Bodilizer

Introduction

The BodiLizer is a VST-plugin for Steinberg WaveLab or Cubase or other host applications that support VST plugins. Currently the plugin is only available for Windows PC platforms.

The plugin is intended to bring life to recordings from guitar pickups for Acoustic-Electric guitars. Such devices are e.g the under-saddle pickups provided by BBand (http://www.bband.com). Other examples are the Fishman pickups (http://www.fishman.com) that are often used in Ibanez or Cort guitars.

The benefit with under-saddle pickups is that they are quite insensitive to acoustic feedback, moreover they don't pickup noise from the guitarist in the same way as e.g an electret mic inside the guitar does. They are also superior compared to real microphones as you don't need to spend hours on trying to figure out the best mic position, also you are free to move around.

The drawback is however that the sound produced by the guitar pickup does not sound like an acoustic guitar at all. The sound is very dry and lacks the reverbrant character of the "real thing".
There exist since long (see e.g German patent DE2906987) solutions that tries to fix this by using a set of bandpass filter to model the resonant character of the guitar body.
The transfer function of this filter is tuned with the sound picked up by a real microphone ~1m away from the guitar as a reference.
This was propably a good solution at that time and also it was possible to implement it with the given hardware.
Today one can do better in a DSP or even in an off the shelf Microsoft Windows PC.

The presented solution is by no means unique. The priciple behind is described quite well by Matti Karjalainen, Henri Penttinen et. al at Helsinki University of Technology (www.acoustics.hut.fi).
Additionally, the Ph.D thesis "Techniques for Digital Filter Design and System Identification with Application to the Violin" by J.O.Smith describes the technique quite well.

The objective of the BodiLizer is thus to shape up the signal from a guitar pickup so that it resembles the real thing as closely as possible. This requires that one can create the filter in some way. The method is to hookup a real microphone and record both the real microphone sound and the guitar pickup sound simultaneously on two different channels. A filter analysis procedure is then used to create a filter that should be applied to the guitar pickup signal. A suitable "training sequence" is to strum the (EADGBE) style grip with open strings, barre over 1st fret, 2nd fret and so on until the 12th fret is reached. Another is to tap the saddle with an impulse hammer.
The latter method is described by Perry R. Cook and Dan Trueman at Princeton University. Read http://www.music.princeton.edu/~dan/nbody/nbody.html for more info about their work.

Instrument body models

Currently the following guitars and other string instruments are modeled.

- Crafter GAE30 acoustic/electric guitar
- Epiphone AJ 18 acoustic/electric guitar
- Cort CJ10-X acoustic/electric guitar
- Takamine EAN40C acoustic/electric guitar

The models below are provided by Perry R. Cook at Princeton University (read http://www.music.princeton.edu/~dan/nbody/nbody.html for more info about their work), 1000 thanks for the help!

- Sam Dunlap 1998 classical guitar
- Sergio Abreu 1997 classical guitar
- Fender Elite 1987 arch-top acoustic/electric jazz guitar
- Kentucky KM1605 1987 F-hole mandolin
- David Folland 1989 violin
- Hauk Buen 1993 Hardanger fiddle

Some of the models exist in both mono and stereo versions, the stereo versions are simply put one filter per channel to mimic the complex soundfield of string instruments.
The filters must be downloaded separately from
http://www.ijdata.com/bodilizer_filters.zip

