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// audio visual art //

*ambiX - v0.2.4 - win64 - o5.exe*

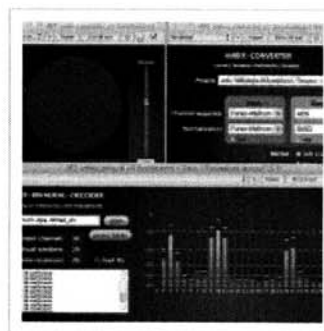
## ambiX v0.2.4 – Ambisonic plug-in suite

Veröffentlicht am 2014/01/25

I am happy to finally release my cross-platform Ambisonic processors useable as VST/LV2 plug-ins or standalone application under Windows, Mac OSX and Linux. They can be used in flexible hosts like Reaper, Ardour, MaxMSP, Bidule or as standalone applications with Jack.

The plug-ins can be used to produce 3D Ambisonic content or do post production on recordings. (eg. Soundfield or Eigenmike® microphone recordings)

The Ambisonic order is variable and can be chosen at compile time. A practical limitation for Reaper is 7th order due to the 64 channel limit. The processors use the ambiX convention (full 3D, ACN channel ordering, SN3D normalization)



A short **video clip** showing the plug-ins in action: <https://vimeo.com/81073470>

You may want to use these plug-ins in combination with the **mcfx** multichannel effect plug-in suite: <http://www.matthiaskronlachner.com/?p=1910>

**Source code** repository: <https://github.com/kronihias/ambix>

### Windows 32bit VST:

1st order: ambix\_v0.2.4\_win32\_o1.exe

3rd order: ambix\_v0.2.4\_win32\_o3.exe

5th order: ambix\_v0.2.4\_win32\_o5.exe



### Windows 64bit VST:

1st order: ambix\_v0.2.4\_win64\_o1.exe

3rd order: ambix\_v0.2.4\_win64\_o3.exe

5th order: ambix\_v0.2.4\_win64\_o5.exe



*Windows Users:* You might need to install the **Visual C++ 2012 runtime components** from [here](#).



#### Mac OS X (>= 10.6) VST Universal Binaries:

1st order: ambix\_v0.2.4\_osx\_o1.zip

3rd order: ambix\_v0.2.4\_osx\_o3.zip

5th order: ambix\_v0.2.4\_osx\_o5.zip

You will also need the **binaural decoder presets** if you want to listen with headphones: ambix\_binaural\_presets\_v0.1.5.zip  
(download includes decoder matrices + binaural loudspeaker impulse responses)



#### Install the decoder presets to:

Windows 7/8: C:\Users\username\AppData\Roaming\ambix\binaural\_presets\

MacOS: ~/Library/ambix/binaural\_presets/

Linux: ~/ambix/binaural\_presets/

Currently there is **no preset generator included**, you have to generate your decoding matrix with other tools. For example with the **Ambisonic Decoder Toolbox** by **Aaron Heller** using Matlab/Octave: [Source repo] [LAC Article].

Read **this article** from the AES Design competition for some informations regarding the plug-ins!

A slightly outdated **paper** about the plug-ins can be found here: <http://lac.linuxaudio.org/2013/papers/51.pdf>

Ambisonic **transformations** are described here

ICSA2014\_KronlachnerZotter\_AmbisonicTransformations.pdf

This software was developed during the work on my master thesis at the Institute of Electronic Music and Acoustic Graz. [ IEM ]

ambiX Ambisonic plug-in suite

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- > cross-platform Ambisonic VST, LV2 plug-ins with variable order for use in Digital Audio Workstations like Reaper or Ardour or as Jack standalone applications.
- > The plug-in suite use the ambiX \*(1)\* convention (ACN channel order, SN3D normalization, full periphony (3D)) except the  $\sqrt{1/4\pi}$  factor in equation 3.
- > these plug-ins use a recursive implementation of the spherical harmonics, therefore the maximum Ambisonic order is defined at compile time. the practical maximum order is rather

defined by the hosts maximum channel count  $(N+1)^2$  or your CPU power

\*(1) [http://iem.kug.ac.at/fileadmin/media/iem/projects/2011/ambisonics11\\_nachbar\\_zotter\\_sontacchi\\_deleflie.pdf](http://iem.kug.ac.at/fileadmin/media/iem/projects/2011/ambisonics11_nachbar_zotter_sontacchi_deleflie.pdf)\*

