Digital SDTV (Standard Definition Television) video signals have a data rate of 270 Mbit/s. This data rate is much too high for broadcasting purposes, which is why they are subjected to a compression process before being processed for transmission. The 270 Mbit/s must be compressed to about 2...6 Mbit/s - a very high compression factor which, however, is possible due to the use of a variety of redundancy and irrelevance reduction mechanisms.

6.1 Video Compression

To compress data, it is possible to remove redundant or irrelevant information from the data stream. Redundant means superfluous, irrelevant means unnecessary. Superfluous information is information which exists several times in the data stream, or information which has no information content, or simply information which can be easily and losslessly recovered by mathematical processes at the receiving end. Redundancy reduction can be achieved, e.g. by variable-length coding. Instead of transmitting ten zeroes, the information 'ten times zero' can be sent by means of a special code which is much shorter.

The alphabet of the Morse code, too, uses a type of redundancy reduction. Letters which are used frequently are represented by short code sequences whereas letters which are used less frequently are represented by longer code sequences. In information technology, this type of coding is called Huffman coding.

Irrelevant information is the type which cannot be perceived by the human senses. In case of the video signal, they are the components which the eye does not register due to its anatomy. The human eye has far fewer color receptors than detection cells for brightness information. For this reason, the “sharpness in the color” can be reduced which means a reduction in the bandwidth of the color information. It is also known that we cannot discern fine structures in a picture, e.g. thin lines, as well as coarse structures. This is precisely the main point of attack for data reduction methods.
like JPEG and MPEG. However, irrelevance reduction is always associated with an irretrievable loss of information which is why the only method considered in data processing is redundancy reduction as, e.g. in the well known ZIP files.

**Data reduction**

- **Redundancy reduction** (No loss in information)
- **Irrelevance reduction** (Loss in information)

In MPEG, the following steps are carried out in order to achieve a data reduction factor of up to 130:

- 8 bits resolution instead of 10 bits (irrelevance reduction)
- Omitting the horizontal and vertical blanking interval (redundancy reduction)
- Reducing the color resolution also in the vertical direction (4:2:0) (irrelevance reduction)
- Differential pulse code modulation (DPCM) of moving pictures (redundancy reduction)
- Discrete cosine transform (DCT) followed by quantization (irrelevance reduction)
- Zig-zag scanning with variable-length coding (redundancy reduction)
- Huffman coding (redundancy reduction).

Let us begin again with the analog video signal from a television camera. The red, green and blue (RGB) output signals are matrixed to become Y, C_B and C_R signals. After that, the bandwidth of these signals is limited and they are analog/digital converted. According to ITU-BT.R601, this provides a data signal with a data rate of 270 Mbit/s. The color resolution is reduced in comparison with the brightness resolution, making the number of brightness samples twice that of the C_B and C_R values and resulting in a 4:2:2 signal; there is thus already an irrelevance reduction in ITU-BT.R601. It is this 270 Mbit/s signal which must be compressed to about 2...6(15) Mbit/s in the MPEG video coding process.