# Soundscape Generator Handout

AV-Room, mac version

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Sound design by Fabian Gutscher and Nadine Schütz
Pamoramix and Spat library by Thibaut Carpentier, Markus Noisternig, Olivier Warusfel and others...

Introduction

The Innovedum Soundscape Generator (ISG) is a tool programmed in Max/MSP with IRCAMs spat.5 library, using their Panoramix Mixing Console. It let's you auralize a 3D model of your choosing by getting location and movment of sources and other data from an Unity Session. It is designed to work with OSC-data from Unity generated with the Soundscape scripts and streams the audio from the lokal harddisk and spatialize it to multichannel room-setups or to a binaural output. It needs always a Unity Project with the scripts and a folder with Audio Library to work properly.

To Start the Examples on Workstation in AV-Room

On the workstations the Max-Collective (ISG_20250227.mfx), the Unity projects and the Audio Library can be found on the desktop.
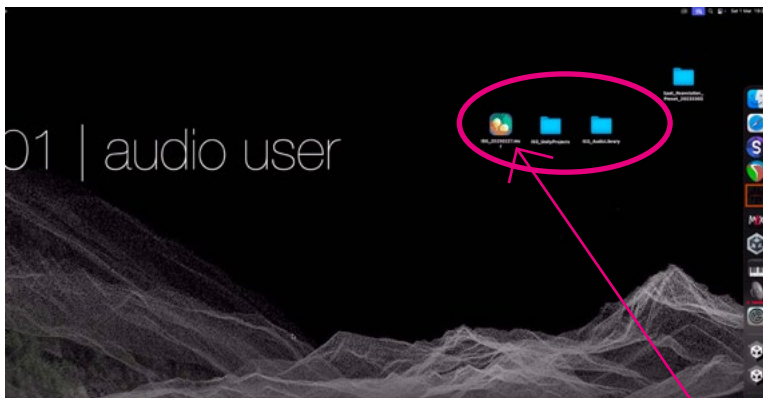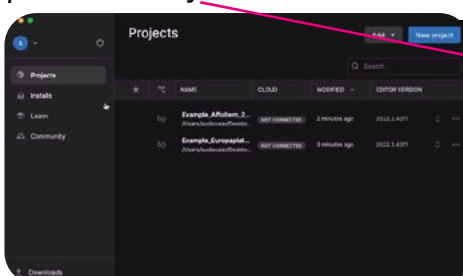

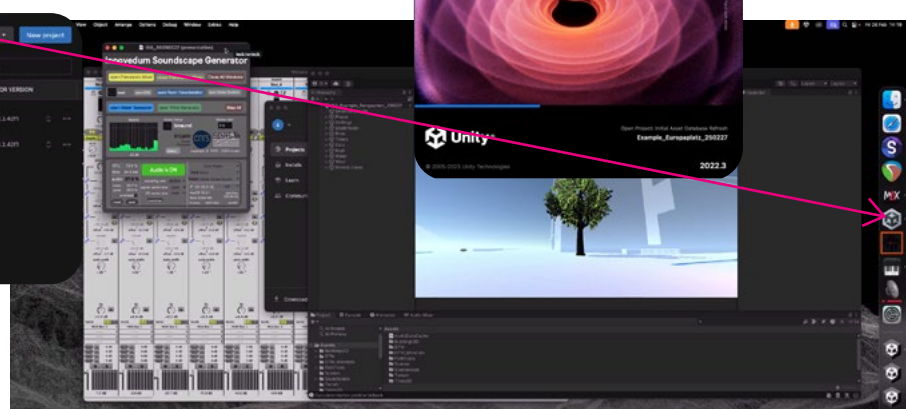Open the Max-Collective by double clicking on it.
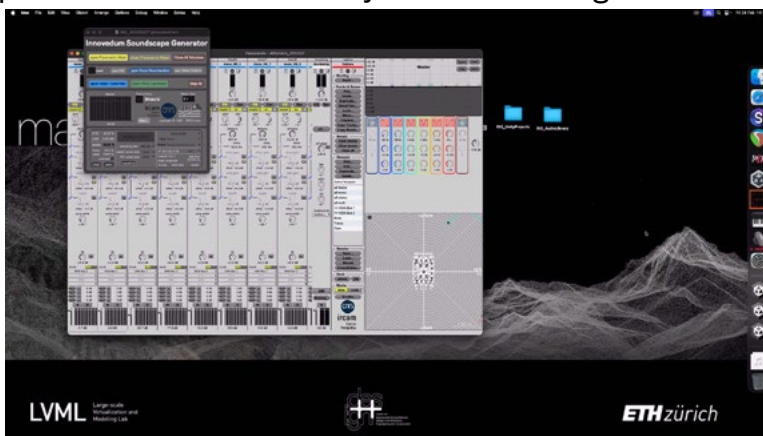
ISG_20250227.mfx

Open the Unity Hub   wait until loaded...