> This software uses the JUCE C++ framework, which is under GPL license.  
More information: <http://www.juce.com>

> other libraries being used:

- > Eigen (MPL2, <http://eigen.tuxfamily.org>),
- > FFTConvolver (GPL, <http://github.com/HiFi-LoFi/FFTConvolver>),
- > liblo (LGPL, <http://liblo.sourceforge.net>),
- > libsoxr (LGPL, <http://soxr.sourceforge.net>)

this software package goes well together with the mcfx – multichannel cross platform audio plug-in suite: <http://www.matthiaskronlachner.com/?p=1910>

plug-in reference:

> some information about the software can be found here: <http://lac.linuxaudio.org/2013/papers/51.pdf>, [http://iaem.at/Members/zotter/publications/2014\\_KronlachnerZotter\\_AmbiTransformationEnhancement\\_ICSA.pdf](http://iaem.at/Members/zotter/publications/2014_KronlachnerZotter_AmbiTransformationEnhancement_ICSA.pdf)

\* ambix\_binaural – binaural decoder with various loudspeaker setups in real world studios/venues

\* ambix\_decoder – same as binaural decoder but without the convolution, the loudspeaker signals are sent directly to the outputs (single band decoding)

\* presets for ambix\_binaural (including impulse responses) and ambix\_decoder are located in the folder ambix\_binaural/Presets (or available as separate download) and should be copied in following folders

\* Windows 7,8: C:\Users\username\AppData\Roaming\ambix\binaural\_presets\

\* MacOS: ~/Library/ambix/binaural\_presets/

\* Linux: ~/ambix/binaural\_presets/

\* ambix\_converter – convert between different ambisonic standards on the fly (include different standards in one project), also between 2D/3D

\* ambix\_directional\_loudness – amplify, attenuate or filter out certain parts of the spherical soundfield

\* ambix\_encoder – panning plug-in with different numbers of input channels – a width

parameter spreads those channels equally along the azimuth

\* ambix\_maxre – apply or reciprocal apply spherical max\_re weighting to suppress sidelobes according to Zotter, Frank – „All-Round Ambisonic Panning and Decoding“

\* ambix\_mirror – invert or mirror soundfield about x/y/z axis

\* ambix\_rotator\_z – rotation around z axis

\* ambix\_rotator – rotation around xyz axis

\* ambix\_vmic – same principle as directional loudness but will not output ambisonics signal but the selected part of the soundfield – similar to the virtual microphone approach

\* ambix\_warp – warp soundfield towards equator, poles, front or back...\*

\* ambix\_widening – frequency dependant rotation around the z-axis, use this for source widening or creating diffuse early reflections, article: <http://dx.doi.org/10.14279/depositonce-12>, Created with help of Franz Zotter and Matthias Frank

prerequisites for building

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- cmake, working build environment
- Steinberg VST 2.4 SDK
- fftw3, liblo, Eigen 3
- Standalone applications: ASIO SDK if you want ASIO under Windows

Install LINUX dependencies (Debian, Ubuntu):

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```
*$ sudo apt-get install libasound-dev libfreetype6-dev libgl1-mesa-dev libx11-dev libxext-dev  
libxinerama-dev libxcursor-dev libeigen3-dev liblo-dev freeglut3-dev libxmu-dev libxi-dev*
```

currently not as developer package available: <http://soxr.sourceforge.net>

optional: libfftw3-dev

Install MacOSX dependencies (through MacPorts):

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```
*$ sudo port install liblo eigen3-devel*
```

optional: fftw-3-single

Install Windows dependencies

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\*getting the dependencies for Windows is a little bit more tricky. you have to get liblo, pthreads, libsoxr and Eigen. liblo is not available as prebuilt version, therefore you have to build it by yourself\*

howto build ambix yourself:

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– copy the Steinberg VST 2.4 SDK into the folder \*mcfx/vstsdk2.4\* (do to legal reasons those can not be included here)

