iJRASET
International Journal For Research in Applied Science and Engineering Technology



INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 5 **Issue:** X **Month of publication:** October 2017

DOI: http://doi.org/10.22214/ijraset.2017.10016

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International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor:6.887
Volume 5 Issue X, October 2017- Available at www.ijraset.com

Image Compression: Huffman and LZW Techniques

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Abstract: ***This paper describes the Huffman and LZW techniques of image compression. There are many techniques of image compression, but these two are important. The paper also differentiates the concepts of Huffman and LZW techniques. These two techniques are belongs to Lossless compression of image compression.***

I. INTRODUCTION

A picture is associate degree artifact that depicts or records perception, as an example a two-dimensional image, that includes a similar look to some subject sometimes a entity or an individual, therefore providing an outline of it. pictures is also two-dimensional, like a photograph, screen show, and similarly as a three-dimensional, like a sculpture or photograph. they will be captured by optical devices like cameras, mirrors, lenses, telescopes, microscopes, etc. and natural objects and phenomena, like the human eye or water surfaces. The subsequent area unit the categories of pictures: volatile image, mental and still image.

II. COMPRESSION

The target of compression is to cut back irrelevancy associate degreed redundancy of the image knowledge so as to be ready to store or transmit knowledge in an economical type. compression is also lossy or lossless. lossless compression is most well-liked for deposit functions and sometimes for medical imaging, technical drawings, clip art, or comics.b lossy compression ways, particularly once used at low bit rates, introduce compression artifacts. lossy ways area unit particularly appropriate for natural pictures like pictures in applications wherever minor (sometimes imperceptible) loss of fidelity is suitable to realize a considerable reduction in bit rate. The lossy compression that produces inaudible variations is also known as visually lossless.

A. Methods for lossless compression are

Run-length cryptography – used as default methodology in PCX and in concert of doable in BMP, TGA, TIFF
Huffman secret writing
Entropy cryptography
Adaptive wordbook algorithms like LZW – employed in GIF and bicker
Deflation – employed in PNG, MNG, and TIFF
Chain codes

III. ADVANTAGES OF COMPRESSION

The essential plan behind this methodology of compression is to treat a digital image as Associate in Nursing array of numbers i.e., a matrix. every image consists of a reasonably sizable amount of very little squares referred to as pixels (picture elements). The matrix similar to a digital image assigns an entire variety to every pel. as an example, within the case of a 256x256 pel grey scale image, the image is keep as a 256x256 matrix, with every component of the matrix being an entire variety starting from zero (for black) to 225 (for white). The JPEG compression technique divides a picture into 8x8 blocks and assigns a matrix to every block. One will use some algebra techniques to maximize compression of the image and maintain an appropriate level of detail. JPEG is one in every of the foremost unremarkably used file formats for storing and transferring pictures. looking on however the image was created, it should be overly giant in size. The larger the JPEG is that the tougher it'll be to transfer and share. Luckily with JPEG compression computer code the file are often created smaller and additional economical.

IV. HUFFMAN CRYPTOGRAPHY

In applied science and data theory, Huffman secret writing is Associate in Nursing entropy cryptography algorithmic program used for lossless information compression. The term refers to the utilization of a variable-length code table for cryptography a supply

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image (such as a personality during a file) wherever the variable-length code table has been derived during a specific means supported the calculable likelihood of prevalence for every doable worth of the supply image. Huffman secret writing uses a selected methodology for selecting the illustration for every image, leading to a prefix code (sometimes referred to as "prefix-free codes", that is, the bit string representing some specific image is rarely a prefix of the bit string representing the other symbol) that expresses the foremost common supply symbols mistreatment shorter strings of bits than area unit used for fewer common supply symbols.

A. Numerous Hufaman cryptography are

1) .n-ary Huffman secret writin

2) Accommodative Huffman secret writing.