Choose a project

Press play in Unity and start to listen. The audio always fades in and out in the end, so do not press play on and off to quickly, as all audio is loaded as soon as you hit play, so give it a bit time. Fade in time is 5 seconds and fade out time 10 seconds.

Basic Functions and Component

The tool always needs a listener, that is placed on the main camera. All the sounds are spatialized according to the listeners position and its rotation. The sound sources are separates in two basic components, a Sound Source Audio and Sound Source Generator. The first is used for all audio files that are be played in the scene (Mono, Stereo and Multi), the second is used to generate wind sound for a bushes and trees or to generate water sounds for fountains or flow waters. The Sound Source is playing a file in a loop, while the Generator is having generated noise and samples, which behave according to the parameters set and both are spatialized according to the listeners position.

In the mixing console (if not open, click „open panoramix mixer") you can monitor the movements and your sources. The names you see in the tracks are corsponding to the sources in Unity and are shown as soon as you start the Unity Session (playmode). If you deactivate objects or multiple objects in Unity, while it runs, the tracks are muted in the console. Beside monitoring you can make your mix (only use the track fader, trim is automated), and save it to a txt.
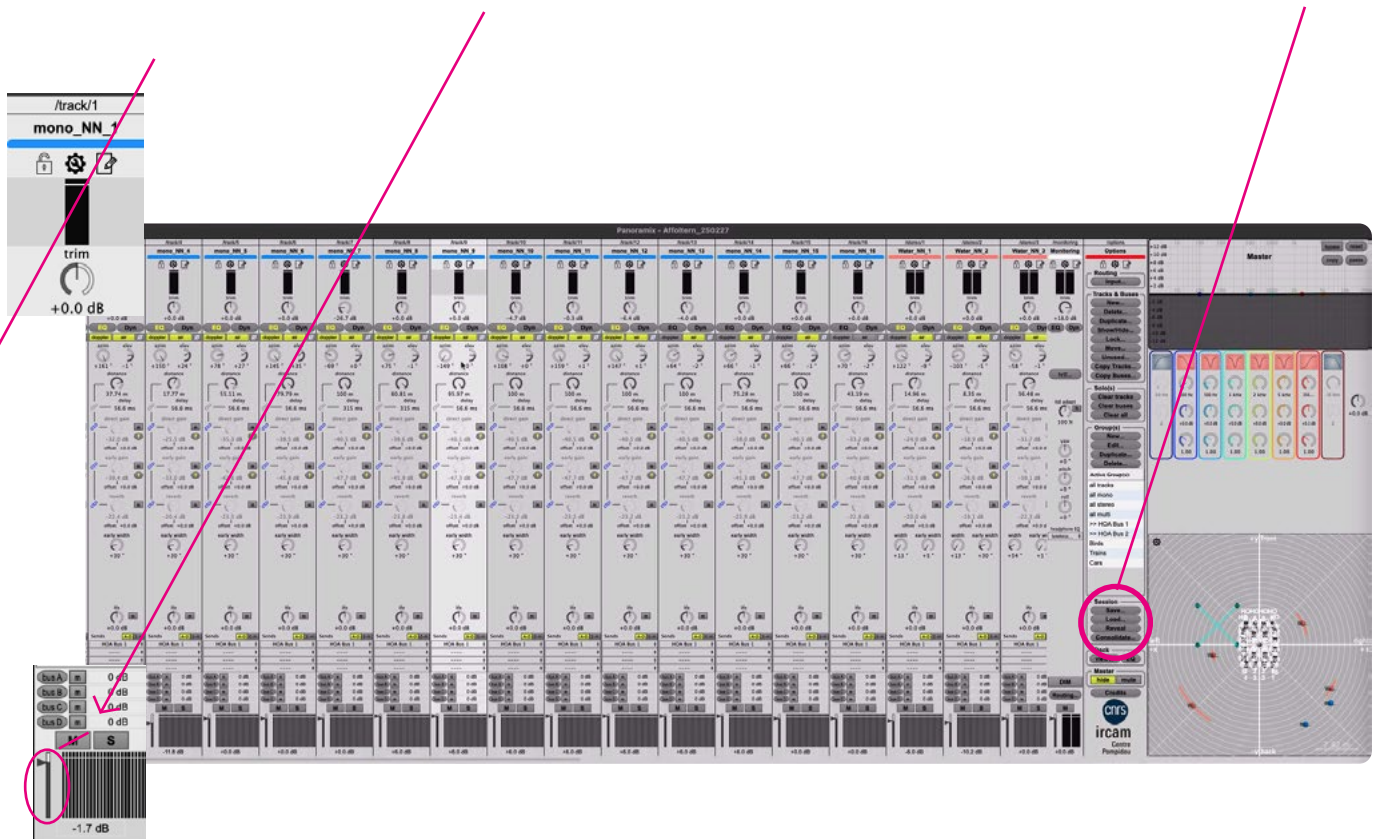
For all the distance effects and spatialization we use IRCAMs algorithms, as they have a limitation on 100m we build a gain fuction that trims the sound source after 100m. Further we use a raycast to determine if a sound is occluded or not. Herefore we trim the direct signal and apply an equalizer. Further there is a higher ambisonic reverb, that can be automated by the Unity Scene, by defining Zones.

