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## Research Article

### IMAGE COMPRESSION RUN LENGTH ENCODING SCHEMA ON RGB VALUES

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#### ABSTRACT

Due to rapid growth of digital media and the subsequent need for reduced storage and to transmit the image in an effective manner Image compression is needed. Image compression is the application of Data compression on digital images. Data compression is the technique to reduce the redundancies in data representation in order to decrease data storage requirements and reduce communication costs. Reducing the storage requirement is equivalent to increasing the capacity of the storage medium and hence communication bandwidth. Thus the development of efficient compression techniques will continue to be a design challenge for future communication systems and advanced multimedia applications. Fast and efficient coding algorithms are needed for effective storage and transmission, due to the popularity of telemedicine and the use of digital medical images. Run-length encoding is a popular compression scheme which is used extensively to compress the attribute values in column stores. The basic characteristics of image like transmission rate, bandwidth, redundancy, bulk capacity and co-relation among pixels makes basic compression algorithms mandatory. The research exploration in the field of image compression is huge. Run length coding is the standard coding technique for compressing the images, especially when images are compressed by block transformation.

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#### INTRODUCTION

Images may be worth a thousand words, but they generally occupy much more space in a hard disk, or bandwidth in a transmission system, than their proverbial counterpart. So, in the broad field of signal processing, a very high-activity area is the research for efficient signal representations. Efficiency, in this context, generally means to have a representation from which we can recover some approximation of the original signal, but which doesn't occupy a lot of space [13].

The rapid growth of multimedia and networking technologies gives rise to numerous multimedia applications such as mobile, desktop, internet and video surveillance, satellite communication and webcams, consequently multimedia transmission has become a challenge issue. Due to the unique characteristics of real time image data such as large data size, high bandwidth and stringent real time requirements [2]. The researchers have been forcing to use the proper image compression algorithm to enhance the overall performance (compression ratio, saving percentage, compression time, entropy and code efficiency) of the system should be selected carefully for real time image transmission. Image compression

is specialized discipline of electronic engineering has been gaining considerable attention on account of its applicability to various fields. Image compression is art of representing information in compact form rather than it's original. Using the image data compression method, the size of particular image file can be reduced. Compressed image transmission economizes bandwidth, computation and transmission--power, cost, and latency and therefore ensures cost-effectiveness during transmission [17].

Compression refers to reducing the quantity of data used to represent a file, image or video content without excessively reducing the quality of the original data. Image compression is the application of data compression on digital images. The main purpose of image compression is to reduce the redundancy and irrelevancy present in the image, so that it can be stored and transferred efficiently. The compressed image is represented by less number of bits compared to original. Hence, the required storage size will be reduced, consequently maximum images can be stored and it can transferred in faster way to save the time, transmission bandwidth. For this purpose many compression techniques i.e. scalar/vector quantization, differential encoding, predictive image coding, transform

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coding have been introduced. Among all these, transform coding is most efficient especially at low bit rate. Depending on the compression techniques the image can be reconstructed with and without perceptual loss. In lossless compression, the reconstructed image after compression is numerically identical to the original image [19].

As the image is compressed more and more, less amount of storage is required in portable real time systems which in turn make it economical as well as rugged. The basic idea behind any image compression is to consider a digital image as an array of numbers or matrix. Every image consists of a number of tiny squares called pixels i.e picture elements. The matrix corresponding to a digital image designates the pixels. In a  $256 \times 256$  gray image, image can be stored as  $256 \times 256$  pixels where each pixel representing a whole number from 0(white) to 255 (black). A jpeg compression technique explores  $8 \times 8$  blocks from original image [20].

Data compression is a process through which an input data stream is converted into another data stream that is of smaller size [1]. It is a process to cut down the redundancies in data representation so as to decrease data storage requirements and hence communication costs. Reducing the storage necessity is equivalent to increasing the capacity of the storage medium and hence communication bandwidth. Data can be characters in a text file, numbers that are samples of speech or image waveforms, or sequence of numbers that are generated by other processes [21]. Image processing and compression is currently a prominent context for computer science field. Basically, image compression is the processes of images that encode the images into small code without any loss of information. In other words, the basic motivation of image compression is using short quantity of information to represents the original image without loss of information. And reduce the size of image for decrease the transmission time [22].