3) 4. Huffman coding with unequal letter costs Applications of Huffman Encoding

Arithmetic coding can be viewed as a generalization of Huffman coding, in the sense that they produce the same output when every symbol has a probability of the form $1/2^k$; in particular it tends to offer significantly better compression for small alphabet sizes. Huffman coding nevertheless remains in wide use because of its simplicity and high speed. In Huffman Encoding, code words can only have an integer number of bits where code word of length k only optimally matches a symbol of probability $1/2^k$ and other probabilities are not represented as optimally. Huffman coding today is often used as a "back-end" to some other compression methods. DEFLATE (PKZIP's algorithm) and multimedia codecs such as JPEG and MP3 have a front-end model and quantization followed by Huffman coding (or variable-length prefix-free codes with a similar structure, although perhaps not necessarily designed by using Huffman's algorithm.

V. LZW CODING

Lempel–Ziv–Welch (LZW) is a lossless data compression algorithm. The algorithm is simple to implement, and has the potential for very high throughput in hardware implementations. It was the algorithm of the widely used Unix file compression utility compress, and is used in the GIF image format.

A. Encoding

A high level view of the encoding algorithm is

1) Initialize the dictionary to contain all strings of length one.

2) Find the longest string W in the dictionary that matches the current input.

3) Emit the dictionary index for W to output and remove W from the input.

4) Add W followed by the next symbol in the input to the dictionary.

5) Go to Step 2. A dictionary is initialized to contain the single-character strings corresponding to all the possible input characters (and nothing else except the clear and stop codes if they're being used). The algorithm works by scanning through the input string for successively longer substrings until it finds one that is not in the dictionary. When such a string is found, the index for the string without the last character (i.e., the longest substring that *is* in the dictionary) is retrieved from the dictionary and sent to output, and the new string (including the last character) is added to the dictionary with the next available code. The last input character is then used because the next start line to scan for substrings. during this manner, in turn longer strings square measure registered within the lexicon and created out there for subsequent encryption as single output values. The algorithmic program works best on information with continual patterns, that the initial elements of a message can see very little compression. because the message grows, however, the compression quantitative relation tends asymptotically to the utmost.

B. Decoding

corresponding string from the initialized lexicon. At identical time it obtains consequent worth from the input, and adds to the lexicon the concatenation of the string simply output and also the 1st character of the string obtained by secret writing consequent input worth, or the primary character of the string simply output if consequent worth can't be decoded (If consequent worth is unknown to the decoder, then it's simply been added , so its 1st character should be identical because the 1st character of the string simply output). The decoder then take to consequent input worth (which was already scan in because the "next value" within the previous pass) and repeats the method till there's no additional input, at that purpose the ultimate input worth is decoded with none additional additions to the lexicon.

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LZW compression became the primary wide used universal information compression methodology on computers. an oversized English document will usually be compressed via LZW to concerning 0.5 its original size.

LZW was utilized in the public-domain program compress, that became a additional or less customary utility in UNIX operating system systems circa 1986. it's since disappeared from several distributions, each as a result of it infringed the LZW patent and since gzip made higher compression ratios victimization the LZ77-based DEFLATE algorithmic program, however as of 2008 a minimum of FreeBSD includes each compress and restore as a section of the distribution. many different common compression utilities additionally used LZW, or closely connected ways.

LZW became terribly wide used once it became a part of the GIF image format in 1987. it's going to additionally (optionally) be utilized in words and PDF files. (Although LZW is accessible in Adobe athlete software system, athlete by default uses DEFLATE for many text and color-table-based image information in PDF files.)

VI. CONCLUSION

This paper presents numerous sorts of compression techniques. There square measure essentially 2 sorts of compression techniques. One is lossless Compression and different is lossy Compression Technique. scrutiny the performance of compression technique is troublesome unless identical information sets and performance measures square measure used. a number of these techniques square measure obtained sensible sure applications like security technologies.

