SynthChallenge 2019

Filip Suchy

We had two songs for choice, the first was **Tri orisky pro popelku** and the second one was **Waterloo**. I choosed **Tri orisky pro popelku**. In this song, there are four different instruments - Piano, Strings, Flute and Bassoon. To synthesize these instruments I used two different technics. The first technic was a simple additive synthesis and I used it for Flute and Bassoon. The second technic was wavetable and I used it for Piano and Strings.
I found and used instrument samples from the page **Free Wave Samples**[1].

Additive Synthesis

I used samples of Flute and Bassoon and plot spectrum of these signals. Fortunately, spectrums were simple and so I grab values of frequencies and amplitudes for each signal and saved them as arrays of values in Matlab. These values are used to generate sinus signals which are added into one.
Also, I plotted original signals of samples and try to create ADSR envelope to match original signals. For flute, I used more than 4 segments in an envelope, but the principle is the same.

Wavetable

I used samples of Piano and Strings and cut a part of the wave from these signals. I didn't use anything special to cut these waves, I just plotted signal, zoom it and manually grab start and end time for the part of wave which I want.
These cuts are used to generate final signals. I calculate how much "longer" or "shorter" has to be this signal to match the requested frequency and then calculate indexes to this signal and use linear interpolation to get values between indexes. To generate full length of final signal I go indexes cyclic in my wavetable.
Unfortunately, this technique was not so successful for me. If I used a short piece of signal to my wavetable a generated signal from this wavetable isn't very similar to the original sample. But if I used a longer piece of signal to my wavetable it's very difficult to find such a piece, that repeating did not cause artifacts.
Also, longer pieces for wavetable have a problem in amplitude, so I had to normalize this piece to a stable amplitude. Then on a generated final signal, I apply ADSR envelope. For piano, I used an exponential envelope because it's more similar to real signal then ADSR.

[1] https://freewavesamples.com/