Installation

The plugin should be dropped into the System\plugins directory in the Steinberg intallation.
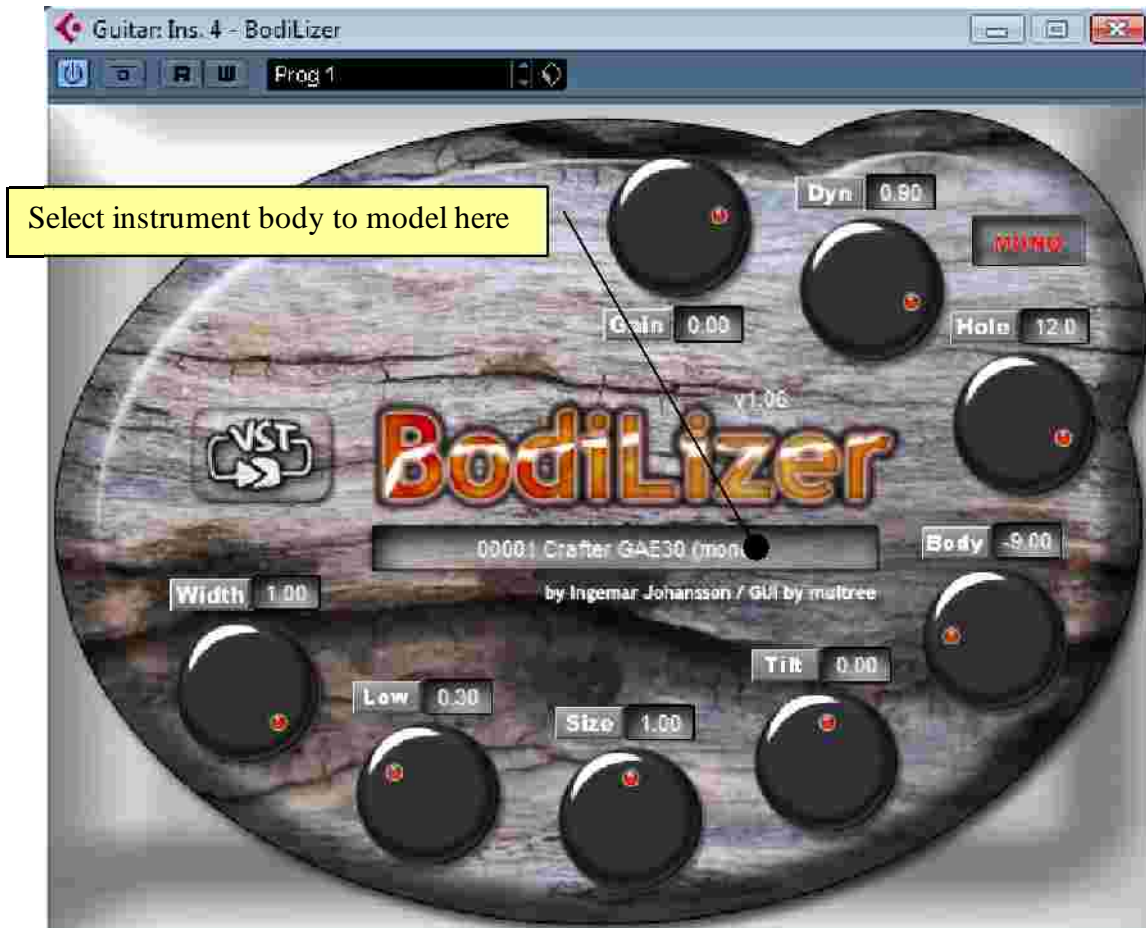C:\Program Files \Steinberg\WaveLabDemo\System\plugins
Note that a subdirectory named BodiLizer should be present in the plugin directory. This subdirectory will host models for the instruments.

Some nuts and bolts
The processing delay of the plugin is 64 samples, which amount to 1.5ms @44100Hz.
The plugin works with other sampling rates than 44.1kHz such as 32kHz and 48kHz.

Controls

Once the BodiLizer plugin is started in the Steinberg WaveLab application a window will appear on screen. It contains, besides the standard Steinberg buttons Bypass, Mute and Preset, a few controls that allows to shape the guitar pickup signal are implemented.

Select instrument body to model here

- **MONO**: Activate this button if the input signal is only on the left or right channel..
- **Gain**: Controls the overall gain (-20 to +6dB).
- **Dyn**: Contols the spectral dynamic range of the filter. If set 1.00 full guitar body filtering will be applied, if set to 0.00 on the other hand the guitar pickup signal will be unaffected. Setting this control to 1.00 may in some cases yield a "boomy" sound, try out the setting that pleases your ears most.
- **Hole**: (-15dB - +15dB). Controls the strength of the Soundhole (or Helmholtz) resonance, this is typically in the range 80-150Hz.
- **Body**: (-15dB - +15dB). Controls the strength of the first body resonance mode, this mode is typically in the range 180-250Hz. Decreasing the strength of this mode can in many cases solve problems with acoustic feedback..
- **Width**: Increase the width of the signal.
- **Low**: Emphasizes low frequencies, needed to avoid a too thin sound.

- **Size**: A perceived size of the instrument is set here. 1.00 means that the original size is maintained. Moving the knob clockwise gives a larger size (filter resonances are moved towards lower frequencies).
- **Tilt**: Makes it possible to tilt the frequency spectrum. Moving the knob clockwise gives a brighter sound.

In the **Preset** menu one has the possibility to select and modify five programs, it is also possible to load and save banks.

Purchase

The BodiLizer can be purchased from IJData, email info@ijdata.com for more info.
The cost is EUR40..