Journal of The Gujarat Research Society

*ISSN: 0374-8588*
*Volume 21 Issue 13, December 2019*

# A Comprehensive Survey on Lossy Image Compression Methods

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***ABSTRACT: The collection and transmission of digital pictures is a huge problem in the current scenario. Image compression is an arena of research where, by eliminating certain redundancies, the size of the digital images is reduced at an optimum level. There are two forms, lossless and lossy, of image compression techniques. Some of the lossy image compression techniques are discussed by the authors in this paper and include a comparative study of these grayscale image compression techniques.Although lossy compression returns a very high bit rate reduction, as low-quality images are not preferred from the point of view of application, lossless compression is ideal for large application areas such as medical, deep sensing, and defence and research purposes. This paper provides a detailed review on various lossy picture compression methods that have been investigated over last decade in order to reduce the size of the images for efficient image transmission over communication media.***

***KEYWORDS:Communication Channel,Correlation Coefficient,Image Transmission, Lossy Compression.***

## INTRODUCTION

In this era of rising technology, the use of digital images is increasing tremendously. With the aid of pixels, a digital image is depicted, which can be considered as little dots on the screen. Each digital image pixel indicates the colour at a single point in the image (for coloured images) or the level of grey (for monochrome images). A digital image is a rectangular pixel array that is often referred to as a bitmap[1].The demand for data storage space and data-transmission bandwidth continues to outperform the capacities of available technologies, despite rapid advancements in mass storage density, processor speeds, and digital communication device performance[2].

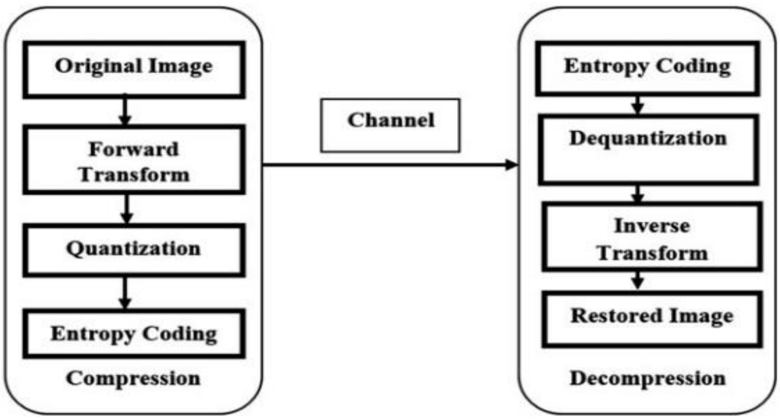


**Figure 1: Illustrates the flow diagram of the lossy image compression**

Journal of The Gujarat Research Society
ISSN: 0374-8588
Volume 21 Issue 13, December 2019

The Figure 1 shows the flow diagram of the lost image compression. The correlation analysis of the pictures can be done by using the following equations.

$$E(x) = \frac{1}{N}\sum_{i=1}^{N} x_i$$

$$D(x) = \frac{1}{N}\sum_{i=1}^{N} (x_i - E(x))^2$$

$$cov\ (x, y) = \frac{1}{N}\sum_{i=1}^{N} (x_i - E(x))\ (y_i - E(y))$$

$$r_{xy} = \frac{cov\ (x, y)}{\sqrt{D(x)}\sqrt{D(y)}}$$

Herein the $\sqrt{D(x)}\ \neq 0, \sqrt{D(y)} \neq 0$

The critical parameter used to calculate the absolute difference between the encrypted image E and the original source image P is MAE. Let us consider the width as well as the height of the source image, respectively, for the W and the H. The MAE expression is given below.

$$MAE = \frac{1}{W \times H}\sum_{i=1}^{H}\sum_{j=1}^{W} |p(i, j) - E(i, j)|$$

$$r_{x,y} = \frac{C(x, y)}{\sqrt{D(x)}.\sqrt{D(y)}}$$

Where $C(x, y), D(x)$ and $D(y)$can be evaluated by using the following equations.

$$C(x, y) = \frac{\sum_{i=1}^{K}(x_i - E(x))(y_i - E(y))}{K}$$

$$D(x) = \frac{1}{K}\sum_{i=1}^{K} (x_i - E(x))^2$$

$$D(y) = \frac{1}{K}\sum_{i=1}^{K} (y_i - E(y))^2$$

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## LITERATURE REVIEW

Manjari et al. conducted a survey on the topic of various image compression techniques: lossy and lossless.Picture compression is a data compression implementation that encodes certain bits of the real image. The goal of image compression is to reduce the redundancy and irrelevance of image data that is capable of recording or sending data in an efficient manner. The compression of the picture thus reduces the transmission time on the network and increases the speed of transmission. In the Lossless image compression process, no data is lost when compressing. Various methods for image compression are used to overcome these types of problems[3].

## DISCUSSION

If the reconstructed image is not exactly the same as the original image after compression, then the compression is known as lossy compression. Some pieces of information are still lost in lossy compression. Compared to lossless compression techniques, the amount of compression in lossy compression techniques is higher, but the quality of the restored image in lossless compression is strong.Table 1 illustrates the comparison of various image compression techniques.

**Table 1: Illustrates the comparison of various image compression techniques.**

| S. NO. | Algorithm | Compression Ratio | PSNR | Comments |
|---|---|---|---|---|
| **1** | Wavelet | >=32 | 137.788 | Higher Compression Ratio |
| **2** | DCT | 29 | 23.40 | Lower Picture Quality |
| **3** | VQ | <30 | 28.23 | Not appropriate for the low bit rate compression |
| **4** | Fractal | >=15 | 28.05 | Can be utilized for the lower bit rate compression |

## CONCLUSION

The study concludes that Wavelet-based compression methods have a high compression ratio and are highly recommended for lower bit rates. The commonly used JPEG norm is supported by Discrete Cosine Transform based approaches and can be used for better compression with an adaptive quantization table. An easy approach, but not ideal for low bit rate compression, is the Vector Quantization approach. If used with its resolution-free encoding, fractal approaches can be used for low bit rate compression.

ISSN: 0374-8588
Volume 21 Issue 13, December 2019

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