Spatial Audio with Halo 3D Pan

HALO_3DPAN is...

- A Binaural Panner for spatialized sound in headphones
- An audio effect plugin with four controls: Azimuth, Elevation, Width, and Spatialization
- Built for performance. Graphics runs smoothly on the GPU, freeing up the CPU for audio processing. Audio processing is extremely lightweight

MacOs Installation:

- Download and open HALO_3DPAN_MacOS_v_1_0.pkg
- Follow the installer prompts

Windows Installation:

- Download and extract HALO_3DPAN_Windows_v_1_0.zip
- Move HALO_3DPAN.vst3 to C:\Program Files\Common Files\VST3

Activating HALO_3DPAN:

- Open your DAW and search for a plugin called 'HALO_3DPAN'
  - If you can't find HALO_3DPAN, make sure VST3 are enabled and that you correctly followed the installation instructions. Rescan for plugins.
- Enter your unique license key into the plugin. Your license key can be found in your download email.
- Each license key works on up to five computers, and cannot be transferred.

Requirements:

- MacOS 10.10+ or Windows 10+
- A DAW that supports VST3/AU such as Ableton Live, FL Studio, Logic, REAPER, ...
  - HALO_3DPAN is **NOT** compatible with Pro Tools
- 64-bit systems only

How it Works

HALO 3D Pan is a binaural panning plugin. It uses pre-recorded binaural impulse responses to simulate the sound of a sound source moving around the listener's head.

HALO 3D Pan has four main controls: azimuth, elevation, width, and focus. Azimuth controls the angle of the sound source around the listener's head. Elevation controls the angle of the sound source above the listener's head. Width controls amount of separation, in the azimuthal plane, between the stereo inputs of the sound sources. Focus fades between spatialized panning and traditional stereo panning.

HALO 3D Pan is intended for use by sound designers, soundtrack artists, game audio artists, and music producers who are looking to create an immersive

listening experience that is tailored for headphones.

HALO 3D Pan relies on head-related transfer function (HRTF) filters to compute the spatialized audio. Incoming sound signals are convolved with a different impulse response for each output ear. The impulse responses are typically recorded using a real or dummy human head a microphone in each ear. I use the "Spherical Far-Field HRIR Compilation of the Neumann KU100" HRTF dataset for my spatialization filters. In order to perform the convolutions efficiently in realtime, HALO 3D Pan computes the convolutions in the fourier domain. I use the Pretty Fast Fast Fourier Transform (PFFFT) library to compute the discrete fourier transform of incoming audio signals for this calculation. Furthermore, I use an overlap add method with a 50% overlap to avoid aliasing at the FFT block boundaries. This method introduces a fixed latency to my plugin of half of an FFT block size (typically 64 samples).

The plugin features a unique raymarched 3D user interface that makes it stand out from traditional plugins. The 3D UI is rendered in realtime on the GPU using a combination of three fragment shaders. The first shader computes hit-boxes for incoming mouse interactions and metadata for later shaders to use. The second shader raymarches the 3D scene and computes the color of each pixel. The third shader applies post-processing effects to the 3D scene to create a glow effect. The 3D UI is designed to be intuitive and easy to use. The user can click and drag on the 3D scene to change parameters of the plugin. When the user hovers over an interactable element, a small parameter description and value is displayed in the bottom left. The outgoing audio spectrum is visualized atop the main azimuth knob.

Tips From the Developer

- Automating Azimuth with a saw wave pattern will result in 360 degrees of panning. The audio will sound like it is moving around your head in a circle.
- Most of the time, I keep elevation at 0 degrees, as increasing elevation will decrease the width of the signal.
- Double click interface elements to reset them.
- Moving width from 0% to 25% can add a lot of depth to a stereo input signal.
- I like to keep spatialization at 100%. Watch out for intermediate spatialization values. They can improve transients, but may cause weird phasing artifacts.
- HALO_3DPAN is most CPU efficient at buffer sizes 128 and 256.

Uninstall HALO_3DPAN from MacOS:

- Delete the following files:
  - /Library/Audio/Plug-Ins/VST3/HALO_3DPAN.vst3
  - /Library/Audio/Plug-Ins/Components/HALO_3DPAN.component
  - ~/Music/nthn_plugins/HALO_3DPAN

Uninstall HALO_3DPAN from Windows:

- Delete the following files:
  - C:\Program Files\Common Files\VST3\HALO_3DPAN.vst3
  - C:\Users\\Music\nthn_plugins\HALO_3DPAN

Support:

Reach out on twitter at @nthnblair or shoot me an email at nthnblairaudio@gmail.com