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Various Image Compression Techniques: Lossy and Lossless

Image compression is an implementation of the data compression which encodes actual image with some bits. Thepurpose of the image compression is to decrease the redundancy and irrelevance of image data to be capable to record or send data in an effective form. Hence the image compression decreases the time of transmit in the network and raises the transmission speed. In Lossless technique of image compression, no data get lost while doing the compression.

Image compression is a type of an application for data/image compression in which the basic image gets encoded with the limited bits. To lower the irrelevance and the redundancy of image data is the major target of the image compression is to enable them to get saved or transmit the data in the better form.The basic objective of the image compression is to show an image in small quantity of bits also the needed content of information is not lost within the actual image.

The image which is needs to be compressed is a gray scale having the pixel values ranges from 0 to 255. Compression addressed to the decreasing the number of data to be used to show content of an image, file or the video without decreasing excessively quality of actual data. Also it lowers the quantity of the bits that is needed to save and send the digital media.To do compression of something implies that there is a piece of data whose size is forced to decrease. For this the JPEG is a best selection for the digitized-photographs. The system called Joint Photographic Expert Group (JPEG) which is dependent on Discrete Cosine Transform (DCT), have been a very largely used method for compression.

Image compression is one of various known techniques in the image processing. This technique may have various implementations and performs a vital role in the effective storage and transmission of the images. The image compression targeted at decreasing the redundancy in the image data to record or sends only few numbers of the samples and by this also a good accession can be reconstruct for the actual image corresponding with the perception of human visual. To compress images is the major target of this paper by decreasing the number of the bits on the basis of per pixel which is needed to show it and also to lower the time of transmission for the transmission of images and for reconstructing again by the Huffman encoding algorithm.

The initial step in this technique is to convert the image from the representation of their spatial domain into a separate type of the representation by the use of few already known conversions and then encodes the converted values i.e., coefficients. This technique allows the huge compression of data as compared to the predictive techniques, though at the cost of the huge computational needs.

Compression is obtained by eliminating any of one or more of the below three fundamental data redundancies: 1. Coding redundancy: This is presented when the less than best (that is the smallest length) code words were used. 2. Inter-pixel redundancy: This results from the correlations between the pixels of an image. 3. Psycho-visual redundancy: This is because of the data which is neglected by human visualsystem (that is, visually not required information).

Why do we need compression?

• Increased enough amount of the storage space.

• Decrease the transmission time of an image toget sent on the internet or get downloaded from webpages.

• Multimedia Applications: Desktop Editing

• Image Archiving: Data from Satellite.

• Image Transmission: Data from the web.

A. TYPES OF IMAGE COMPRESSION

1. Lossless In the technique of Lossless compression with the compressing of data that is when get decompressed, will be the same replica of actual data. In this case, when the binary data like the documents, executable etc. are get compressed. This required to be reproduced exactly when get decompressed again. On the contrary, the images and the music also required not to be generated 'exactly'. A resemblance of the actual image is sufficient for the most objective, as far as the error or problems between the actual and compressed image is avoidable or tolerable.

1. Huffman encoding

2. Run length encoding

3. Arithmetic coding

4. Dictionary Techniques

5. Bit Plane coding

2. Lossy In the technique of Lossy compression, it decreases the bits by recognizing the not required information and by eliminating it. In these methods few loss of the information is acceptable. Dropping non-essential information from the source of data can save the storage area. The Lossy data-compression methods are aware by the researches on how the people anticipate data in the question. The Lossy image compression technique is used in the digital cameras, to raise the storage ability with the minimal decline of the quality of picture.

B. BENEFITS OF IMAGE COMPRESSION

Below are few benefits of the Image compression technique: It enables a reliable cost of savings that is included withthe sending of less data on the network of switched telephone in which the cost of call is normally dependent on its duration. It is not only to decrease the requirements of storage but also decrease the entire time of execution. It decreases the chances of the errors transmission as Some bits have got transferred. It enables a level of the security against monitoring the unlawful Activities.

C. VARIOUS COMPRESSION ALGORITHMS   1. JPEG: DCT-Based Image Coding Standard JPEG enables a compression technique which is able to do compressing continuoustone image or data along with a pixel having depth of the 6 to 24bits with the enough efficiency and speed. A discrete cosine transform (DCT) describes a fixed series of the data points in the terms of sum of the cosine functions fluctuate at various frequencies. By using the cosine instead of the sine functions it is complicated in theseimplementations: for the compression, which it returns found that the cosinefunction is so much effective as mentioned here, some functions are required to the exact a typicalsignal, while for the differential equations, the cosines function explains a specific selection of the boundary conditions. JPEG image compression performs in thepart through rounding off the non-essential bits of the information.Here is an associated trade-off in between theinformation loss and in reduction of size.

DCT fragmented the images into the parts of separate frequencies in which less significant frequencies are cancelled through the quantization process and more significant frequencies are used for retrieving the image while the process of decompression.

 2. Image Compression by Wavelet Transform For various natural signals, the technique of wavelet transform is very efficient tool as compare to the Fourier transform technique. The technique of wavelet transform enables the multi-resolution representation by the use of the set of analyzing functions which are translations and dilations of the some specific functions or wavelets.The technique of wavelet transform found in various forms. Thecomplicated sampled form of wavelet transform enables thevery sophisticated representation; although, it has various limitations also.

3. Huffman Algorithm The Huffman code process is dependent on the two observations mentioned below: a. Very frequently found symbols will have the shorter code-words as compare to the symbol which found less frequently. b. Two symbols which found least frequently may have the equal length.

TheHuffman code is prepared by combining together twoleast possible characters and that are repeating in this process as far as there is only the one character is remaining. A code-tree is hence prepared and then a Huffman code is generated from thelabeling of code tree.It is the best prefix code that is generated from the set of the probabilities and which has been used inthe different applications of the compression.

These generated codes are ofdifferent length of codewhich is using integral number of the bits. Thisconcept results in a decrease in average length of the code and hence the whole size of the compressed data is become smaller as compare to theoriginal one. The Huffman's algorithm is the first that provides the solutionto the issue of constructing the codes with less redundancy.