

Advanced JPEG Features and Services for Potential Project Partners

Introduction

For more than 25 years JPEG has established itself as the universal format for the capture, distribution, and archiving of digital photographic images on all fields of visual communication.

In the last years the “Independent JPEG Group” has worked on introducing considerable advances in the core technology of JPEG which provide new features and improved performance for the processing of digital images far beyond the previous development state used in applications.

Interested users who want to benefit from the advantages are called to engage in the adoption of the new functions in their application projects. In contrast to the deployment of other kind of formats, which are occasionally propagated by different interest groups, the advanced JPEG format ensures the long-term universal availability.

Recommended reference applications, which represent the current status of JPEG development, are cPicture, PhotoLine, Directory Opus and StudioLine Photo.

Overview

New features and functions are available in following areas:

- Lossless re-compression of already existing JPEG image files by arithmetic coding
- Lossless compression of image files
- Lossless re-scaling of already existing JPEG image files, and other lossless transformation functions (crop, rotation, etc.)
- Scaled encoding and decoding
- Extended color representation (Wide Gamut), in order to support various and future image capture devices and output media
- Extended range of supported bit depths

These functions are available with the new versions 7, 8, and 9 of the „Independent JPEG Group“ software („libjpeg“ package) for integration in application programs.

Furthermore, following opportunities of performance optimization and other extensions are available for project work:

- Optimal integration and customization for application projects
- Selective performance boost for the lossless compression
- Performance optimization by usage of platform dependent processor instruction set extensions especially in the area of DCT functions for encoding and decoding
- Performance optimization for arithmetic coding with platform specific programming
- Coding with higher bit depths („HDR“ – High Dynamic Range)
- Application for moving pictures (Motion-JPEG) with corresponding adaptations and optimizations

In the long run the development goes in direction of an option for the direct coding in the original “radiance” domain instead of the usual output-referred (perceptual) domain. Only such option will enable true “HDR” (High Dynamic Range) and “AR” (Augmented Reality) applications.

The direct “radiance” representation in the core of the codec is the logical progression of development in image coding.

The inner structure of the original (reference) JPEG procedure already provides the necessary prerequisites, though there remains considerable development effort for the actual implementation.

Arithmetic Coding

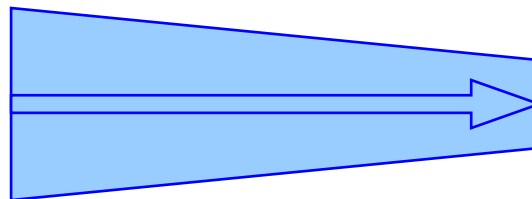
By lossless transcoding of existing (Huffman coded) JPEG image files into arithmetic coded JPEG image files it is possible to reduce the storage requirement by 5 to 20 percent.

This function is especially useful for archiving huge image data collections.

For application in data exchange it is to notice that on the receiver side a corresponding decoder based on version JPEG 7 or newer is required.

Beside the reference applications mentioned in the introduction, the popular image viewer IrfanView supports the function.

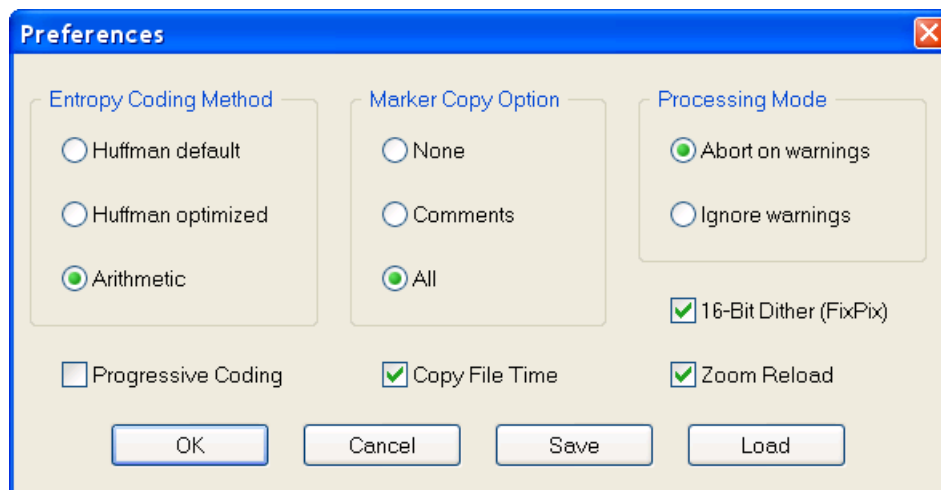
JPEG Huffman coded



JPEG arithmetic coded

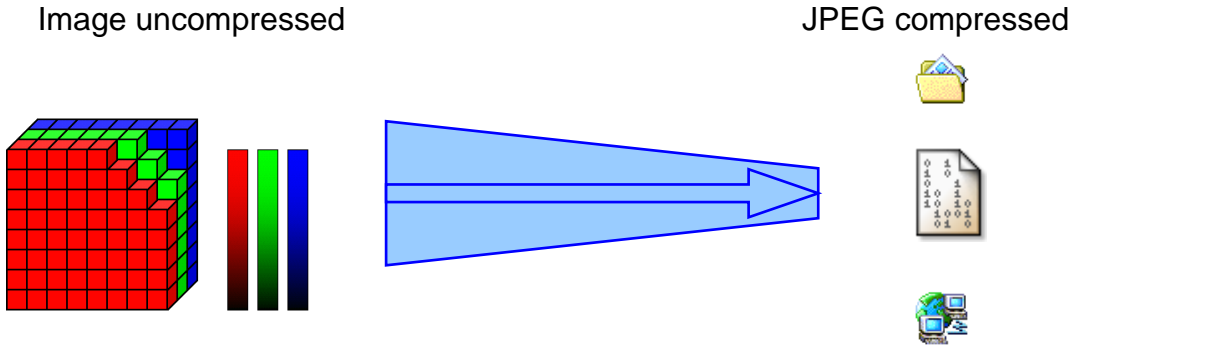


The program Jpegcrop provides, among other functions, an option for performing the lossless conversion on individual images:



Lossless compression

Uncompressed image data can be losslessly compressed since version JPEG 8, and since version 9 with an improved rate which is superior to other available formats (compression to under 50 percent for photographic images).



SmartScale

SmartScale denotes a new feature with flexible possibilities for rescaling during encoding, decoding, and transcoding. This allows flexible adaption of image size according to actual requirements.



Extended color representation (Wide Gamut)

By defining three primary color points in the standard RGB color model, the range of usable color values is restricted to a subset of the visible spectrum.

An extended coding mode according to the IEC 61966-2-1 standard allows the use of extended color values in order to cover further application areas and to support novel image capture devices and output media.

With this feature, JPEG is currently the only image coding standard which supports all color coding modes as defined in IEC 61966-2-1 and which thus provides the widest color range for all applications.

