

OuterSpace - An Ambient Sound Generator for Pure Data

Alberto Zin*

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1 Introduction

OuterSpace (OS) is an ambient sound generator for Pure Data. It can be used to reproduce natural sounds (water, wind, fire, chimes, space sounds) and other unusual sounds. The synthesis method is based on white noise filtered by a bank of 128 (!) band-pass filters spread across the audio spectrum. Each filter contributes to the overall sound as an independent voice. Each voice has a "quartic" attack and decay amplitude envelope (for a natural effect of attack and decay), each voice being triggered independently. Each voice is then placed in the stereo field and rotated according to a low frequency oscillator (LFO), plus an LFO "spread". Left and right outputs are summed up in mixing buses. High frequencies can be attenuated using a power law $(1/x)^d$ where x is the frequency and d is the "damp" control. The output is reverberated using the `freeverb~` external. Few reverb parameters are implemented in the main control GUI. In few cases the CPU load can be quite high: on old machines, playing all 128 voices may hang up the audio. In order to reduce the load, decrease the polyphony parameter to lower numbers, like 96, 64, 32. Note that, since high voice numbers are used to generate the high frequency part of the spectrum, this part may be lost. The "frequency spacing" parameter can help in compensate for this. OS idea is based on Reaktor's SpaceDrone instrument, but it features a different approach to the sound generation method.

2 Dependencies

OuterSpace depends from `freeverb~`, external (other than `expr~`). It can be found in the Extended Pure Data distributions (by H. C. Steiner <http://at.or.at/hans/pd/installers.html>) or in the Pure Data CVS Repository. OS has a graphical user interface made with *GriPD* (see Figure 1). Make sure that GriPD is working in your PD setup. Otherwise, there is a plain GUI made as a PD patch (Figure 2). OuterSpace was tested on Windows and Linux.

