Surround sound via headphones

September 6 2005

Music fans will soon be able to enjoy high-quality surround sound even when traveling: Ensonido creates an illusion of several loudspeakers for the ears wearing stereo headphones. The software measures the movements of the head to generate a spatially constant sound field. Visitors to the international consumer electronics fair IFA in Berlin are able to try out the new audio experience.

Image: When the listener turns her head, she gains the impression from her headphones that the sound sources are always in the same place. © Fraunhofer IIS/Michael Schnödt

All-round sound or domestic harmony? One person may long for peace

and quiet while another is looking forward to a surround-sound movie. This may be a matter for delicate negotiations at the moment, as surround sound tends to involve acoustic irradiation of the room with five or more loudspeakers. Using headphones may restore domestic harmony, but it usually means having to go without the acoustic experience. “Systems do exist for generating surround sound through headphones,” remarks Jan Plogsties, head of the Ensonido project at the Fraunhofer Institute for Integrated Circuits IIS in Erlangen, “but the sound quality is often less than acceptable.”

The Ensonido® software developed by the Fraunhofer researchers optimizes this sound experience. “Up to now, it took five loudspeakers and a subwoofer to obtain the quality of 5.1 surround sound that we are now achieving with conventional stereo headphones,” says Plogsties. “It is done with spatial transmission functions that adapt to the movements of the head.” A filter modifies the acoustic signals in the same way they are modified on the way from the loudspeaker to the human ear – through different reflections on walls and ceilings, for instance. Ensonido® even takes into account the characteristics of the human head: If a loudspeaker is located behind the listener, for instance, major elements of the signal first have to pass the auricle. A head tracker fitted with acceleration sensors tracks every movement of the head. The software modifies the acoustic signal accordingly, deceiving the brain with the resulting acoustic impression in real time. Music fans have the feeling that the sound field stays in one place while they themselves are moving around. The software enables its users to set any kind of soundscape – as though standing in a church or a movie theater.

The audio impression is based on audio-coding techniques such as “MP3 Surround”. This new technology compresses the six channels of the 5.1 surround sound so efficiently that MP3 Surround files only require five percent more memory than conventional MP3s. “With the emerging generation of portable MP3 players, the user should be able to plunge

into an all-round audio experience even when traveling," Plogsties anticipates. "But Ensonido and MP3 Surround are suitable for DVD players, mobile radios and cell phones as well."