Abstract

In the last few decades digital synthesizers and music producing software have became increasingly more popular. These software products create the sound of the desired instrument using external or built-in plugins. The goal of this thesis is to create a plugin that reproduces the sound of the classical guitar.

There are several methods for synthesizing string instrument sounds, one of which is called physical modeling synthesis. This method models the elements of an instrument (the strings, the instrument body, the musician) as separate blocks. The interaction between these blocks is described by physical equations. Using this method any string instrument can be modeled with good accuracy, but the more precise the model, the more the computational cost, which is crucial in audio applications. Physical modeling synthesis wasn't used for real-time sound synthesis because of this fact until the 1990s. Nowadays however the computational capacity of the average personal computer is sufficient for running a physical instrument model.

For modeling the string there are several methods available. In this thesis modal synthesis was chosen, because it can replicate a real instrument with great accuracy. The model parameters are obtained by recording, measuring and analyzing the sound of a classical guitar.

There are two ways for exciting the string in the final instrument model: it can be plucked using a plectrum (pick) model or with fingers. When using the VST plugin, the user can choose from the two excitation models. The instrument body is modeled with parallel second-order filters, whose parameters have been obtained from the analysis of measured guitar body response.

The virtual instrument was implemented in Steinberg's VST (Virtual Studio Technology) environment. The final result of this work is a *.dll* file, which can be imported and used as a virtual synthesizer in DAW software. The plugin can also be controlled directly in real time with a MIDI-keyboard.