*Alberto.Zin@poste.it

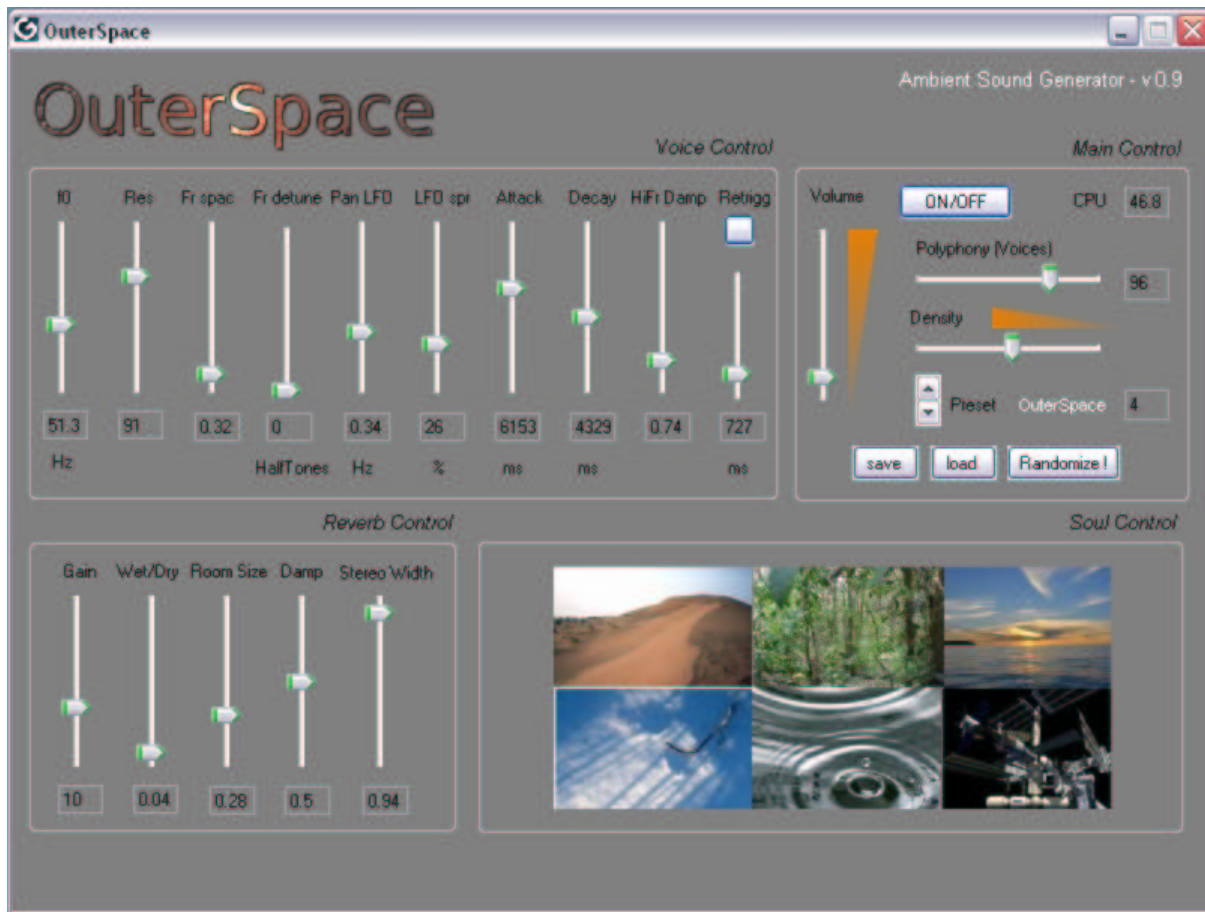


Figure 1: OuterSpace GriPd Intefrace

3 Install

Unpack the files into a selected directory, for example `./<yourpddirectory>/extra/OuterSpace`. In the newly created directory you should have all the necessary abstractions to run OS plus a `data` directory, in which the presets and saved patches shall be placed. Make sure that the `freeverb~` external is in the PD path.

In order to use the *GriPd* GUI you'll probably need to edit the path in the main file `OuterSpaceMainGriPDGui.pd` in the message that calls GriPd (`open_locked`). The path is relative to the pd executable directory. For example, in my windows setup, GriPd is in `./<yourpddirectory>/Gripd`. In order to use the GriPD gui open:

- `OuterSpaceMainGriPDGui.pd`

The plain native PD GUI version is:

- `OuterSpaceMainPDGui.pd`

4 Controls

The following paragraphs are a description of the GUI controls.

4.1 Voice Controls

- f_0 : base frequency [Hz]. All the band pass filters are tuned on multiple frequencies of f_0 ;
- *Res*: resonance control of the band-pass filter. Low values produce large bandwidths higher values means narrow “tuned” filter frequency;
- *Fr Spac*: Frequency spacing (Δf). The multiplier of the fundamental frequency. At the end the central frequency of each bp filter will be tuned on $f_N = f_0 * n * \Delta f + \text{detune}$, where n is the voice number (1 to 128) and detune is explained later;
- *Fr Detune*: frequency detune (Half-tones). During the attack and decaying phase the sound is detuned by the amount of halftones specified here;
- *PAN LFO*: Panoramic Low Frequency Oscillator [Hz]. Each voice moves in the stereo panorama with a frequency specified here (each voice independent from the others);
- *LFO spr*: LFO spread. [%]. controls the spread in LFO frequency in percentage of the PAN LFO, in order to let each voice moving with different frequency in the stereo field;
- *Attack*: [ms] similar to the attack time for each voice. The true attack time is selected randomly based on random(Attack). For the amplitude envelope of each voice a “quartic” attack has been selected to produce “natural” results.;
- *Decay*: [ms]. The same as attack.;
- *Hi-fr Damp*: High-frequencies damping. A damping is provided in order to attenuate the very high frequencies which may be too loud. The amplitude of each voice is attenuated by the factor $(1/x)^\alpha$ where x is the voice number (1-128) and α is the parameter set here.;
- *Retrigg* (radio button): Activates/Deactivates the retrigger function
- *Retrigg*: [ms]. Retriggering function. If this is not activated the attack of each voices is activated exactly when the decay part has been finished. Activating the retrigger radio button the attack part of each voice is retriggered independently every Retrigg ms.;