Compression [3] techniques are being rapidly developed for compress large data files such as images. With the increasing growth of technology a huge amount of image data must be handled to be stored in a proper way using efficient techniques usually succeed in compressing images. There are some algorithms that perform this compression in different ways; some are lossless and lossy. Lossless keep the same information as the original image and in lossy some information loss when compressing the image. Some of these compression techniques are designed for the specific kinds of images, so they will not be so good for other kinds of images [23]. Compression is an art of representing information in a compact form rather than its original form. Because of requiring large capacity of storing and transmitting of video files are not easy and it also need high bandwidth [4]. In order to overcome this problem various compression techniques have been used to minimize storage space and reducing the amount of required bandwidth to transmit video files.

The bandwidth of channel and memory of devices are limited that need to encode data contain fewer bits than original data to allow small storage and increase the speed of transmission. The process of reducing bits from original message is known as Encoding or Compression. In other words, we have some data and we decrease its size that requires few bits to store and transmit [4].

At receiver side exactly reverse of encoding is performed that is known as Decoding or Decompression. Compression can be classified as either lossy or lossless. Lossless compression techniques reconstruct the original data from compressed file without loss of any data that is also known as reversible compression because original data are reconstructed by decompression process without any loss. Lossless techniques are used mainly in medical image and for executable files. Lossy compression techniques generate data with some discarded information so also known as irreversible. Lossy compression techniques are used in multimedia image/ video to achieve more compression [5] [24]. We can use Data compression algorithm for Image compression but the result obtain from that process is less than optimal. Different types of images are used in bio medical, remote sensing and in technique of video processing which require compression for transmission and storage. Compression could be achieved by removing some redundant or extra bits from the image[25].

This Image compression is the process of encoding image data into lesser number of symbols such that after decoding, the original image information can be retrieved. The compression procedure facilitates optimized space utilization for storage purposes and also enhances network utilization by using lesser bandwidth [6, 7] [26]. Data compression implies sending or storing a smaller number of bits. Data compression is a process that reduces the amount of data in order to reduce data transmitted and decreases transfer time because the size of the data is reduced [8]. Data compression is commonly used in modern database systems. Compression can be utilized for different reasons including:

1. Reducing storage/archival costs, which is particularly important for large data warehouses.
2. Improving query workload performance by reducing the I/O costs[9].[27]

### Image Compression

Image compression is one of the applications of Data compression on digital images. The objective of image compression is to reduce redundancy of the image data in order to be able to store or transmit data in an efficient form. Image compression techniques are lossy and lossless. [14]

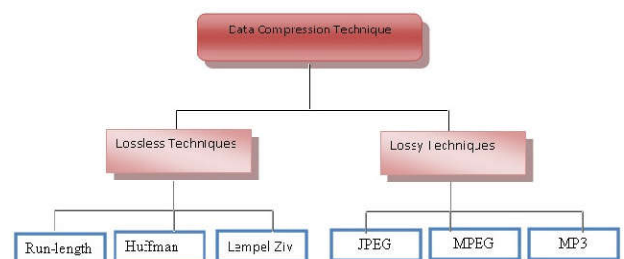


Figure 1 Data Compression Method [14]

Lossless compression is preferred for artificial images like technical drawings, icons and also be preferred for high value content, such as medical imagery or image scans made for archival purposes. Lossy methods are especially suitable for natural images such as photos in applications where minor loss of fidelity is acceptable to achieve a substantial reduction in bit rate. The lossy compression that produces unnoticeable differences can be called visually lossless. Run-length

encoding, Huffman encoding and Lempel Ziv encoding are the methods for lossless image compression [14].

**Compression:** Compression is a method that reduces the size of files. The aim of compression is to reduce the number of bits that are not required to represent data and to decrease the transmission time. Achieve compression by encoding data and the data is decompressed to its original form by decoding. A common compressed file extension is .sit, .tar, .zip; which indicates different types of software used to compress files [28]. RLE compresses sequences containing subsequent repetitions of the same character. By compressing a particular sequence, its code is obtained. The idea is to replace repetitions of a given character (like aaaaa) with a counter saying how many repetitions there are. Namely, it is represented by a triple containing a repetition mark, the repeating character and an integer representing the number of repetitions. [29]

**Decompression:** The compressed file is firstly decompressed and then used. There are many software's used to decompress and it depends upon which type of file is compressed. For example WinZip software is used to decompress .zip file [10][28].

