R&D Information

International Standardization of Lossless Coding Technology for Audio Signals

A specification for lossless coding technology for audio signals was officially approved as a standard called MPEG-4ALS[*] at the end of 2005 (ALS: audio lossless coding). MPEG (moving picture experts group) is a working group of ISO/IEC (International Standards Organization, International Electrotechnical Commission). NTT Communication Science Laboratories made a large contribution in MPEG toward the standardization of this technology, which includes a number of elementary technologies proposed by NTT.

Some standard audio coding schemes such as MP3 and AAC (advanced audio coding) already exist and are in use. They are all based on perceptual coding, which offers a high compression ratio in exchange for minor waveform distortion at the decoder. That is, the waveform is different from the original, even though it is carefully controlled and perceptually very close to the original. In contrast, lossless coding enables perfect reconstruction of the waveform. This is very important for applications such as waveform editing or the storage of high-quality audio signals with, for example, high sampling rates, high word resolution, and multiple channels. The cost of perfect reconstruction is a limited compression ratio: the compressed file size varies from 15 to 70% of the original depending on the statistical properties of the original waveform. Nevertheless, the compression performance of MPEG-4ALS, exceeds that of ZIP, a general-purpose lossless compression tool, and the other available compression tools for audio signals. Thus, it offers a wide range of flexibility in selecting the operation mode at the encoder, such as a very fast encoding mode with lower compression performance or a very high compression mode at the cost of slow encoding and decoding.

MPEG-4ALS accepts a wide range of input formats:

- Sampling rates of up to 192 kHz (44.1 kHz for a compact disc (CD))
- Various integer PCM (pulse code modulation) formats up to 32 bits per sample (16 bits for CD)
- 32-bit floating point data in the IEEE754 format (integer for CD)
- Up to 65,536 channels (2 channels for CD).

Moreover, it is very useful for downloading and storing compressed files because file compression enables significantly smaller archive files and shorter downloading times and the decoding is generally very fast, at least ten times faster than the playback time of the music.

NTT developed and contributed several elementary technologies used in the standardized specification. For example, the time domain linear prediction is based on PARCOR coefficients invented by NTT while the multi-channel coding and long-term prediction were developed in collaborative work between NTT and the University of Tokyo.

NTT Communication Science Laboratories will continue to support the standardization of the conformance and reference software and the enhancement of the encoder performance, and NTT Communications will design and provide integrated delivery and archiving systems using practical software that complies with the standard. NTT group companies will also work with partners or license others to produce applications, including professional audio editing tools.

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[*] The official name is MPEG-4 audio 3rd edition amendment 2, but it is usually called ALS.