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Image Processing using Image Compression Methods

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ABSTRACT
Image is the combination of pixels. Pixel is the element which is present in the image in the dot form. In today's era image is treated like as 3D form but at previous time image is in the form of 1D text or 2D text. In this paper we show the image compression on the images. We basically perform the compression on the biomedical images. Biomedical images are very huge in size. We select biomedical images because if we transfer any biomedical image from one place to another then we need compression methods.

Introduction

In today's scenarios health care services or practices and the development of the mutual platforms for biomedical diagnosis have resulted in the technique to compress the medical data in efficient way. We all know, an image is making with the help of small pixels. In ancient time, image is treated as in the form of 1D and then come the image in 2D form. But at that time image is present in the form of 3D.

Compression refers to size storage, cost reduction and achieve the transmission speed of medical information from one source network to other destination network; therefore medical images are important in the form of compressed images for research. Due to large size of medical images, it takes a lot of storage space as compared to normal images. Image compression can be completed in two ways- lossless and lossy form. In lossless compression, achieved data is same as the original data even after the compression. On the other hand, in lossy compression, when compression is performed, the resultant data is missing some part of the original image with minimum loss of data. Applications of lossless compression can be used for text and medical, satellite type images etc. and whereas applications of lossy compression are it is used for signals like speed, natural images, etc. [1][6]

DICOM Image

Digital technology is introduced in every field of medical application. There has been a wide development in noninvasive medical imaging technique. There are various medical equipment dealers and manufactures which established a standard DICOM (Digital Imaging and Communication in Medicine) for storing & exchanging the medical images from source to destination. [1][7]

Related Work

The Literature of this research paper is formed by comprehensive analysis of different research papers based on Lossless Methods. Figure 1 shows the steps for finding the literature of this research paper.

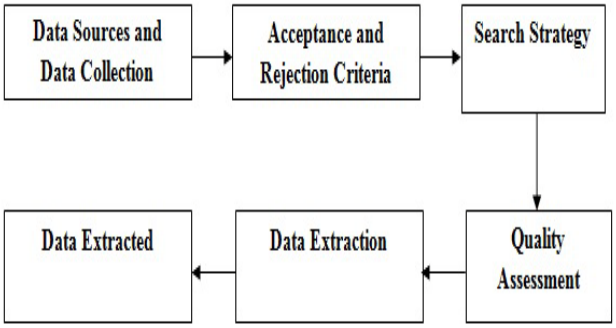

Figure 1. Steps for related work.

The authors propose an algorithm that works by applying a reversible transformation on the fourteen commonly used files of the Calgary Compression Corpus. It does not process its input sequentially, but instead processes a block of texts as a single unit, to form a new block that contains the same characters, but is easier to compress by simple compression algorithms, group characters together based on their contexts. This technique makes use of the context on only one side of each character so that the probability of finding a character closer to another instance of the same character is increased substantially. The transformation does not itself compress the data, but reorder it to make it easy to compress with simple algorithms such as move-to-front coding in combination with Huffman or arithmetic coding [2].

Lossless compression is preferred for artificial images such as technical drawings, icons or comics. This is because lossy compression methods when used especially at low bit rates, introduce compression artifacts. It can also be used for high value content, such as medical imagery or image scans in health industry where there is archiving of large number of images. Lossless compression increases the efficiency of sharing and viewing personal images, uses less storage space and is quicker in transmission and reception of images [3].

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Gunasekaran G. and Bimal Kumar Ray, in this paper, authors demonstrate that the image encryption algorithm is efficient and highly secure. All parts of the proposed encryption system were simulated using MATLAB. The scheme can resist most known attacks, such as statistical analysis and brute-force attacks. All the experimental analysis shows that the proposed encryption algorithm has high level of security with less computation, it shows how to safe guard the sensitive data on network and it helps in securing the important information inside an image or picture. [4]

Proposed Work

We show the proposed work by using the activity diagram.

In this figure we simply show the step by step procedure.