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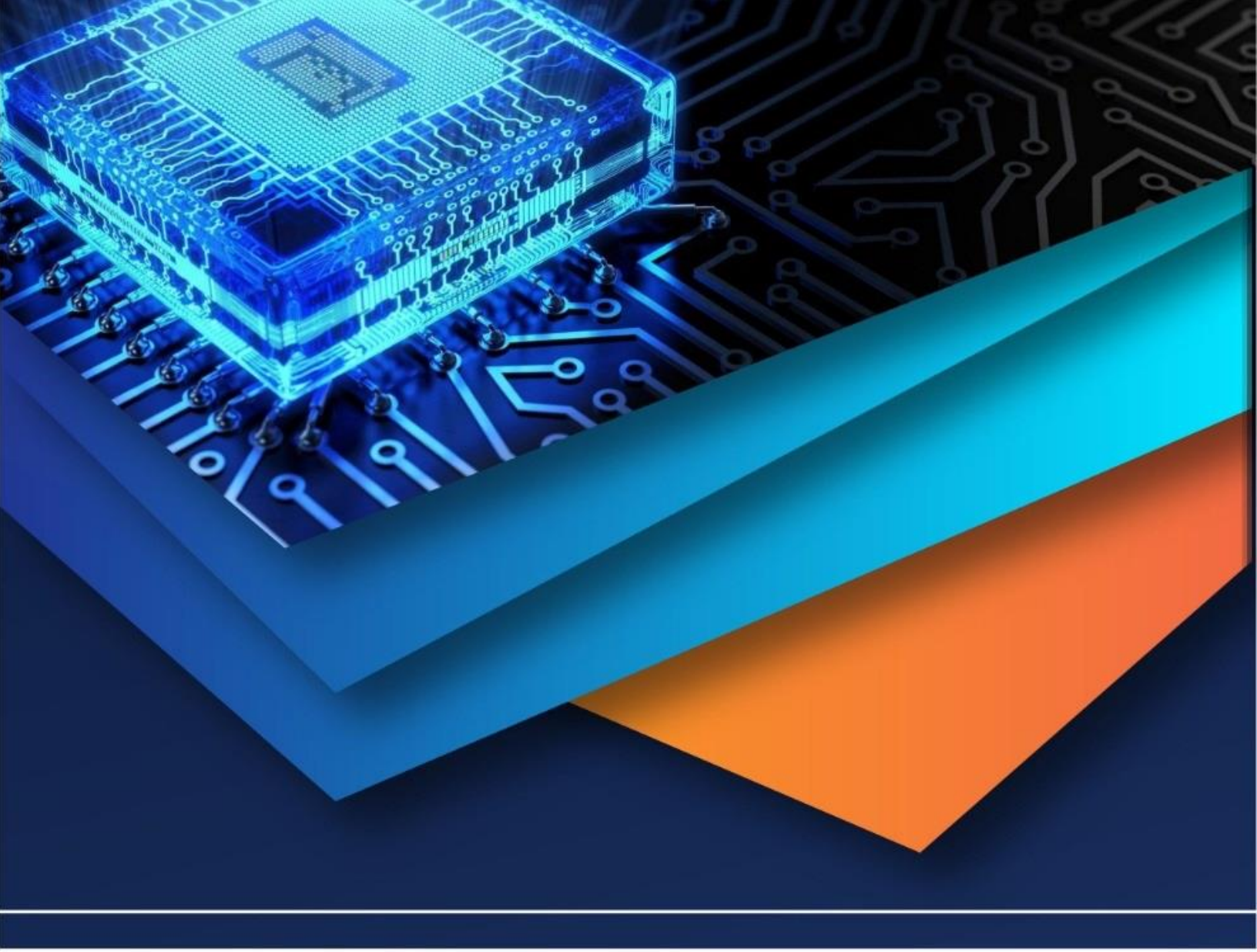
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Volume 5 Issue X, October 2017- Available at www.ijraset.com

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