

Abstract

Since the first synthesizers came out, users have wanted – besides creating new, synthetic sounds – to accurately generate the sounds of other instruments, such as organs, pianos, or guitars. The most often used method is playing back pre-recorded samples from an onboard memory, while shaping the waveforms and filtering the output. The spread of virtual synthesizers and the increasing computing power of CPUs have allowed more demanding, physics based synthesis methods to gain ground.

Nowadays many physics based electric and acoustic guitar models are available even for free, but usually these cannot be used in the sounding range of the bass guitar, mainly due to the warmer tone of electric guitars. In addition, there are far less synthesizers modeling the bass guitar.

Another problem is that the guitar synthesizers that sound good even in the bass range are not prepared for special bass guitar playing techniques, like the slap bass style, where the musician either slaps the lower strings or pops the higher ones, creating a unique sound not to be found in any other instrument.

Numerous methods have been introduced to model the vibrating string from a physical aspect, one of these is the modal based approach, which I use in this thesis. After modeling the string, the other parts of the instrument are implemented by methods found in the available literature. My objective is to create a physics-based model of my own bass guitar and to use it as a VST (Virtual Studio Technology) plugin in real time, focusing on the modeling of the slap bass style. VST is a de facto standard environment developed by Steinberg that allows DAWs (Digital Audio Workstations) to access virtual synthesizers. After loading the plugin in one of these workstations, the user is able to control the synthesizer with an external MIDI controller, e.g. a keyboard, in real time.