morphing Wavetable. To add a wavetable path, I would need to use the Audio Table macro, then draw the waveforms and morph between them using the XO, XR, YO, YR inputs of the module.

An arpeggiator could be suitable for the instrument as well, helping users to create instant melodies with a different approach.

Moreover, a sub oscillator could be useful to help the synth to play lower frequencies. It could be designed with only a square or sine wave with a pitch value linked to the first oscillator and transposed by an octave.

The reason these features were not implemented in the final product is that, the Angel Synth being my first instrument, I preferred a simple and classic synthesizer path to be sure to understand well every element of it and be able to eventually easily overcome any issue. Further, I was not very interested in the FM sound, as it would be inconsistent and non-related to the concept and the type of instrument that I was looking for.

Some users noticed that the reverb cannot be modified or switched off and they did not understand the reason for this choice: they realized that there was a reverb, but they could not see it on the front panel, which ended up being slightly confusing for them. I replied saying that it was an intentional choice, made in order to omit the reverb controls from the instrument. In doing so, I hoped users would be inspired from the first rough sound to create certain sonorities. Thankfully, all found the reasons behind my choice much clearer once I explained it to them.

After finishing the instrument, I sent it back to the users for a final feedback. All of them appreciated the synthesizer in its entirety and they all agree that it could be useful for production purposes. However, one user complained that he was not sure he would buy it if he saw it in an advertisement or on a website surrounded by many other products. He explained that the design of the instrument is not flashy and developed enough. Nonetheless, the other three users disagree with him on this point: their opinion is that the lo-fi and bare aspect of the Angel synth would catch people's attention enough to click on the advertisement. Another user affirmed that he would have appreciated a glide control and a feedback circuit on the VCF. This could be done by multiplying the output of the filter with a knob before plugging it back into the filter and adding it to the original signal. In addition, a module to modify the phase of the feedback signal could be useful to emulate an analog circuit.

The simple structure of the synth allowed me to keep all inconveniences or problems at a minimum during the design process. The feedback of the beta users has been positive since the first try and I just had to make some adjustments in order to complete the instrument. After having collected opinions, I spent a couple of days using the Angel Synth as a producer so that I could have my own point of view as a user over a longer period. Playing the instrument as a musician and trying not to focus on the design, helped me to understand more about it and see the synthesizer from another perspective. At this point, I was able to draw my final conclusions and thoughts about it.

Comparison with other existing instruments and final conclusion

The Angel Synth never had the pretentiousness to be distinguished from its competitors for what concern its sound design possibilities. There are more than one instruments comparable to mine in terms of features. 2-Osc from the factory library of Reaktor looks very similar in the signal path: while it has more controls on modules such as VCF or Envelopes, it is minimal in terms of effects, being equipped with only a stereo delay. Moreover, 2-Osc doesn't have any design concept behind it. It has a very basic design, like all the synthesizers of the factory library of Reaktor. The Minimoog by Moog looks very similar in the features, having three oscillators with the same control settings, a mixer which is identical to mine and some other features similar to the Angel Synth. However, the Minimoog has a unique and recognizable sound texture, incomparable with my instrument. The Oberhausen by Brainworx is another virtual instrument very similar to mine in terms of characteristics and layout but it includes many other options such as mid-side technology, FM synthesis and the modulation matrix.

Regarding the design, I already mentioned the Dada Life's plugins concept, which are in my opinion the most successful ones in terms of sound quality and graphic interaction. There are other plugins lesser-known such as Delay Lama by AudioNerdz, an old synthesizer plugin from 2002 based on an XY pad which makes the monk sing. Moving the vertical control (Y) allows to modify the shape of the monk's voice, while the horizontal control (X) changes the pitch. These controls are linked to the mouth of the Dalai Lama which opens and closes according to the position of the two arrows on the pad.

The graphic design of the aforementioned plugin is certainly more advanced than mine. Though because it was created for a more fun experience than a real musical purpose, the sound applications are very limited; the Angel Synth is definitely more versatile.

In conclusion, I think that my instrument has all the credentials to be useful and applicable in different musical contexts. My personal experience playing with it made me realize its potential and how powerful instruments are when you know them in detail. Despite all the improvements that could be made and considering my abilities and my familiarity with the software, the final result is more than acceptable. The shortcomings regarding the design are more than obvious, even if the graphics was supposed to be one of the most important aspect, according to the initial idea. In my opinion, the Angel Synth is suitable for whoever is looking for a simple and clear instrument which is easy to understand and to edit. It is not the type of synthesizer usable by scrolling presets, looking for a specific sound without realizing what is

really going on. It is an instrument that, in its simplicity, could inspire producers and could help especially newcomers to try their hand on sound synthesis and sound design.

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