Audio File Formats

TYPES OF AUDIO FORMAT

Three major groups of audio file formats:

- Uncompressed audio formats, such as WAV, AIFF and AU;
- formats with lossless compression, such as FLAC, Monkey's Audio (filename extension APE), WavPack (filename extension WV), Shorten, Tom's lossless Audio Kompressor (TAK), TTA, ATRAC Advanced Lossless, Apple Lossless and lossless Windows Media Audio (WMA).
- formats with lossy compression, such as MP3, Vorbis, Musepack, ATRAC, lossy Windows Media Audio (WMA) and AAC.

Uncompressed audio format

- There is one major uncompressed audio format, PCM, which is usually stored as a .wav on Windows or as .aiff on Mac OS.

- WAV is a flexible file format designed to store more or less any combination of sampling rates or bitrates.

- This makes it an adequate file format for storing and archiving an original recording.

- A lossless compressed format would require more processing for the same time recorded, but would be more efficient in terms of space used.

Uncompressed audio format

- WAV, encodes all sounds, whether they are complex sounds or absolute silence, with the same number of bits per unit of time. E.g a file containing a minute of playing by a symphonic orchestra would be the same size as a minute of absolute silence if they were both stored in WAV.

- If the files were encoded with a lossless compressed audio format, the first file would be marginally smaller, and the second file taking up almost no space at all. However, to encode the files to a lossless format would take significantly more time than encoding the files to the WAV format.

- Recently some new lossless formats have been developed (for example TAK), which aim is to achieve very fast coding with good compression ratio.

Lossless audio formats

- Lossless audio formats (such as the most widespread FLAC, WavPack, Monkey's Audio) provide a compression ratio of about 2:1.

Lossy audio compression

- A **lossy compression** method is one where compressing data and then decompressing it retrieves data that may well be different from the original, but is close enough to be useful in some way.

- Lossy compression is most commonly used to compress multimedia data (audio, video, still images), especially in applications such as streaming media and internet telephony.

- By contrast, lossless compression is required for text and data files, such as bank records, text articles, etc.

Lossy audio compression

- Lossy compression formats suffer from generation loss: repeatedly compressing and decompressing the file will cause it to progressively lose quality. This is in contrast with lossless data compression.

Free and open file formats

- wav – standard audio file container format used mainly in Windows PCs. Commonly used for storing uncompressed (PCM), CD-quality sound files, which means that they can be large in size — around 10 MB per minute. Wave files can also contain data encoded with a variety of codecs to reduce the file size (for example the GSM or mp3 codecs). Wav files use a RIFF structure.

- ogg – a free, open source container format supporting a variety of codecs, the most popular of which is the audio codec Vorbis. Vorbis offers compression similar to MP3 but is less popular.

- mpc - Musepack or MPC (formerly known as MPEGplus, MPEG+ or MP+) is an open source lossy audio codec, specifically optimized for transparent compression of stereo audio at bitrates of 160–180 kbit/s. Musepack and Ogg Vorbis are rated as the two best available codecs for high-quality lossy audio compression in many double-blind listening tests. Nevertheless, Musepack is even less popular than Ogg Vorbis and nowadays is used mainly by the audiophiles.

Free and open file formats

- flac – a lossless compression codec. This format is a lossless compression as like zip but for audio. If you compress a PCM file to flac and then restore it again it will be a perfect copy of the original. (All the other codecs discussed here are lossy which means a small part of the quality is lost). The cost of this losslessness is that the compression ratio is not good. Flac is recommended for archiving PCM files where quality is important (e.g. broadcast or music use).

- aiff – the standard audio file format used by Apple. It is like a wav file for the Mac.

- raw – a raw file can contain audio in any codec but is usually used with PCM audio data. It is rarely used except for technical tests.

- au – the standard audio file format used by Sun, Unix and Java. The audio in au files can be PCM or compressed with the µ-law, a-µlaw or G729 codecs.

- mid - an industry-standard protocol that enables electronic musical instruments, computers, and other equipment to communicate, control, and synchronize with each other

Open file formats

- gsm – designed for telephony use in Europe, gsm is a very practical format for telephone quality voice. It makes a good compromise between file size and quality. Note that wav files can also be encoded with the gsm codec.

- dct – A variable codec format designed for dictation. It has dictation header information and can be encrypted (often required by medical confidentiality laws).

- vox – the vox format most commonly uses the Dialogic ADPCM (Adaptive Differential Pulse Code Modulation) codec. Similar to other ADPCM formats, it compresses to 4-bits. Vox format files are similar to wave files except that the vox files contain no information about the file itself so the codec sample rate and number of channels must first be specified in order to play a vox file.

- aac – the Advanced Audio Coding format is based on the MPEG2 and MPEG4 standards. aac files are usually ADTS or ADIF containers.

- mp4/m4a – MPEG-4 audio most often AAC but sometimes MP2/MP3

- mmf - a Samsung audio format that play a music of ringtone

Proprietary formats

- mp3 – the MPEG Layer-3 format is the most popular format for downloading and storing music. By eliminating portions of the audio file that are essentially inaudible, mp3 files are compressed to roughly one-tenth the size of an equivalent PCM file while maintaining good audio quality.

- wma – the popular Windows Media Audio format owned by Microsoft. Designed with Digital Rights Management (DRM) abilities for copy protection.

- atrac (.wav) – the older style Sony ATRAC format. It always has a .wav file extension. To open these files simply install the ATRAC3 drivers.

- ra – a Real Audio format designed for streaming audio over the Internet. The .ra format allows files to be stored in a self-contained fashion on a computer, with all of the audio data contained inside the file itself.

- ram – a text file that contains a link to the Internet address where the Real Audio file is stored. The .ram file contains no audio data itself.

- dss – Digital Speech Standard files are an Olympus proprietary format. It is a fairly old and poor codec. Prefer gsm or mp3 where the recorder allows. It allows additional data to be held in the file header.

Proprietary formats

- msv – a Sony proprietary format for Memory Stick compressed voice files.
- dvf – a Sony proprietary format for compressed voice files; commonly used by Sony dictation recorders.
- ivs – A proprietary version with Digital Rights Management developed by 3D Solar UK Ltd for use in music downloaded from their Tronme Music Store and interactive music and video player.
- mp4 – A proprietary version of AAC in MP4 with Digital Rights Management developed by Apple for use in music downloaded from their iTunes Music Store.
- iklax – An iKlax Media proprietary format, the iKlax format is a multi-track digital audio format allowing various actions on musical data, for instance on mixing and volumes arrangements.
- mxp4 – a Musinaut proprietary format allowing play of different versions (or skins) of the same song.