Music Media Production Program

MMP305 Midterm Whitepaper

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The Dendo 305 Audio Recorder

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1 Introduction

The Dendo 305 (Figure 1) is a recreation of the *Nintendo DSi/3DS Sound* software included with the Nintendo DSi and 3DS. As these systems age, it's important to preserve their features. The 305 allows users to make a recording using their system microphone and apply different effects to the recorded audio. These effects include low harmony, high harmony, synth harmony, tunnel, helium, transceiver, robot, and electric fan. The pitch and sound of the recording can also be adjusted. Only one recording can be made at a time.

Figure 1. The Dendo 305

2 System Demonstration

The following section will describe the process of finding inspiration for the project, as well as the implementation of features.

2.1 Prior Designs

The Dendo 305 is meant to be an emulation of the 3DS's recording software, so in creating the concept we took as much as we could from the original design including its GUI and selection of effects. This software had several effects to choose from, with each box housing 3 similar effects to save space (Figure 2). For example, the low, high, and synth harmony effects are all housed in the same box.

Figure 2. Screenshot of DSi Sound software's control panel

The DS, however, has a top and bottom screen. The sound editing options were on the bottom screen, while the top screen showed the soundwaves of the recording (Figure 3).

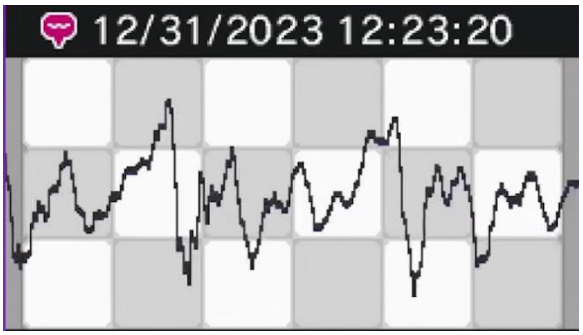

Figure 3. Screenshot of the DS's top screen displaying sound waves

These are the things we worked to emulate in our recreation, with the intention of preserving the look and functionality of the original software.

2.2 Pitch Shifter

Figure 4 depicts the pitch shifter used in the Dendo 305. The same pitch shifter is also used for every harmonizer effect, as well as the transceiver and helium effects.

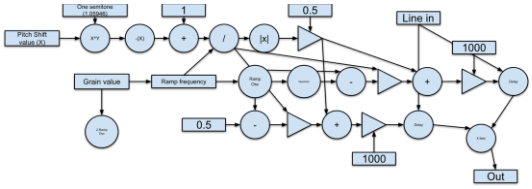

Figure 4. Pitch shifter flow chart

The pitch shifter functions by splitting the incoming signal's samples in half. Half of the samples are then read at a slower or faster rate, causing the pitch difference. The signal is combined back with the dry input, and the modified signal is adjusted back in the time domain to match the original signal's time. This allows for pitch shifting without changing the output's speed [Ref. 2].

2.3 Tunnel Effect

Figure 5 shows the circuit used to make the Tunnel effect.

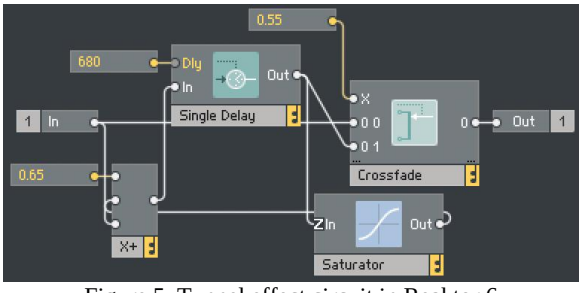

Figure 5. Tunnel effect circuit in Reaktor 6

The input is sent into a crossfade as a dry signal. It's also added to a duplicate of itself that's fed back from the Single Delay and multiplied by a factor of 0.65 to reduce the volume of the delayed signals. The saturator is used to limit the feedback signals' amplitudes to ensure the system isn't overloaded. These signals are then mixed with the dry signal by a factor of 0.55 to create the tunnel effect [Ref. 1].

2.4 GUI

The original models for the Nintendo DSi/3DS was the main inspiration for the Dendo 305's GUI. Sticking with the simpler design of the DS made it much easier to implement the touch pad, as there was already a design to work with.

The purple color scheme comes from a combination of the 3DS colors Flame Red and Cobalt Blue, an ode to the original system that still gives the Dendo 305 its own unique palette.

3 Conclusion

This paper showcased the Dendo 305, an audio recording software inspired by the *Nintendo DSi/3DS Sound* software made with the intention of preserving the look and feel of the original software.

3.1 Things That Were Easy

After the pitch shifter circuit was finished, the rest of the build was relatively simple, as most effects were made by tweaking values of the pitch shifter, with a couple of exceptions.

One of these exceptions was the electric fan effect, which was created by multiplying a slow sine wave LFO by the user's recording (Figure 6).

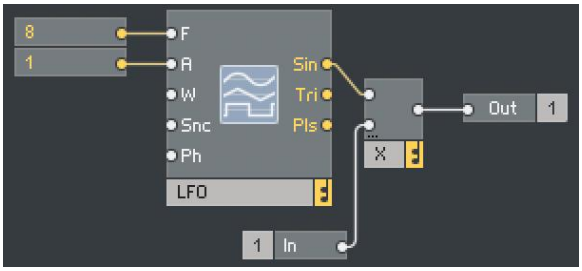

Figure 6. The circuit behind the electric fan effect

3.2 Things That Were Not

While trying to stay consistent with the original model of the Nintendo DSi and 3DS, transferring the model into Reaktor causes the angles that would normally be seen with a physical model to be lost. Several pieces of the device's controls, like the side switches and buttons, cannot be seen from a flat point of view.

3.3 Remaining/Unsolved Issues

The biggest unsolved issue is pitch detection, which is necessary for effects like Trumpet, Buzzer, and Whistle, all of which are included in the original DSi/3DS software. These effects, if implemented, would take the pitch information of the original recording and synthesize it with a new signal like a sampler or oscillator. Since there is no pitch detection in the build, the three effects that rely on it are not yet included.

References

[1] Dubspot, *Sound Design Tutorial: How To Create A Delay Effect w/ Reaktor - Native Instruments*, YouTube (2013), https://www.youtube.com/watch?v=sMKGSaO20zY

[2] ADSR Music Production Tutorials, *NI Reaktor tutorial - Create a Pitchshifter in Primary*, YouTube (2014), https://www.youtube.com/watch?v=ga5pkRO2jHU

[3] Nintendo of Europe AG, *Nintendo 3DS Sound*, https://www.nintendo.com/en-gb/Hardware/Nintendo-3DS-Family/Instant-Software/Nintendo-3DS-Sound/Nintendo-3DS-Sound-115638.html?srsltid=AfmBOorPTRWM9IUZ2-1yyj_EqhlIBOYMuJxz3qtfo6So-KF9FuLzUtMz