**Need of compression:** An Uncompressed image occupies large amount of memory in storage media, and it takes more time to transfer from one device to another. So if we want to transfer or store digital image then we has to compress it first for fast speed of transfer and to store in a less space. Hence compression is very essential for modern multimedia application[25]. The needs for image compression becomes apparent when number of bits per image are computed resulting from typical sampling rates and quantization methods[20].

**Run Length Encoding**

Run-length encoding (RLE) is a very simple form of data compression in which runs of data (that is, sequences in which the same data value occurs in many consecutive data elements) are stored as a single data value and count, rather than as the original run. This is most useful on data that contains many such runs: for example, simple graphic images such as icons, line drawings, and animations. It is not useful with files that don't have many runs as it could greatly increase the file size. The main philosophy behind selecting approximate matching technique along with run length encoding technique is based on the intrinsic property of most images, that they have similar patterns in a localized area of image, more specifically the adjacent pixels row differ in very less number of pixels. This property of image is exploited to design a very effective image compression technique. Testing on a wide variety of images has provided satisfactory results. The technique used in this compression methodology is described in this section [13].

Run-length encoding (RLE) is a very simple form of image compression in which runs of data are stored as a single data value and count, rather than as the original run. It is used for sequential [11] data and it is helpful for repetitive data. In this technique replaces sequences of identical symbol (pixel), called runs. The Run length code for a grayscale image is represented by a sequence {Xi, Yi} where Xi is the intensity of pixel and Yi refers to the number of consecutive pixels with the intensity Xi as shown in the figure. This is most useful on data that

contains many such runs for example, simple graphic images such as icons, line drawings, and animations. It is not useful with files that don't have many runs as it could greatly increase the file size. Runlength encoding performs lossless image compression [12]. Run-length encoding is used in fax coding. Run-length encoding is particularly effective when compressing binary images. Because there are two possible intensities (black and white), adjacent pixels are more likely to be identical. It can be used to compress data made of any combination of two symbols represented as 0s and 1s. The general idea behind this method is to replace consecutive repeating occurrences of a symbol by one occurrence of the symbol followed by the number of occurrences[14]. Run length coding is a simple method used for compressing sequential data. It achieves compression by eliminating redundancy and avoiding repetitive data [15].

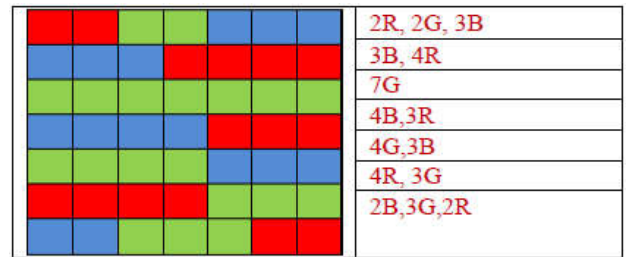
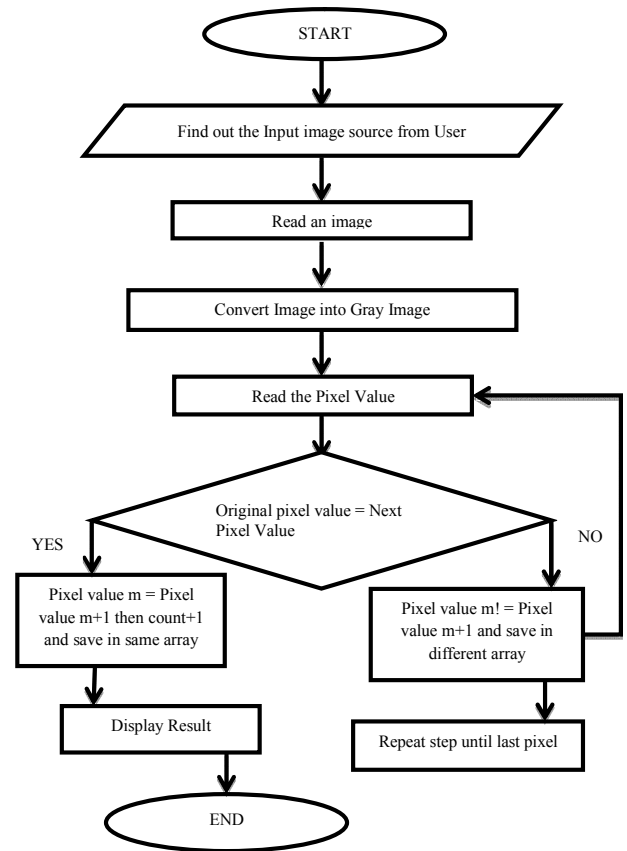