What has to be noted: We are using perceptual models, the aim is to give an sonicly preceivable idea of a soundscape. In the tool you can recreate the passing of a car for example. How loud this car is, compaired to the river behind it, needs a human ear to be adjusted. It lets you add trees, bushes, waters and streams to an existing world to imagine different soundscapes that you create with your imagination and correct with your perception.
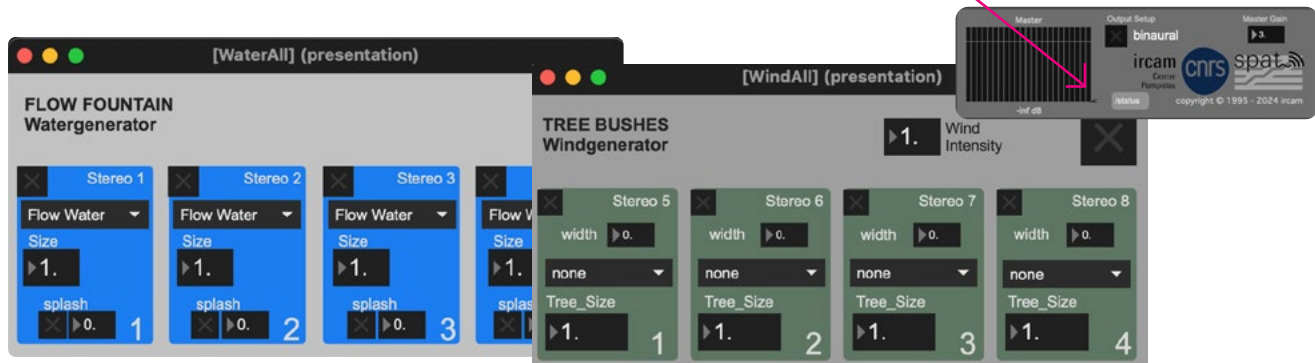
Generator

There are two generators one for wind and one for water. They are both automated by the parameter you set in Unity. They are playing on Stereo 1 - 4 for water and on Stereo 5 - 8 for wind, which can be choosen in the dropdown menu. Be carefull if using stereo sources they may overlay with generators channels.

In the Max-Collective you can open them. Even though they are normaly automated from Unity they can be used without Unity running, for this you need to open the master fader manually.


When adding a generator, a instance of those four generator modules is initialised. You can choose from Flow Water, Drinking Fountain, Splashing Fountain (in Unity). You can choose a size, which modulates and changes the samples played. In Flow Water for example all sound until size 5.0 are trickles to little rivers, from size 6. up extra white noise is added for cascading waterflow, so size 10. would be a waterfall. The Splashing Fountain has two extra parameters for the lenght of the splash and the break. The Tree Bushes Windgenerator has two types needles or leaves. They can be added to groups of threes or bushes, which makes there stereo width bigger. Enjoy playing around with the parameters.

Sources

The sources are the hearth of the tool (component Sound Source Audio). Here you actually can build your soundscape. There are three types of sources Mono, Stereo and Multi (dropdown menu). We built in 16 Mono, 8 Stereo and 4 Multi Sources. On the right you see all the different souces in the viewer.

