Audio Format

Audiofields Sound Format in Series Production at Mercedes

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Mercedes-Benz, the Fraunhofer IDMT and Burmester have presented "Audiofields". The audio format generates immersive sound from 2D content—and is also suitable for warnings from exactly the right direction.

The Fraunhofer IDMT, Mercedes-Benz and Burmester have developed the 3D audio technology "Audiofields".
(Image: Thomas Günnel - Automotive Industry)

Immersive surround sound in the car for music, speech or warning messages: The Fraunhofer Institute for Digital Media Technology IDMT in Ilmenau, Mercedes-Benz and Burmester have spent around four years developing "Audiofields". The audio format separates music, voices and sound from the installed loudspeakers and creates an immersive, three-dimensional sound image in the interior, even with stereo music content. Mercedes is now offering the format as

standard. Spatial sound at the touch of a button—doesn't that already exist? Partly. A brief digression.

Channel-Based Versus Object-Based Sound

With channel-based audio playback, sound is produced as a mix for a fixed speaker configuration, for example stereo with two channels, 5.1 surround or 7.1.4 systems. The audio files contain the information as to which sound should come from which speaker. This only works correctly if the playback environment, the speaker layout, corresponds to the production environment.

Object-based audio playback with Audiofields does not save the sound as a finished loudspeaker mix, but as a collection of audio objects. An audio object always consists of the actual signal, such as a voice, instrument or warning tone. It also contains information on the position and movement of the audio object in the room. Only during playback does the audio processor calculate the loudspeaker signals to match the surroundings. Sound sources can therefore be placed anywhere in the room. Audiofields also adapts to the existing loudspeaker layout—the spatial impression remains consistent even with different vehicle models.

Adapted to the Vehicle Interior

Object-based sound is not new in itself; Dolby Atmos or DTS:X achieve something similar. However, the loudspeaker layout must be right for this; more so with Dolby Atmos than with DTS:X. According to Fraunhofer IDMT, Audiofields is adapted for vehicle interiors, which have a number of acoustic peculiarities: limited space, fixed specifications for the installation location of the speakers, reflections on glass and plastic—and, from the acousticians' point of view, never the ideal seating position.

The Special Features of Audiofields

The Fraunhofer IDMT algorithm requires significantly fewer speakers and is scalable from entry-level to high-end systems. In addition, Audiofields works in real time on serial processors, optimized for energy and computing. Tracks mixed with Dolby Atmos can also be played back with Audiofields. Above all, however, the new algorithm is intended for 2D upmixes—i.e. spatial yet authentic sound from stereo files. This means that there is not simply more reverb on one channel, but instruments and voices are given a significantly larger stage.

"Virtual loudspeakers placed around the outside of the vehicle ensure that channel-based audio content is reproduced in 3D," explained Christoph Sladeczek, Group Manager Smart Acoustic Solutions at Fraunhofer IDMT, at the presentation in Erfurt at the end of February. "In addition, virtual loudspeakers offer new possibilities for interactively adapting the sound image to personal preferences: By changing the stereo panorama, a wide yet deep sound stage can be created, which gives the instruments significantly more spatiality—for lively sound with a live character."

Convincing Audio Sample

The first listening impression in the GLC was convincing; the pure sound, apart from the immersion, is also very clean and precise, typical of Burmester. Sladeczek answers the question of how exactly the algorithm extracts from the 2D signal where the instruments should be arranged in the room, and how the algorithm can determine what is an instrument or vocal in the data stream with a smile and a reference to the "fairy dust" of development. "It's a lot of math," he says.

Warning Sounds in Real Time—And Other Applications

However, this upmixing is only part of what Audiofields can do. Arranging audio objects in space can also be used, for example, to warn the driver of a cyclist in the car's blind spot. In sensor fusion with the surrounding vehicle sensors, it is conceivable, for example, to accompany the cyclist's changing position with a sound in the interior. This makes it clear where the cyclist is at all times—without taking their eyes off the road. This also works with navigation instructions, for example, combined with visual elements in the cockpit if required.

Another example is conversations with several people on the telephone. Audiofields places voices as spatial audio objects in the interior. This makes it easier to differentiate between conversation partners, which increases intelligibility and is less tiring. Other examples include acoustic feedback when buttons are pressed from the exact direction of the control element. The active autonomous driving mode can also be accompanied by an atmospheric soundscape. And: personalized sound zones are conceivable. By means of loudspeakers in the headphones and the correct masking of frequencies from the other seats. Many possibilities—which the people at Fraunhofer IDMT are working on.

Available in the Fourth Generation "MBUX"

The 3D sound algorithm developed by the Fraunhofer IDMT under the name "SpatialSound Wave" can be integrated into existing vehicle and sound systems. Mercedes offers the 3D audio

Audiofields is primarily intended for upmixing 2D content—but the object-based process is also suitable for a number of other applications in vehicles.
(Image: Fraunhofer ICT Group)

driver assistance or Active Sound Design.

technology in all models equipped with the fourth generation of the "MBUX" infotainment system. Starting with the CLA, GLC, GLB and S-Class. Burmester is responsible for fine-tuning the sound systems. Mercedes has been working with the manufacturer of high-end audiophile components since 2013.

In future, Audiofields will enable uniform sound management, in which all audio functions that were previously produced separately will converge: Infotainment,

Outlook for Audiofields

What's next? "The boundaries imposed by the car must be removed," said Ingolf Franke, Head of Development Sound & Acoustics at Mercedes-Benz, describing the goal for the next few years. In other words, audio objects should be able to be displayed around the car in such a way that there is no longer a sense of being limited by the bodywork, i.e. the feeling of space should be enhanced.

Development of Object-Based Audio Systems

Since the early 2000s, the Fraunhofer IDMT has been developing object-based 3D audio systems for professional audio and entertainment applications, with success: the researchers have won the Thuringian Research Award, the German stage award "Opus", the "Tony Award" 2018 for the best sound design and the "Avard 2024", an award for professional audio and video applications, among others.

Fraunhofer IDMT's 3D audio technology has also been used in international installations, including at the Bregenz Festival, the Berlin State Opera, the Zurich Opera House and the Barrymore Theatre on Broadway.

The researchers have also been developing for the automotive industry since 2007. Together with Mercedes-Benz and Burmester, the 3D sound algorithm now presented was developed for Mercedes-Benz models from 2021. In 2025, the companies integrated the algorithm into a CLA for the first time.