# Documentation and Reporting

Umang Hirani                                                              92200133025

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**Technical Report**:

SimpleSynth is an audio synthesizer plugin built with the JUCE framework and C++17.

It runs as a standalone application or as a VST3 plugin in DAWs. The synthesizer has 5 polyphonic voices, ADSR envelope control, filtering, and four effects processors.
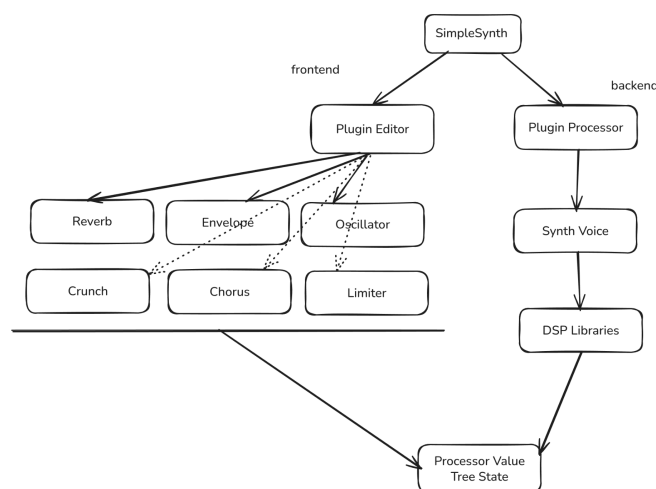
The code uses modular design with separate components for UI and audio processing.

 Here's how I did it :-

The system has three main parts: audio processing, parameter management, and user interface. The audio engine uses JUCE's Synthesiser class to handle five independent voices. Each voice processes MIDI notes and generates audio. The AudioProcessorValueTreeState manages all parameters and ensures thread-safe updates between UI and audio threads using atomic operations. The UI consists of separate component classes for oscillator, envelope, filter, and effects controls.

The audio flows through each voice in this order: oscillator generates waveform, noise can be added, ADSR envelope shapes volume, filter removes frequencies, then four effects process the signal in series (distortion, chorus, reverb, limiter).

 The final stereo output goes to the audio buffer and to a waveform display.

# User Manual

## Installation

Copy the SimpleSynth plugin file to your system's plugin folder.

On Windows this is Program Files/Common Files/VST3. On macOS use Library/Audio/Plug-Ins/VST3 for VST3 or Library/Audio/Plug-Ins/Components for AU.

On Linux use the .vst3 folder in your home directory.

After copying, open your DAW and scan for new plugins. Insert SimpleSynth on a MIDI track.

## Navigating through the UI

- The interface has six main sections.
- The top bar shows the preset controls with save, load, previous, next, and delete buttons.
- The oscillator section has waveform selection, noise amount, oscillator volume, octave, and semitone controls.
- The envelope section has four sliders for attack, decay, sustain, and release.
- The filter section has frequency and resonance sliders.
- Four effects sections show crunch, chorus, reverb, and limiter with their individual parameters.

You are always free to mess around with the knobs of these sound and see how each parameter shapes the sound in a certain way

I have added presets to show the vast amount of sounds that this synthesizer can make.

- The bottom shows a waveform visualizer of the final output.

## Preset Management

Saving - Click the save button to store current settings. Enter a name and click OK. The preset saves to your documents folder under the manufacturer and plugin name.

Loading - Click the preset dropdown to see all saved presets. Select any preset to load it instantly. Use the arrow buttons to browse through presets sequentially.

Deleting - Click delete to remove the currently selected preset.

You can also cycle through all the presets by pressing the < and > button which I have made, and also your presets that you have made.