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A TWOFOLD COMPRESSION- AN IMAGE PROCESSING TECHNIQUE

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ABSTRACT

Images have a vital influence in many aspects of modern life. You can't have a lot of storage space for a certain photo in everyday life. Image compression is a method of reducing the amount of data required to represent an image. It is one of the most helpful and commercially effective digital image processing methods. In terms of storage, you may efficiently enhance the capacity of your storage device by employing a method that compresses the data's body during transfer to the storage device and decompresses it after acquisition. As a result, picture compression is necessary. This is the process of compressing or transforming an image file such that it takes up less space than the original. The primary goal of image compression is to lower the image's size. With our compression technique, you may minimize the size of image files without compromising their quality. Two image compression methods are used in our method.

Keywords: Double Compression, Run-length encoding, LZW Compression, Image Processing, Image Compression

1. INTRODUCTION

In the realm of digital image processing, image compression is one of the most helpful and effective methods. It's the process of compressing digital images via data compression. A massive quantity of data is saved, processed, and transported every day. As a result, it will have storage and communication issues. Compression addresses this by minimizing the amount of data necessary to describe an image or by reducing the redundancy of visual data to efficiently store or transmit data. The most important aim is to limit the amount of storage as much as feasible. An encoder compresses a picture and produces a compressed image as a result. Compression is almost imperceptible to the user. The actual photo can also be reconstructed via decompression. Two widely used image compression coding methods, Run Length and LZW are introduced in this paper, and double compression is achieved using these approaches.

2. METHODOLOGY

Image compression is a data compression method used to compress digital images. This approach is used to minimize the size and amount of storage and transmission space required for images.

When compared to other data compression methods, image compression produces an aesthetically appealing image that keeps its statistical properties. The main issue is to simply minimize the number of bytes in the image without compromising the image's quality. You can store more photos in a given space by shrinking the image size. It also decreases the time it takes to send and receive pictures from web pages over the Internet. As a consequence, the photos are better, requiring less storage space and loading time, and enhancing page rank. Because compressed photos demand less storage space, the overall time required by our website will be significantly reduced.

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Image compression reduces image data's irrelevance and redundancy so that it may be stored or transported more effectively. The goal is to reduce the number of bits required to represent the image.

2.1 LOSSLESS AND LOSSY COMPRESSION

Lossy or lossless image compression is possible. For archiving purposes, lossless compression is desirable, as it is for medical imaging, technical drawings, clip art, and comics. Compression artifacts are created by lossy compression algorithms, especially when utilized at low bit rates. Lossy approaches are best for natural pictures like photographs, where a slight (often undetectable) loss of authenticity is tolerated in exchange for a significant drop in bit rate. Visually lossless compression is lossy compression that causes unnoticeable changes.

2.2 RUN LENGTH

Run length is the simplest fundamental compression approach. Run Length is a lossless algorithm that discovers runs of the same value in bits, bytes, or pixels and encodes the length and value of the run (i.e. sequences in which the same data value occurs as a single data value in many successive data elements) instead of counting the original run. This strategy works well with data that has several runs. Each recurring instance of a symbol is replaced with one occurrence of the symbol followed by the number of occurrences. Simple visual graphics, such as icons and line drawings, are examples.

Example:

- CCCCCC can be represented as C6 in Run Length algorithm (i.e) C represents a character and 6 represents the number of times the character appears in the string.
- AAAAEEENNH can be represented in Run Length algorithm as A4E3N2H1 (i.e) there are four A, three E, two N and one H in a string.

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2.3 LZW COMPRESSION

Abraham Lempel, Jacob Ziv, and Terry Welch devised the L ZW compression algorithm, which compresses a file into a smaller file using a table-based lookup technique. The GIF image format used by Web sites and the TIFF image format are two frequently used file formats that employ LZV compression. Text files can also be compressed using LZW compression.

2.3.1 STEPS TO PERFORM LZW CODING

From top to bottom, left to right, the image is encoded by processing its pixels. Each successive intensity value is multiplied by a variable called the 'currently recognized sequence.' The dictionary is examined for each concatenated sequence. If one is discovered, it is replaced with the newly concatenated and recognized sequence. There are no output codes or dictionary modifications. If the concatenated sequence cannot be found, the next encoded value should be set to the currently recognized sequence's address. The dictionary should be updated with the unrecognized concatenated sequence. As a result, the current pixel value is used to establish the presently recognized sequence.

Consider the 4* 4, 8 bit image

39	39	126	126
39	39	126	126
39	39	126	126
39	39	126	126

The encoded output is

39 39 126 126 256 258 260 259 257 126

Like the encoder, the decoder also starts with the initial dictionary entries of 0 255 only.

The decoded output is

39	39	126	126
39	39	126	126
39	39	126	126
39	39	126	126

3. MODELING AND ANALYSIS

A common image processing strategy is to apply a specific compression algorithm to a image and then decompress it. Should we, however, compress a picture twice? Yes, employing two separate compression algorithms, a picture may be compressed twice. When compared to normal compression, the major goal of double compression is to lower the amount of data.

