Towards usability of Higher Order Ambisonics

in Digital Audio Workstations

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Background. Ambisonics is a recoding and playback technique for reproducing or synthesizing two- and three dimensional sound fields. Most commercial surround formats depend on a specific loudspeaker configuration. In contrast, Ambisonics recordings are independent from a certain loudspeaker configuration in the listening room and scale easily with the amount of available speakers. The origins of Ambisonics date back to the early 1970s, when Michael Gerzon did research in surround sound at the Mathematical Institute Oxford. He formulated the theory of first order Ambisonics, which encodes a 3D sound field into four Ambisonics Channels – W, X, Y and Z, also known as B-Format. Ambisonics is based on the comparison between an incoming (reference) plane wave and a reproduced plane wave by the speaker system. Solving these equations results into a decomposition in Spherical Harmonics. The Higher Order Ambisonics approach expands this theory to include Spherical harmonics of higher degree, enabling a more accurate reproduction of the sound field. Therefore it is possible to synthesize sound fields with more accurate located sound sources around the listener.

Aims. This work should present first results of a Higher Order Ambisonics Audio Plug-in Suite, usable in various Digital Audio Workstations (DAW) on multiple operating systems. To enable monitoring of Ambisonics recordings without the need of a big loudspeaker setup, a headphone playback solution will be presented.

Main contribution and implications. Apart from a set of Audio Plug-ins for the Linux platform, there are no platform independent Audio Plug-ins for encoding and decoding Higher Order Ambisonics available. Therefore a cross-platform programming library has been used to develop Audio Plug-ins usable in DAWs under Windows, Linux and Mac OS X. Apart from platform compatibility, some considerations about usability did result in features of the user interface, not available in other surround panning Plug-ins. Continuously rotating a sound source results in a discontinuity of the angular representation between -180 and 180 degree. This jump is also reflected when drawing automation curves. This results in a mismatch between the visual representation and auditory perceived movement of a sound source. A solution using absolute start points and relative movements is proposed. To enable monitoring of Ambisonics content without an extensive loudspeaker setup, a binaural decoder for headphone playback has been developed.

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