

Real-Time VST Guitar Effects Processor

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Project Background

- Address the demands of traveling musicians (guitarists) by giving them near-studio recording experience through user-friendly guitar effects
- Ensure device compatibility on any Windows device (32-bit or 64-bit) without utilizing 32-bit external signal processing devices
- Develop optimization skills and minimize memory-allocation problems faced in the industry
- Accumulate C++ and Matlab/Simulink programming experience

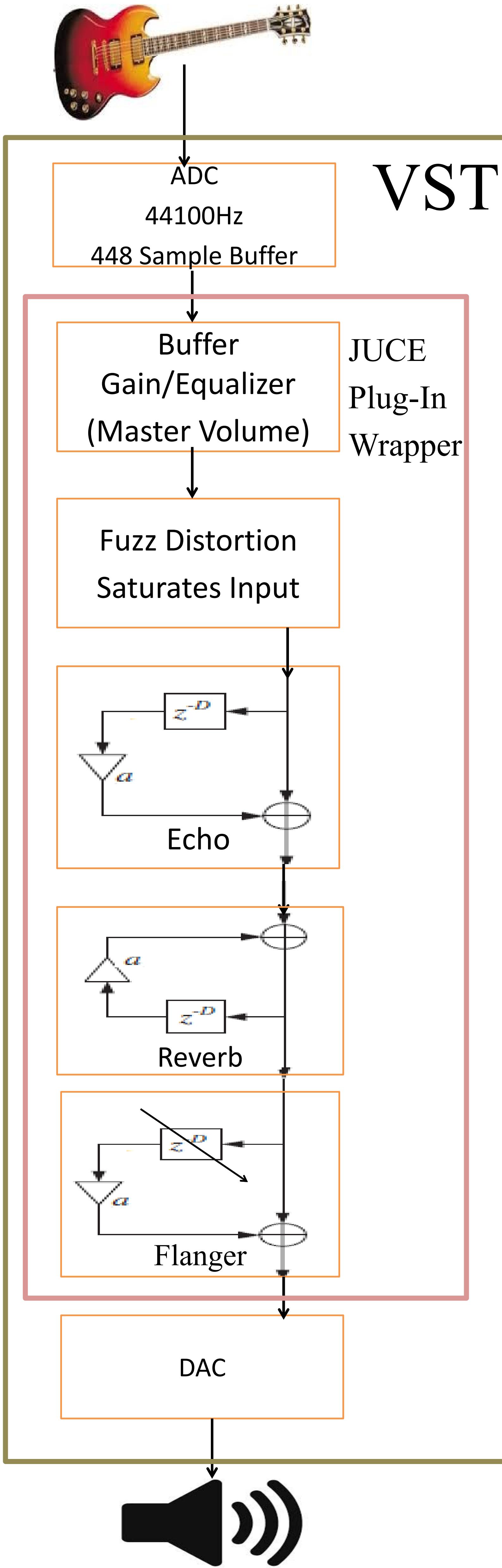
Design Abstract

By utilizing the VST-Host, we can interact with the soundcard by establishing a signal sampling rate and an audio buffer size. For the accuracy purpose of our project, we utilized the smallest sampling rate possible at 44100Hz. After undergoing testing, we had concluded that the buffer size of 448 samples worked best with most computers. The bulk of the Discrete –Time Signal Processing is carried out by JUCE wrapper, in which we programmed our guitar effects and Audio GUI. The guitar effects loop is then put together as a “VST plug-in” or signal block (.dll file) with the VST Plug-in host, which connects the computer input (Guitar) to the effects, and from the effects to the output (Speakers).