Figure 2 RGB block calculation in Run length Encoding[22]

**RESULT AND DISCUSSION**



The basic philosophy behindhand the selecting Run Length Encoding technique, that is loss less technique and based on intrinsic property of images and they have same patterns in

nearest pixel area of image. Specifically the intensity of two pixels is very much same in nearest area. This property of image is exploited to design a very effective image compression technique. The technique used in this compression methodology and run length coding are described in this section. Here consider run length compression for given image. The bellow image has RGB color combination. Image read from first pixel of image and starts compression. The basic steps of proposed algorithm of Run Length Encoding are mention in above algorithm.







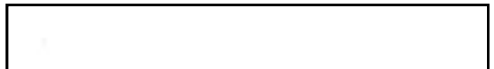
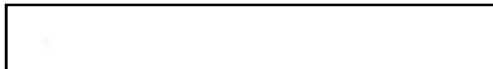
memory space then its run length encoding image compression techniques. Following table 2 will describe the overview of images.

Another image3.jpg, image4.jpg and image5.jpg are color image which used green, red and blue color frame and then also they reduce the size of that image which describe in following table 3.

**Table 1** Result optimize by Run length Encoding










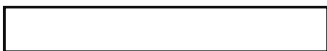
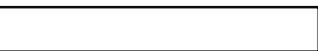
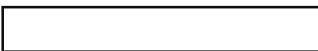
Image	Row	Cols	RGB bits	Total size before compression in bits	Total size before compression in bytes	Total Size after compression in bytes	Compression Calculation	Compression Percentage (%)
image1.jpg	222	227	64	222*227*64=3225216	403152	7664	7664/403152*100	1.90%
image2.jpg	279	180	64	279*180*64=3214080	401760	7664	7664/401760*100	1.91%
image3.jpg	1440	900	64	1440*900*64=82944000	10368000	19256	19256/10368000*100	0.19%
image4.jpg	1280	1024	64	1280*1024*64=83886080	10485760	563136	563136/10485760*100	5.37%
image5.jpg	1300	450	64	1300*450*64=37440000	4680000	563136	563136/4680000*100	12.03%

**Table 2** Display Black and White Image Description of Run Length Encoding

Image	image1.jpg	image2.jpg
Original Image		
Gray Image Type		
Before Technique		
After Technique		

Above table 1 is describe the detail description of original and run length encoded system. image1.jpg and image2.jpg are black and white type of images which are containing more

**Table 3** Display Color Image Description of Run Length Encoding

Image	image3.jpg	image4.jpg	image5.jpg
Original Image			
Gray Image Type			
Before Technique			
After Technique			

## CONCLUSION AND FUTURE SCOPE

The algorithm proposed here is for lossless image compression as it is evident from the algorithm, that the exact image data (pixel values) are extracted from the compressed data stream without any loss. Moreover the techniques such as approximate matching and run length encoding technique are intrinsically lossless. This compression technique proves to be highly effective for images with large similar locality of pixel layout. Comparing the performance of compression technique is difficult unless identical data sets and performance measures are used. Studied in different papers related to lossy and lossless compression techniques are used for better compression ratio for different types of data inputs. There are different types of symbol coding techniques that can be used for Data compression.

These research papers provide a working of lossless image compression technique (RLE) of image data. It is the explicit form of algorithm that extract the pixel value from image data. Compression is very much important and useful part of image processing.

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