3.1 DOUBLE COMPRESSION

We utilize two approaches to compress the image twice. To double the image compression, runtime encoding and LZW compression were utilized. The following are the steps involved in double compression: The image should first be encoded by employing the run-length encoding method to process the pixel value, which results in a decoded output as a text file. LZW compression was applied to the text file. From the encoded output, LZW Compression will now provide decoded output. The result has been decrypted before being stored as a text file. Finally, we use these two approaches to compress the image twice.

Figure 1: Original Image to be compressed.

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3.2 DOUBLE DECOMPRESSION

After double compressing the image, we decompress the decoded output to obtain the resultant image similar to the original image. To achieve double decompression, we reverse the process of double compression. LZW compression encodes the decoded output from the compression. To produce the resultant image the output encoded using LZW compression is again processed using the Run-length encoding approach. Because we merged the two procedures, the final image will be of superior quality. The specified input picture and the produced output image are identical. As a result, the image is compressed effectively using the double compression approach.

Figure 2: Resultant Image.

4. RESULTS AND DISCUSSION

The goal and mechanism of compression have been explored in this study. We looked at run-length compression and LZW compression. We employed a new strategy that combined the Run-length method with LZW to achieve double compression. Other image compression algorithms can also be used to decompress. Television broadcasting, remote sensing via satellite, military communication systems through radars, teleconferencing systems, communications systems built through computers, facsimile transmission of medical images in computer tomography magnetic resonance imaging, capturing and transmitting satellite images, geological surveys, and weather reporting applications are all areas where image compression is used. Image compression will be employed in all sectors in the coming years. After encoding and decoding a picture, we will acquire a clear-quality image in the future.

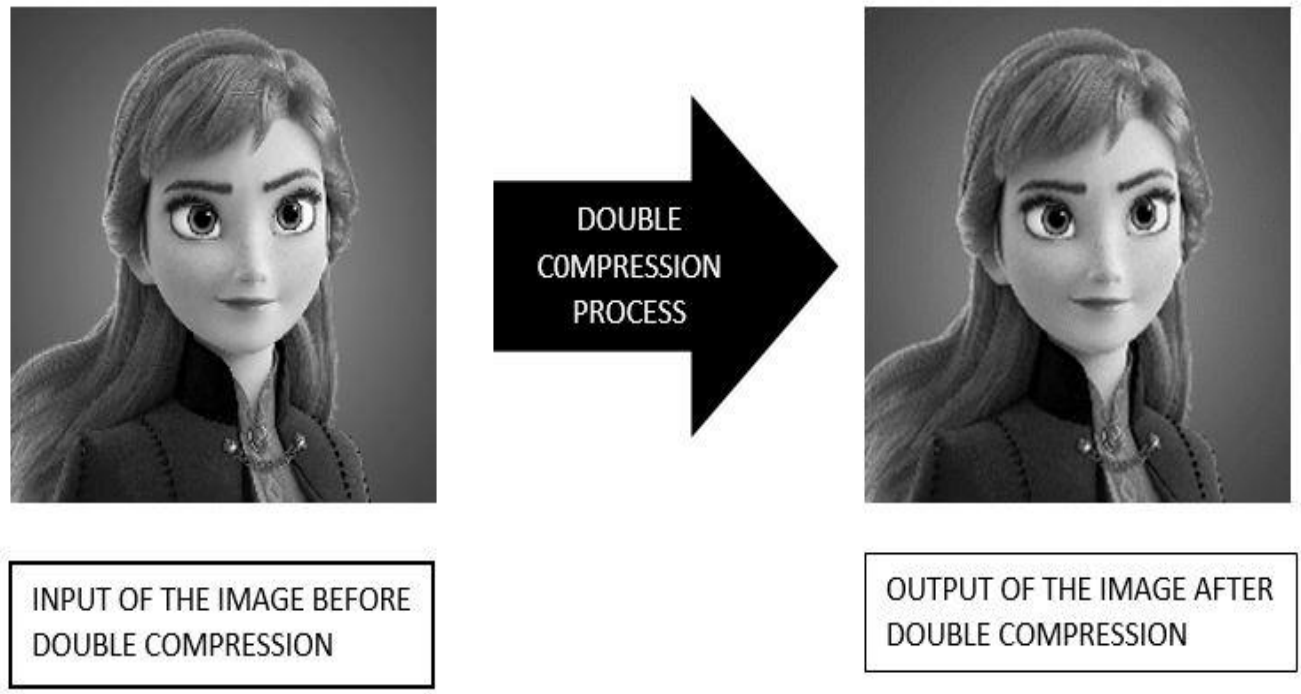

Figure 3: Entire process of Double Compression

5. CONCLUSION

An image file format is a standard way to organize and store picture data in the context of digital imaging. It specifies how the data is organized and what form of compression is used (if any). An image container is comparable to a file format, except it may hold a variety of different forms of picture data. Image compression standards, on the other hand, provide processes for double compressing and double decompressing pictures, minimizing the amount of data required to describe an image. The general acceptance of image compression technology is based on these standards.

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