Transform coding

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Transform coding is a type of data compression for "natural" data like audio signals or photographic images. The transformation is typically lossy, resulting in a lower quality copy of the original input.

In transform coding, knowledge of the application is used to choose information to discard, thereby lowering its bandwidth. The remaining information can then be compressed via a variety of methods. When the output is decoded, the result may not be identical to the original input, but is expected to be close enough for the purpose of the application.

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Colour Television   [edit]

For more details on this topic, see YIQ.

NTSC   [edit]

One of the most successful transform encoding system is typically not referred to as such—the example being NTSC color television. After an extensive series of studies in the 1950s, Alda Bedford showed that the human eye has high resolution only for black and white, somewhat less for "mid-range" colors like yellows and greens, and much less for colors on the end of the spectrum, reds and blues.

Using this knowledge allowed RCA to develop a system in which they discarded most of the blue signal after it comes from the camera, keeping most of the green and only some of the red; this is chroma subsampling in the YIQ color space.

The result is a signal with considerably less content, one that would fit within existing 6 MHz black-and-white signals as a phase modulated differential signal. The average TV displays the equivalent of 350 pixels on a line, but the TV signal contains enough information for only about 50 pixels of blue and perhaps 150 of red. This is not apparent to the viewer in most cases, as the eye has sophisticated systems for "re-building" a sharp image based on clues from contrast and edges.

PAL and SECAM   [edit]

The PAL and SECAM systems use nearly identical or very similar methods to transmit colour. In any case both systems are subsampled.

Digital   [edit]

The term is much more commonly used in digital media and in digital signal processing. The common JPEG image format is an example of a transform coding, one that examines small blocks of the image and "averages out" the color using a discrete cosine transform to form an image with far fewer colors in total. MPEG modifies this across frames in a motion image, further reducing the size compared to a series of JPEGs. A widely used transform in this regard is the Discrete Cosine Transform (DCT), developed in 1974 by N. Ahmed, T. Natarajan and K. R. Rao; see Citation 1 in Discrete cosine transform. 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. MPEG audio compression analyzes the transformed data according to a psychoacoustic model that describes the human ear's sensitivity to parts of the signal, similar to the TV model.

The basic process of digitizing an analog signal is a kind of transform coding that uses sampling in one or more domains as its transform.

See also [edit]

- Karhunen–Loève theorem
- Transformation (function)
- Wavelet transform

Categories: Lossy compression algorithms