– use cmake gui or cmake/ccmake from terminal:

– adjusts the various parameters to your needs, make sure the libraries are found

**\*\*TERMINAL:\*\***

– create a folder in the \*ambix\* folder eg. \*BUILD\*

\*ambix/BUILD> \$ cmake ..\*

– adjust parameters

then

\*ambix/BUILD> \$ make\*

\*(if you have a multicore processor you can speed up the make process by using make -j #CPUCORESx1.5)\*

– find the binaries in the \*ambix/BUILD/\_bin\* folder and copy to system VST folder

**\*\*VST installation folders:\*\***

– MacOSX: /Library/Audio/Plug-Ins/VST or ~/Library/Audio/Plug-Ins/VST

– Windows: eg. C:\Program Files\Steinberg\VstPlugins

– Linux: /usr/lib/lxvst or /usr/local/lib/lxvst

LV2 plug-in

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- compile the plug-ins with the flag BUILD\_LV2 ON

- go to the folder `*lv2-ttl-generator*` and `**> make**` for compiling the tool `*lv2_ttl_generator*`

- go to the `_bin` folder (eg. `*ambix/BUILD/_bin*`) and execute the script `*> ../../lv2-ttl-generator/generate-ttl.sh*`

this will generate all needed .ttl files, afterwards you can copy all .lv2 folders from `*ambix/BUILD/_bin/lv2*` to `/usr/lib/lv2`

#### known problems

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- \* documentation missing – for now you can check this:

<http://lac.linuxaudio.org/2013/papers/51.pdf>

<http://iaem.at/Members/zotter/publications>

[/2014\\_KronlachnerZotter\\_AmbiTransformationEnhancement\\_ICSA.pdf](#)

<http://www.matthiaskronlachner.com/wp-content/uploads/2013/01>

[/Kronlachner\\_Master\\_Spatial\\_Transformations\\_Mobile.pdf](#)

<http://www.matthiaskronlachner.com/wp-content/uploads/2013/01>

[/kronlachner\\_aes\\_studentdesigncompetition\\_2014.pdf](#)

- \* GUI less plug-ins can not be used as standalone – therefore GUI for some more of the plug-ins would be nice...

- \* Linux: LV2 plug-ins don't show the GUI, VST plug-ins GUI might crash – better just stick to the hosts' GUI or help me fix that. you can use the standalone version in any case and connect via Jack

- \* different orders require different plug-in instances: maybe VST 3 can fix that with it's dynamic input/output ports. but we'll have to wait for it beeing implemented in appropriate hosts.

#### changelog

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- \* v0.2.4 (2015-07-19) improved efficiency for binaural decoder

- \* v0.2.3 (2014-12-27) multichannel encoder display actual source positions, compatibility with audiomulch for saving settings

- \* v0.2.2 (2014-08-18) encoder flickering fix, added osc settings, new control modes for encoder display: right mouse click for relative source movement, press shift to freeze elevation while moving and ctrl to freeze azimuth
- \* v0.2.1 (2014-04-17) fixed vst identifier for Plogue Bidule compatibility
- \* v0.2.0 (2014-03-30) added ambix\_widening, JUCE update, encoder GUI panning fix
- \* (2014-03-15) fixed binaural decoder crash during configuration unloading
- \* (2014-02-19) warping curve 2 changed slightly (icsa paper), warping pre-emphasis added, encoder abs(elevation) > 90° was wrong!
- \* (2014-02-13) ambix\_maxre added
- \* v0.1.0 (2014-01-24) – first release

thanks to

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several people and institutions contributed to this software in one or another way, i would like to name them here without particular order: Institute of Electronic Music and Acoustics Graz, Franz Zotter, Winfried Ritsch, Martin Rumori, Florian Hollerweger, Peter Plessas, IOhannes Zmölnig, Thomas Musil, Gerriet K. Sharma, Matthias Frank, Fons Adriaensen, Jörn Nettingsmeier, Filipe Coelho (DISTRHO project), Music Innovation Studies Centre of the Lithuanian Academy of Music and Theatre, Ricardas Kabelis, Mantautas Krukauskas, Tadas Dailyda, the surrround and linux audio community – to be continued...

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