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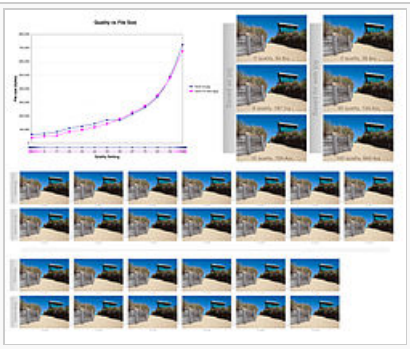
Image compression

From Wikipedia, the free encyclopedia
(Redirected from Image Compression)

This article includes a list of references, but **its sources remain unclear** because it has **insufficient inline citations**. Please help to improve this article by introducing more precise citations. *(April 2010)*

The objective of **image compression** is to reduce irrelevance and redundancy of the image data in order to be able to store or transmit data in an efficient form.

Contents [hide]



Comparison of JPEG images saved by Adobe Photoshop at different quality levels and with or without "save for web"

Lossy and lossless Image compression [edit]

Image compression may be lossy or lossless. Lossless compression is preferred for archival purposes and often for medical imaging, technical drawings, clip art, or comics. Lossy compression methods, especially when used at low bit rates, introduce compression artifacts. Lossy methods are especially suitable for natural images such as photographs in applications where minor (sometimes imperceptible) loss of fidelity is acceptable to achieve a substantial reduction in bit rate. The lossy compression that produces imperceptible differences may be called visually lossless.

Methods for lossless image compression are:

- Run-length encoding – used as default method in PCX and as one of possible in BMP, TGA, TIFF
- Area image compression
- DPCM and Predictive Coding
- Entropy encoding
- Adaptive dictionary algorithms such as LZW – used in GIF and TIFF
- Deflation – used in PNG, MNG, and TIFF
- Chain codes

Methods for lossy compression:

- Reducing the color space to the most common colors in the image. The selected colors are specified in the color palette in the header of the compressed image. Each pixel just references the index of a color in the color palette, this method can be combined with dithering to avoid posterization.
- Chroma subsampling. This takes advantage of the fact that the human eye perceives spatial changes of brightness more sharply than those of color, by averaging or dropping some of the chrominance information in the image.
- Transform coding. This is the most commonly used method. In particular, a Fourier-related transform such as the Discrete Cosine Transform (DCT) is widely used: N. Ahmed, T. Natarajan and K.R.Rao, "Discrete Cosine Transform," *IEEE Trans. Computers*, 90-93, Jan. 1974. The DCT is sometimes referred to as "DCT-II" in the context of a family of discrete cosine transforms; e.g., see discrete cosine transform. The more recently developed wavelet transform is also used extensively, followed by quantization and entropy coding.
- Fractal compression.

Other properties [edit]

The best image quality at a given bit-rate (or compression rate) is the main goal of image compression,

however, there are other important properties of image compression schemes:

Scalability generally refers to a quality reduction achieved by manipulation of the bitstream or file (without decompression and re-compression). Other names for scalability are *progressive coding* or *embedded bitstreams*. Despite its contrary nature, scalability also may be found in lossless codecs, usually in form of coarse-to-fine pixel scans. Scalability is especially useful for previewing images while downloading them (e.g., in a web browser) or for providing variable quality access to e.g., databases. There are several types of scalability:

- **Quality progressive** or layer progressive: The bitstream successively refines the reconstructed image.
- **Resolution progressive**: First encode a lower image resolution; then encode the difference to higher resolutions.[1][2]
- **Component progressive**: First encode grey; then color.

Region of interest coding. Certain parts of the image are encoded with higher quality than others. This may be combined with scalability (encode these parts first, others later).

Meta information. Compressed data may contain information about the image which may be used to categorize, search, or browse images. Such information may include color and texture statistics, small preview images, and author or copyright information.

Processing power. Compression algorithms require different amounts of processing power to encode and decode. Some high compression algorithms require high processing power.

The quality of a compression method often is measured by the Peak signal-to-noise ratio. It measures the amount of noise introduced through a lossy compression of the image, however, the subjective judgment of the viewer also is regarded as an important measure, perhaps, being the most important measure.

Notes and references [edit]

1. ^ Burt, P.; Adelson, E. (1 April 1983). "The Laplacian Pyramid as a Compact Image Code". *IEEE Transactions on Communications* **31** (4): 532–540. doi:10.1109/TCOM.1983.1095851.
2. ^ Shao, Dan; Kropatsch, Walter G. (February 3–5, 2010). "Irregular Laplacian Graph Pyramid" (PDF). *Computer Vision Winter Workshop 2010* (Nove Hrady, Czech Republic: Czech Pattern Recognition Society).

External links [edit]

- Compress Image Online at http://CompressPic.com
- Image compression from MIT OpenCourseWare
- Image Coding Fundamentals
- A study about image compression (Image compression basics and comparing different compression methods like JPEG2000, JPEG and JPEG XR / HD Photo)
- Data Compression Basics (includes comparison of PNG, JPEG and JPEG-2000 formats)
- FAQ:What is the state of the art in lossless image compression? from comp.compression
- IPRG Open group related to image processing research resources

v · t · e **Data compression methods** [show]

v · t · e **Multimedia compression and container formats** [show]

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