Chapter 3 - Intro to Video Compression

Video, in its raw form, takes up huge amounts of space.   Depending on frame size, frame-rate, compression, and quality, 1 second of raw video can take from 1 - 20 megabytes of disk space.   In order to make desktop video feasible, video compression algorithms were created.   Video compression is the process by which a large movie clip is reduced in size by the removal of redundant audio and video data.

Movie Cleaner and QuickTime™

Movie Cleaner is a QuickTime application.   This means that it uses Apple Computer's QuickTime engine to handle movies.   QuickTime allows computers to deal with data that changes over time, such as video and audio.   You must have QuickTime 2.0 or later installed in your Extensions folder in order to use Movie Cleaner.

Movie Cleaner offers you the ability to use all the QuickTime compatible codecs.   A codec is an algorithm that handles the compression of your video, as well as its decompression when it is played.   The word codec stands for compression/decompression.   The two most widely used codecs for CD-ROM content are Cinepak™ and Indeo™.

How codecs work

The details of how codecs work are far beyond the scope of this manual.   However, the basic principles are essentially as follows: most codecs attempt to compress the data using temporal and/or spatial compression techniques.   Now, here's what that actually means:

Temporal Compression: One way to make a frame smaller is to look for changes between frames and then store just the differences instead of the whole frame.   The reference frame from which these differences are based are called keyframes.   The frames based on differences are called delta, or difference frames.

For example, if you had a newscaster in front of a static background, the first frame of the movie would be a keyframe, which would be the whole picture.   The next several frames would be delta frames, which would only show the differences between the previous frame and the current frame.   Most of this delta data would relate to how the pixels in the newscaster's face were different from the last frame. The delta frame wouldn't bother with the static background since it is basically the same as it was in the key frame.   Every second or so a new keyframe would be used to correct for slight cumulative errors in the key frames, so the image doesn't "drift."

This kind of compression looks at data over a period of time and is therefore called temporal compression.

Spatial Compression:
Another way of compressing frames is to remove the redundant data within any given image.   In our example of the newscaster, the background might have large areas of a solid color, perhaps on the wall. Instead of specifying each pixel and its color, a codec can generalize and simply specify the area and the area's color, without having to worry about all the little details.   This manner of reducing the size of an image is called spatial compression.

Compression in Action and Movie Cleaner

The actual process of analyzing each frame and creating a compressed version is what takes so long in video compression - for each frame, vast amounts of calculations are going on to generate the final compressed frame.   On a midrange Power Macintosh, it can often take a couple of seconds to compress a single frame.

The codec also controls the playback of the compressed video. It's no accident that the decompression routines are much faster than the compression routines — this allows the frames to be decompressed fast enough to play the movie smoothly.   A frame that took a couple of seconds to compress might take less than 1/30th of a second to decompress. Processes that take a long time to compress but decompress quickly are known as asymmetric. Both Cinepak and Indeo are extremely asymmetric, which means that movies made with them play back smoothly, but take a long time to create.

Compressing an hour-long movie can easily take 40 hours on a midrange Power Macintosh, or much longer on a 68K Macintosh.   Movie Cleaner gives you the ability to suspend a long compression, and then start it up again.   Unless you have a dedicated compression computer, it's important to be able to get your computer back when you need it.