1.1 Introduction

For many years now, the compression of still images has been a very active area of research [2]. Image compression is essential for applications such as TV transmission, video conferencing, facsimile transmission of printed material, graphics images, or transmission of remote sensing images obtained from satellites and reconnaissance aircraft. Another area for the application of efficient coding is where pictures are stored in a database, such as archiving medical images, multispectral images, finger prints, and drawings. As image needs a huge amount of data to store it, there is pressing need to limit image data volume for fast transport along communication links.

A fundamental goal of compression is to code the image data into a compact form to reduce the bit rate for transmission or data storage while maintaining an acceptable fidelity or image quality [8].

The importance of image compression is emphasized by the huge amount of data in images, a typical gray-scale image of 512×512 pixels, each represented by 8 bits, contain 256 kilobytes of data. With the color information, the number of bytes is tripled. If we talk about video images of 25 frames per second, even a one second of color film requires approximately 19 megabytes of memory, therefore the capacity of a typical hard disk of a PC-machine (540 MB) can store only about 30 seconds of film. Clearly, image compression is needed [7].

1.2Classification of compression methods

Image compression methods can be divided into two major families of compression techniques when considering the possibility of reconstructing exactly the original source, information preserving compressions permit error-free data reconstruction (lossless compression), while compression methods with loss of information do not preserve the information completely (lossy compression).An image compression method is normally designed for a specific type of image [3, 6, 10].

1.2.1 Lossless compression

A lossless scheme encodes and decodes the image perfectly, and the resulting image is bit-by-bit identical to the original image. There is no degradation in the process no data is lost [4, 7]. Usually we need to apply lossless data compression techniques on text data or scientific. A small error in the reconstructed text can have a completely different meaning. We do not expect the sentence “You should not delete this file” in a text to change to “You should now delete this file”. Medical imaging is an example of such an application where compressing digital radiographs with a lossy scheme could be a disaster if it has to make any compromises with the diagnostic accuracy. Similar observations are true for astronomical images for galaxies and stars [5].We can distinguish :

a) **Predictive methods:** these exploit the spatial redundancy that exists between the current value and the preceding or following values;
b) **Entropy (statistical) encoders:** these try to get as close as possible to the entropy of the sequence of values to be encoded, by assigning the smallest number of bits possible to the most probable values

and vice versa. Huffman coding and arithmetic coding are the main entropy coders used in the field of image compression.

1.2.2 Lossy compression

Lossy compression schemes allow redundant and nonessential information to be lost.
lossy compression produces an image that is close to the original but not exactly identical. lossy techniques take advantage of the fact that the human eye has a hard time distinguishing between nearly identical colors. The goal is to keep the losses indistinguishable. The reason for using lossy compression is that it generally gives significantly greater compression than lossless methods do because compression ratios are usually very low (approximately 10 or less) for lossless coding [4, 7].The lossy compression techniques are usually applicable to data where high fidelity of reconstructed data is not required for perception by the human perceptual system. Examples of such types of data are image, video, graphics [5].
We can distinguish:

a) **Methods based on scalar quantization (SQ):** they consist in processing the values (of pixels or coefficients) individually. Different types of Scalar Quantification exist, and are still used, for example for the JPEG2OOO standard;
b) **Methods based on Vector Quantization (VQ):** they simultaneously process a grouping of pixels or coefficients, called vectors. In theory, they allow hearth always to be more efficient than the methods based on Scalar Quantification.

1.3 Bit rate

The most obvious measure of the compression efficiency is the bit rate. Bit rate is generally measured in bits per second or bits per sample. The number of bits per second is simply the product of the sampling rate (measured in Hertz or pixels per second) and the average number of bits per sample used in the quantizing system of the coder [16].

1.4 Compression ratio CR

The ratio of the total number of bits needed to code the original image to the total number of bits needed to code the compression image.

$$compressionratio = \frac{size\ of the\ original\ file}{size\ of\ the\ compression\ file} = \frac{B_o}{B_c} \qquad (1)$$

Where B_o is the total number of bits needed to code the original image data and B_c is the total number of bits needed to code the compressed data. A higher numerical CR value indicates that fewer bits were needed to code the compressed image.

1.5 The main evaluation criteria for any compression method are:

- The quality of image reconstruction.
- The compression ratio (Te) and the signal to noise ratio (SNR).
- The speed of the encoder and decoder (encoding / decoding).