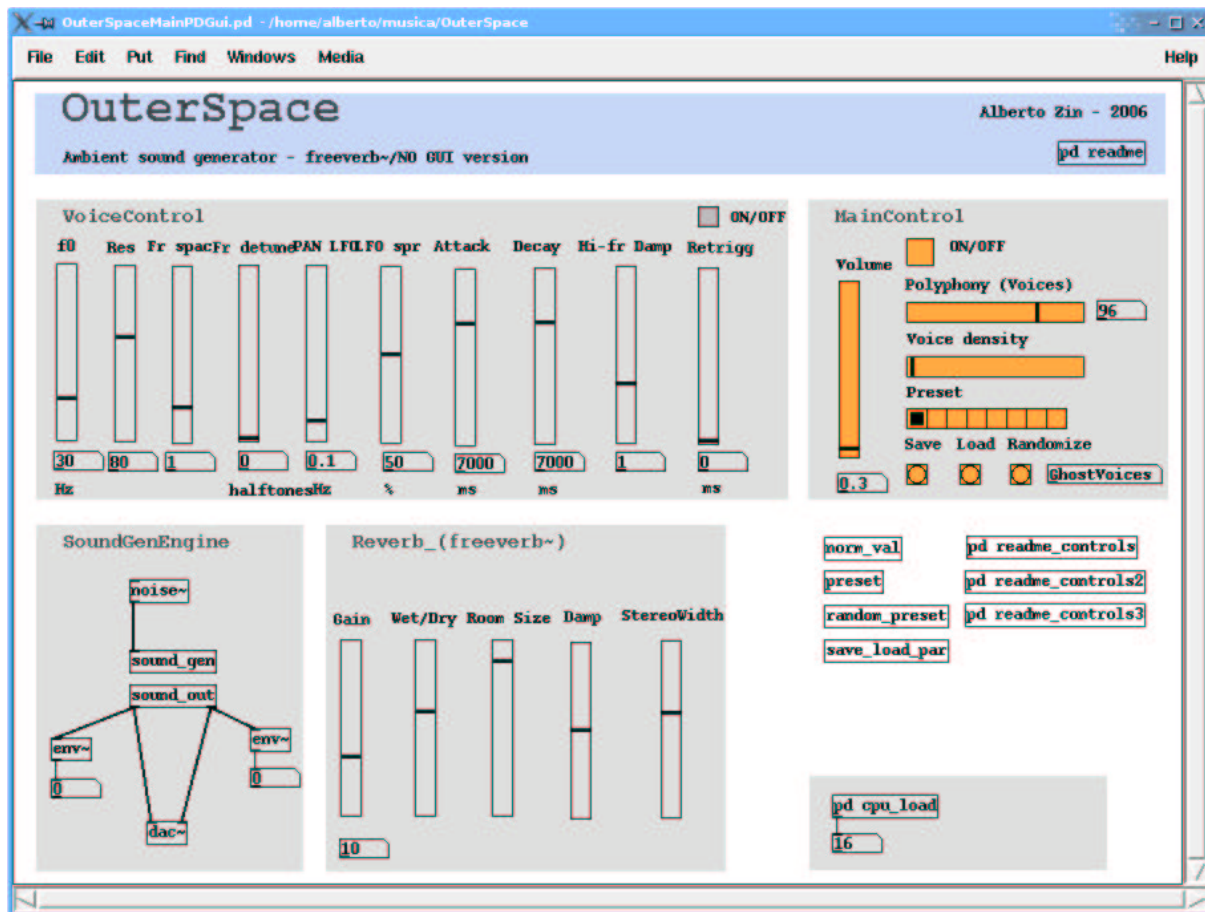


Figure 2: OuterSpace plain PD Interface

4.2 Main Controls

- *ON/OFF*: activates/deactivates the instrument;
- *Preset*: enables 8 presets.
- *Save*: writes the current GUI parameters in a file to be later loaded. When prompted, provide a name for the file (for example with default extension .txt) and save it in the /data directory;
- *Load*: loads a previously saved set of parameters;
- *Randomize*: the fun of the game! try it to find your favourite sound in OuterSpace! Then remember to save it!;
- *Polyphony*: sets the instrument polyphony i.e. the number of parallel `bp~` filters. In order to save CPU the voices that are not used are turned off using `switch~`. By lowering the number of voices a cut in the high frequencies is obtained. In order to

compensate for this drawback use the “fr. spac”parameter to cover the same audio frequencies (but with less voices in between);

- *Density*: sets the number of voices playing at the same time. This parameter has good results with sounds with short attack and decay time (i.e. preset 2 “Bubbles”)

4.3 Reverb Controls

- *Gain*: 1st stage of gain (dB) used to amplify the reverb section;
- *Wet/Dry*: [0-1] parameter that controls the full activation of the reverb effect.;
- *Room Size*: [0-1] small - large room for reverberation
- *Damp*: [0-1] frequency damping within the reverberation algorithm
- *Stereo Width* [0-1]: placing of reverberated output in the stereo panorama.

5 Tips

- Let the sound evolve a bit in order to catch all the evolution patterns
- Change the sliders slowly in order to avoid sudden frequency/amplitude variations. Put particular attention to the Volume/Gain and Q sliders.
- Try the presets first, then enjoy “Randomize” function.
- You can Save/Load presets. Few examples in ./<yourpddirectory>/extra/OuterSpace/data

6 Warranty

No warranty at all. The patch is provided “as-is”, without any express or implied warranty. In no event shall the author be held liable for any damages arising from use of this patch.

7 License

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