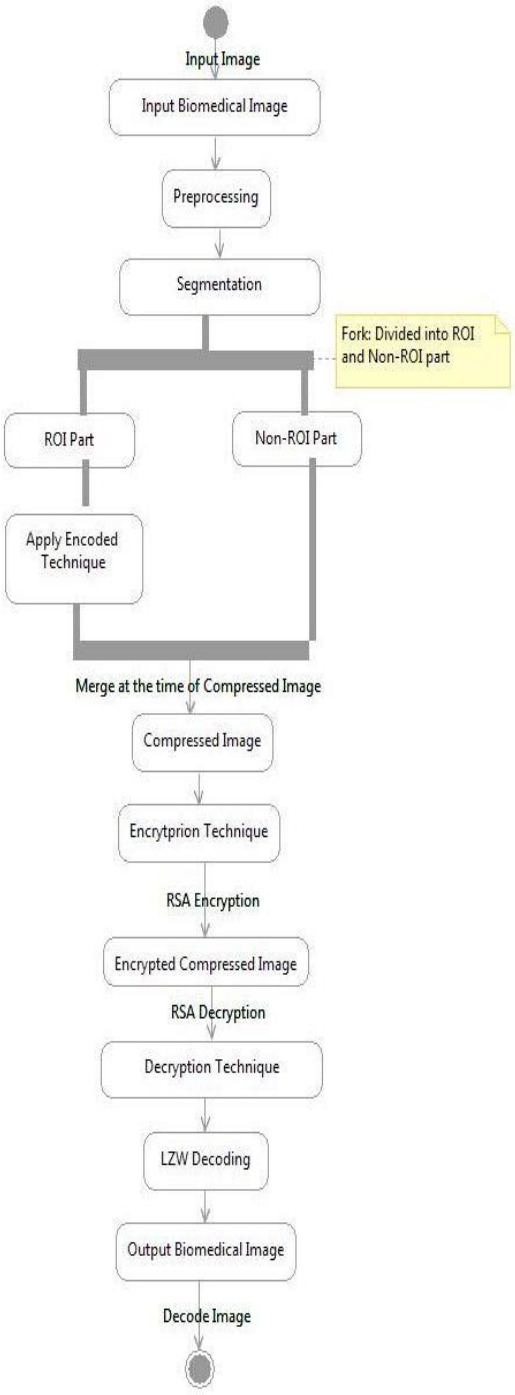

Figure 2. Activity Diagram for Image Compression.

Experiments and Results

We perform the experiments on the biomedical images. We does not show all the original image, but one image we shown.

Figure 3. Original Image.

Compression Ratio is calculated with the help of the given formula.

$$\text{Compression Ratio} = \frac{\text{Uncompressed Size of Image}}{\text{Compressed Size of Image}}$$

Figure 4. ROI of an Image.

ROI is Region of Interest, this is used for find the place where there is needed to compress the image.

LZW

LZW compression technique is used to compress the images, characters, videos, audio, etc., limitations in the image compression are that the number of colors is mainly considered and it is used for some cases.

Figure 5. Original and Decoded Image Using LZW

These limitations will be removing by using the bit plane slicing technique for both the RGB and gray scale images. Dictionary based approaches are used to scan a file and then perform searching on sequences of data or strings which occurs more than once in a scanned file. LZW compression works on single codes after replacing the strings of characters and it also adds a new character of strings in the dictionary in the encoding process. But in decoding we convert that single code into the characters of strings by using the static dictionary. [1] [5]

Table 1. Comparison between Size of Compressed image and Original image through different techniques using ROI.

Images	Original Image Size (MB)	LZ77 Compressed Image Size (MB)	LZ78 Compressed Image Size (MB)	LZW Compressed Image Size (MB)
1.dcm	53.9	52.74	35.08	23.70
2.dcm	269	39.06	39.66	35.38
3.dcm	54.5	38.74	37.70	19.03
4.dcm	268	40.45	39.88	24.77
5.dcm	256	51.79	30.04	21.77
6.dcm	133	29.08	35.29	4.23
7.dcm	136	28.04	35.09	18.91
8.dcm	513	45.12	32.83	6.37

Table 2. Compression Ratio for different compression techniques using ROI

Images	Original Image Size (MB)	LZ77 Compression Ratio	LZ78 Compression Ratio	LZW Compression Ratio
1.dcm	53.9	1.02	1.54	2.27
2.dcm	269	6.89	6.78	7.60
3.dcm	54.5	1.41	1.45	2.86
4.dcm	268	6.63	6.72	10.82
5.dcm	256	4.94	8.52	11.76
6.dcm	133	4.57	3.77	31.44
7.dcm	136	4.85	3.86	7.19
8.dcm	513	11.37	15.63	80.53

Figure 6. Decrypted and Decoded Image

Conclusion and Future Advancement

In this Paper we simply perform the image Compression by using the LZW technique. We also show the comparison between LZW to the other techniques like LZ77 and LZ78. We clearly see the compression ratio of LZW is more other than the techniques.

In future we also perform the compression by different techniques. Biomedical Image Compression is also compress with the help of other techniques with the help of the LZW technique.

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