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Lossless Image Compression: A Review Paper

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ABSTRACT: ***In industrial, academic, defence and medical fields, image compression is one of the main and important applications. Larger image files cannot be easily and securely processed or stored. Therefore, for real-world applications, compressing images while preserving the highest possible quality is very critical.For image compression, lossy compression is widely popular and used in commercial applications. In order to perform successful image-related work, the quality needs to be high in many circumstances despite having a comparatively low file size. In this analysis, lossless compression algorithms are therefore used to compare the lossless algorithms and to check which algorithm makes the compression maintain a decent compression ratio of consistency. In this paper, various lossless image compression techniques are discussed in order to secure and maintain the data privacy during the image transmission over the communication channels.***

KEYWORDS:Communication Channel,Correlation Coefficient,Image Transmission, Lossless Compression.

INTRODUCTION

Image compression is a technique that is commonly used during image storage and processing to minimise the size of the image. With growing image quality and scale, compression has become critical in everyday life. With the increased use of cloud storage, compression plays an essential role in the online storage of a large number of images.When the amount of data required to display an image is reduced, and the space to store it is reduced, and the efficiency of image transfer increases, image compression is efficient.Using two-dimensional Cartesian coordinates, an image is digitally represented as I (m, n). The indices m, n are used to represent the image rows and columns, and the coordinate (m, n) represents the pixel from the top left corner of the image at the position where the representation begins. In abstract spaces dependent on the application, images may also be denoted. You may also use the coordinates to represent a space of three or more dimensions[1].

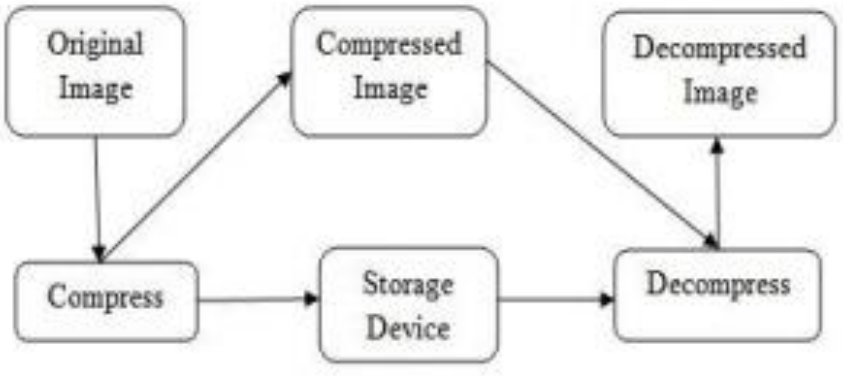

Figure 1: Illustrates the flow diagram of the image compression

The Figure 1 shows the flow diagram of the image compression. 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.

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

Lossless image compression in the field of multimedia communication is an important activity. Traditional image codecs, such as the Site, JPEG2000, and FLIF, generally support lossless mode. The ability at this stage has recently begun to be seen by deep learning-based approaches. For lossy image compression, Hyperprior is an efficient technique proposed. This article generalises the hyperprior from lossy model to lossless compression and recommends an L2-norm term to speed up the training procedure in the loss function. In addition, this paper also analysed various parameterized models for latent codes and proposed using Gaussian mixture probabilities to achieve adaptive and versatile background models. Experimental results confirm that our technique can outperform established lossless compression based on deep learning, and outperform JPEG2000 and Web for JPG photos.The correlation coefficient is another essential constraint to ensure that how much efficient is the encryption algorithm.

As a result of technological advances, the bandwidth of communication networks has continuously increased. The launch of new networks and the extension of existing ones, however, have resulted in even higher bandwidth demand. This explains the many efforts in the field of data compression currently being invested. The main objective of these works is to improve information source coding techniques such as voice, image and video to decrease the number of bits needed to represent a source without significantly degrading its content[2].

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

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

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

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

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

LITERATURE REVIEW

Pareek et al. conducted a research on image encryption using chaotic logistic map. In recent years, chaos-based cryptographic algorithms have proposed many new and efficient ways of creating secure image encryption techniques. In this interaction, we propose a new approach to image encryption, based on chaotic logistic maps, to meet the requirements of secure image transfer. [3].Dang et al. conducted another research on image encryption for secure internet multimedia applications. In recent years, Internet multimedia applications have become very popular. However, when in storage and during network transmission, sensitive multimedia content such as digital images is vulnerable to unauthorised access. For streaming digital images, elevated network bandwidth for transmission is also needed. Therefore, for efficient image transmission over the internet, both security and bandwidth issues must be considered [4].

DISCUSSION AND CONCLUSION

Lossless compression does not normally substantially decrease the image size, but the image quality is maintained to the highest degree possible. For analysis and image evaluation applications, this method of compression is very much useful. The primary aim of compression is to make the image with the smallest bits possible and to increase the transmission rate, reducing the requirements for storage.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. Lossless compression is applied to a wide range of files, such as images, PDF, text documents, etc. They do not apply all lossless compression algorithms to images. This research therefore focuses on applying various lossless compression algorithms to images and comparing the results for the best quality and compression ratio obtained.

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