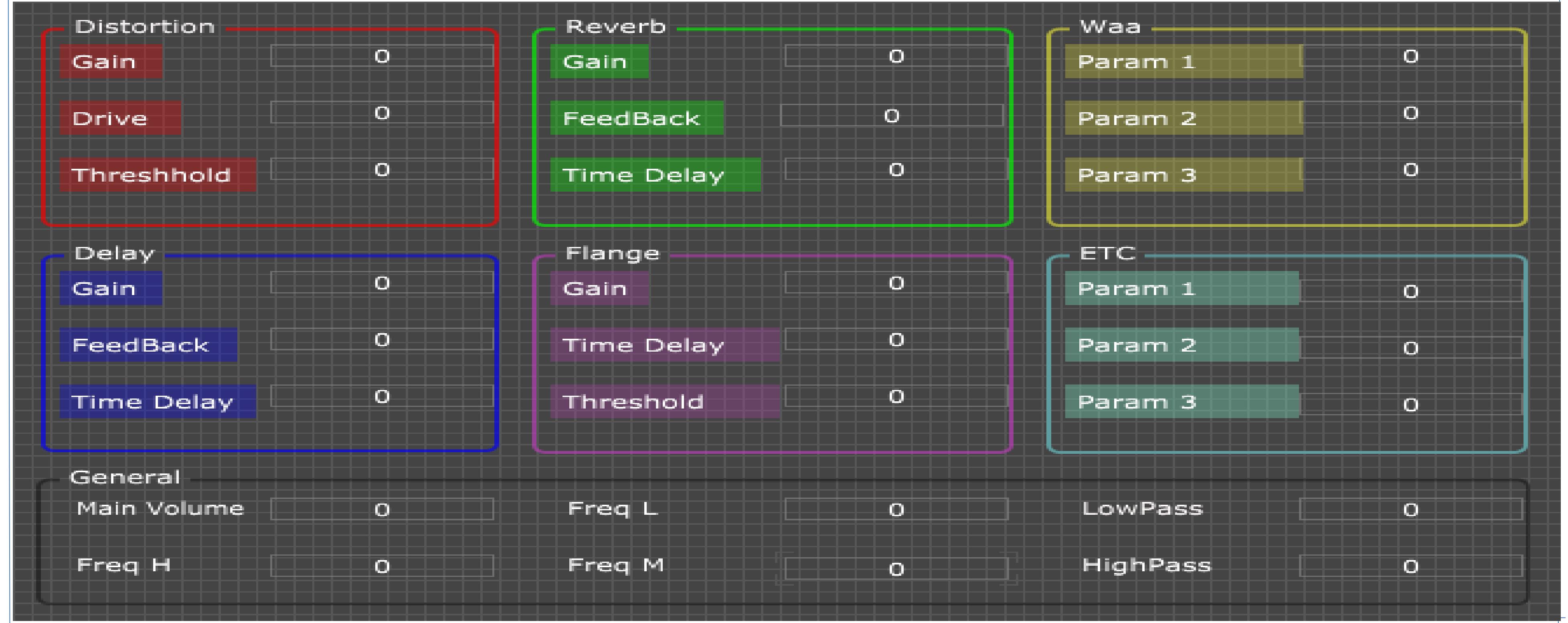
Future Development

To further improve the flexibility of the effects, a parametric equalizer is needed to filter out and cancel out specific sound frequencies. This can allow the inclusion of other distortion effects such as Overdrive, which requires a pre-amp to boost specific frequencies. Furthermore to improve memory usage, the delay-based effects will be combined as one effect, exclusively using pointers to carry out the different sounds.

DSP Block Diagram



Graphical User Interface



Guitar Effect(s) Frequency Responses

-Non-Linear Effect(s)

- Fuzz- Saturates input signal before going through an amplifier. For ease of control and usage, this method was selected over other distortion effects.

-Delay Effect(s)

- Echo- Copies original buffer, delays by a variable, and output with the original buffer
- Reverb- Utilizes four separate pointers on the delay buffer, each delayed by at most 100ms, and output with the original buffer to create wall-echo effect

-Modulation Effect(s)

- Tremolo- Continuous Input Amplitude Modulation, producing vibrato sound
- Flanger- Continuous Phase Modulation on delay buffer, producing jet-stream sound effect
- ETC- Custom Phase Modulation Effect based on Flanger and Reverb, producing bagpipe sound

