

Ambiophonics reproduction of different stereo recordings

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Abstract

This audio demonstration was conceived for analyzing the suitability of various kind of stereo recordings to reproduction over an Ambiophonics surround system. The basics of Ambiophonics are recalled only very quickly, as they are presented in detail in a parallel scientific paper. The audio demonstration focuses much more on the perceptual effects deriving from different recording techniques, and on the fact that different sets of processing digital filters can be derived, each being particularly tailored to the reproduction of one specific kind of recordings.

The listener will be able to compare in real time recordings taken during the same performance with different microphones (binaural, sphere, ORTF, M/S, spaced omnis, Soundfield), and to express their preference filling up a quantitative questionnaire.

Precis

Each surround reproduction method usually requires a specific recording technique, and does not allow for satisfying reproduction of other kind of recordings. Ambiophonics instead include customizable inverse filters, which partially compensate for the peculiarities of the microphones employed for recording: this means that in principle Ambiophonics is capable of reproducing almost any kind of pre-recorded material. This does not mean, anyway, that all the recording methods perform the same results. Furthermore, the customization possibility allows for different inverse filters to be designed for each kind of recording. The goal of this work is thus to evaluate from a perceptual point of view what are the recordings more suitable for Ambiophonics reproduction, and what is the better set of digital filters for each of them.

The recordings employed for the audio presentation come from simultaneous multitrack recording of the same performances, obtained by placing inside an high quality venue some outstanding performers. Many different microphones were employed simultaneously, so that the results can be compared directly. In more details, the following 7 simultaneous recordings were done:

- Binaural, Neuman KU-100 dummy head
- Binaural, Bruel & Kjaer type 4100 dummy head
- Omni Sphere, with Schoeps KFM 360 microphone
- Cardioid Sphere, with Schoeps KFM 360 microphone
- ORTF

- M/S (Blumlein), with Soundfield microphone
- Two spaced omnis (B&K pressure microphones)

Each of these recordings was saved as a separate 2-channels WAV file, at 24 bits, 96 kHz. For each recording method, one or more sets of Ambiophonics reproduction filters were derived. All these filter sets are loaded on the DSP platform programmed for the cross-talk-cancelling reproduction (BSS SoundWeb 9088-II), feeding the frontal loudspeaker pair in the Stereo-Dipole configuration. The impulse responses employed for the surround convolution are always maintained the same. These were derived from actual measurements taken with the Aurora system inside the original venue where the recordings were performed, after proper editing (removal of the direct sound, reshaping of the tail).

The Ambiophonics method will be demonstrated also through the software-only implementation made by J.J.Lopez, which allows for multichannel processing of the original stereo recording by means of a convolver software running on a low cost PC, equipped with a multichannel sound board.

The real-time Ambiophonic system will be employed for collecting subjective responses from a number of trained listeners: a quantitative questionnaire will be set up, based on discrete horizontal 7-point scales connecting opposite perceptual attributes. Each listener will be able to switch at will, in real time, among the different soundtracks and the different filter sets, with the goal of ranking them in order of preference, and to select the optimal filter for each recording type.

It is scheduled to conduct many short listening sessions during the whole duration of the conference (as Nick Zacharov did during the 16th AES Conference); at the end of the conference, a brief analysis of the collected subjective results will be given, the averaged ranking of the recording methods will be disclosed, and hopefully it will be possible to draw some concluding remarks.

If the logistic conditions will permit it, the Ambiophonics method will be also compared with the two partial surround methods which compose it (Stereo Dipole and virtual Ambisonics), including them in the overall ranking procedure.