The Mono Sources are the ones you will need the most. For example birds, cars, etc. are all rendered loops in mono. As we want them to be spatialized pricecely (from one point) we use one channel audio files (mono) for that.
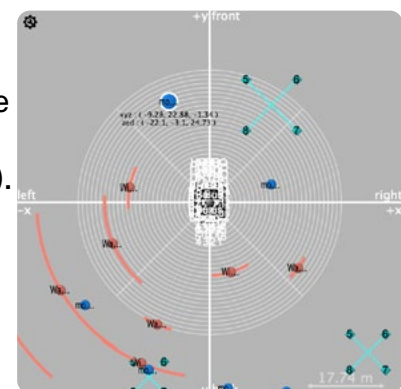

(blue Mono, red Stereo, green Multi)

The Stereo Source is for sounds that are more atmospheric or field recordings to add to your auralizations. The Generator is using the stereo format as well. As described before: the stereo width is acctually calculated automaticly. If you groupe trees or bushes there stereo field is opening, resulting in the impression of a forest or bush formation. In the example scenes the Stereo Sources are all used for Generators.

Multis are for ambisonic B-Format files. They are used for geolocated recording renderd as loops from the places your sound study is about, for example. Ambisonic formats can be decoded to different channelcounts. We decode them using a cube using 8 channels. You can imagine this like a cube with a speaker in every corner. These speakes are located in your scene, you can move around in them and as we apply distant effects on them, you can walk away from them. For an ambisonic source that is decoded directly to the HQA Bus choose it in the Scene Manager.

Reverb

The reverb works in the higher ambisonic domain and is part of the spat library. It is relativly precise in it's spatial accuracy. The reverb helps to make distance effects and elevation more sensable. Because we don't want to overload the cpu with having multiple instances of the reverb, the possibilities of automating one single one are reduced, changing reverbs parameter to extrem can result in unwanted cracks and noises. So we use a general reverb, that you can define in the Scene Manager in Unity and two Reverb Zones with different parameters. Moving from one to the next Zone will fade the parameter accordingly. If you are outside of any Zone the general reverb will apply. The Reverb Zones can be scaled with the coloured cubes and they have fading radii, which changes how fast the parameters are crossfaded.
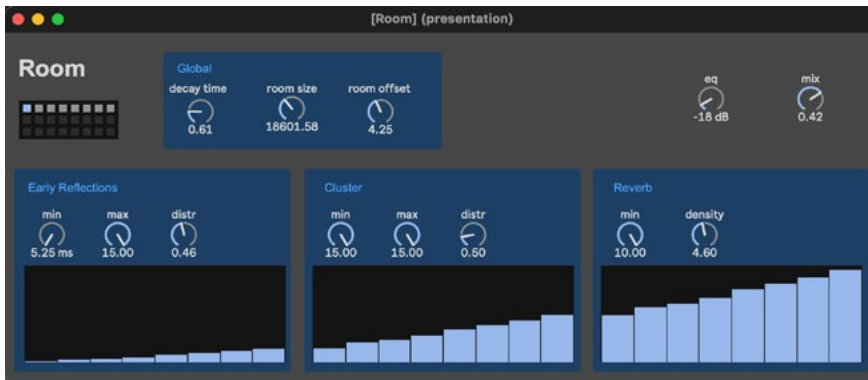
If you click „open room reverbaration" you see the interface above. We are currently automating room size, decay time, eq and mix. Room size and decay time are classical parameter for the roomcalculation and can be changed in realtime. As described before be carefull if you go from a very big to a very small room (or also large decay time to a short) can not very unpleasant. The EQ is a highshelf that can be adjusted in the panoramix mixer. It has a range from 0. -20. dB. The Mix parameter is automating the master gain of the reverb and it reaches from 0. to 1. which corresponds -60 to 0.dB.

Setup and Scene Manager

For the setup you should not need to do a lot. In the Max-programm you can find the setup possibilities for the audio engine and monitor the performance. In the AV-Room it should be on Dante Vitrual Soundcard. You can change the sampling rate (not on Dante, is locked) and signal vector size and i/o according to your project (longer time, less cpu use, but longer latencies).

As decribed before the general reverb can be defined in the Scene Manager. Further you can choose a atmospheric soundlayer. These are for example steps, humans voices, rain, wind etc. Also in the Scene Manger you find the overall wind intesity and a global scale. Which scales all the distances in you project. You can also set here a minimal diameter for the occlusion. Means a object under a diameter will not make occlusion effects. if you click „open Global Transform", you get a lot of more possibilities to change the way the coordinates are interpeted.