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A Novel Image Compression on Image Local Patch Extraction Using Run Length Coding

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ABSTRACT: Image compression is currently a prominent topic for both military and commercial researchers. 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. In this paper presents a novel Image Compression On Image Local Patch Extraction Using Run Length Coding incorporates image compression theory, which is the process of extracting the information from the image features from the unsupervised database. The proposed method presents a framework for digital image compression with patch extraction is to discovering best feature from Noisy image database. By aligning the important image features from the database and by using the matching sequence or its encryption of match, the searching between the data features are determined.

KEYWORDS: Image Compression; Run length coding; patch extraction; JPEG2000;

I. INTRODUCTION

Digital image processing is the use of computer algorithms to perform image processing on digital images. The two types of methods used for Digital Image Processing are Analog and Digital Image Processing. Analog or visual techniques of image processing can be used for the hard copies like printouts and photographs. Image analysts use various fundamentals of interpretation while using these visual techniques. The image processing is not just confined to area that has to be studied but on knowledge of analyst. Association is another important tool in image processing through visual techniques. So analysts apply a combination of personal knowledge and collateral data to image processing.

Along with the standardization or independently, many lossless image compression algorithms have been proposed. Among a variety of algorithms, the most widely used ones may be Lossless JPEG [1], JPEG-LS [2], LOCO-I [3], CALIC [4], JPEG2000 [5] (lossless mode) and JPEG XR [6]. The LOCO-I and CALIC were developed in the process of JPEG standardization, where most ideas in LOCO-I are accepted for the JPEG-LS standard although the CALIC provides better compression performance at the cost of more computations.

Image compression is an application of data compression that encodes the original image with few bits. The objective of image compression is to reduce the redundancy of the image and to store or transmit data in an efficient form. The block diagram of the general image storage system. The main goal of such system is to reduce the storage quantity as much as possible, and the decoded image displayed in the monitor can be similar to the original image as much as can be. Lossless compression is bit preserving compression, where the reconstructed image is numerically identical to the original image. This type of compression is important for applications such as medical and satellites imaging, where distortion or loss of information is unacceptable.

The rest of the paper is organized as follows: Related is detailed in Sect. 2. In Sect. 3, Proposed Methodology and the conclusion are in Sect. 5.

II. RELATED WORK

In [2] authors described the JPEG-2000 is an emerging standard for still image compression. This paper provides a brief history of the JPEG-2000 standardization process, an overview of the standard, and some description of the capabilities provided by the standard. Part I of the JPEG-2000 standard specifies the minimum compliant decoder, while Part II describes optional, value-added extensions. Although the standard specifies only the decoder and bit-stream syntax, in this paper we describe JPEG-2000 from the point of view of encoding. In [3] authors described the standardization committee has been the development of Part I, which could be used on a royalty- and fee-free basis.

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This is important for the standard to become widely accepted. The standardization process, which is coordinated by the JTCI/SC29/WG1 of the ISO/IEC has already produced the international standard (IS) for Part I. In this article the structure of Part I of the JPFG 2000 standard is presented and performance comparisons with established standards are reported. In [4] authors formulated national standards for digitization and compression of gray-scale fingerprint images. The compression algorithm for the digitized images is based on adaptive uniform scalar quantization of a discrete wavelet transform subband decomposition, a technique referred to as the wavelet/scalar quantization method. The algorithm produces archival-quality images at compression ratios of around 15 to 1 and will allow the current database of paper fingerprint cards to be replaced by digital imagery. A compliance testing program is also being implemented to ensure high standards of image quality and interchangeability of data between different implementations. In [5] authors present a new and different implementation based on set partitioning in hierarchical trees (SPIHT), which provides even better performance than our previously reported extension of EZW that surpassed the performance of the original EZW. The image coding results, calculated from actual file sizes and images reconstructed by the decoding algorithm, are either comparable to or surpass previous results obtained through much more sophisticated and computationally complex methods. In addition, the new coding and decoding procedures are extremely fast, and they can be made even faster, with only small loss in performance, by omitting entropy coding of the bit stream by the arithmetic code. In [6] authors illustrated a large volumes of fingerprints are collected and stored every day in a wide range of applications, including forensics, access control etc., and are evident from the database of Federal Bureau of Investigation (FBI) which contains more than 70 million finger prints. Wavelet based Algorithms for image compression are the most successful, which result in high compression ratios compared to other compression techniques. Even though wavelet bases are providing good compression ratios, they are not optimal for representing images consisting of different regions of smoothly varying grey-values, separated by smooth boundaries.

III. PROPOSED ALGORITHM

The proposed method accepts the Image Compression parameters as input which contains the MATLAB simulation where the novel Run Length coding based image compression algorithm is applied to the real-world image databases. This overall proposed architecture in figure 1 follows a Compression framework from the beginning to end state.

A. *IMAGE FEATURE EXTRACTION*

Image feature extraction is done without local decision making; the result is often referred to as a feature image. Consequently, a feature image can be seen as an image in the sense that it is a function of the same spatial (or temporal) variables as the original image, but where the pixel values hold information about image features instead of intensity or color. Image pre-processing is an Image mining technique that involves transforming raw data into an understandable format. Real-world data is often incomplete, inconsistent, and/or lacking in certain behaviors or trends, and is likely to contain many errors. Data pre-processing is a proven method of resolving such issues. Data pre-processing prepares raw data for further processing. The two images must be of the same size and are supposed to be associated with indexed images on a common color map.

The input images are first separated into amount of pixels, which are separated into non-overlapping pixels. The image pixel orientation and magnitude are computed for each pixel. An image vectors variation of these bin orientations is formed for each shape. The magnitude of the bin is used as a vote weight. The resulting mean shift grouping pixels are concatenated to form the image descriptor.

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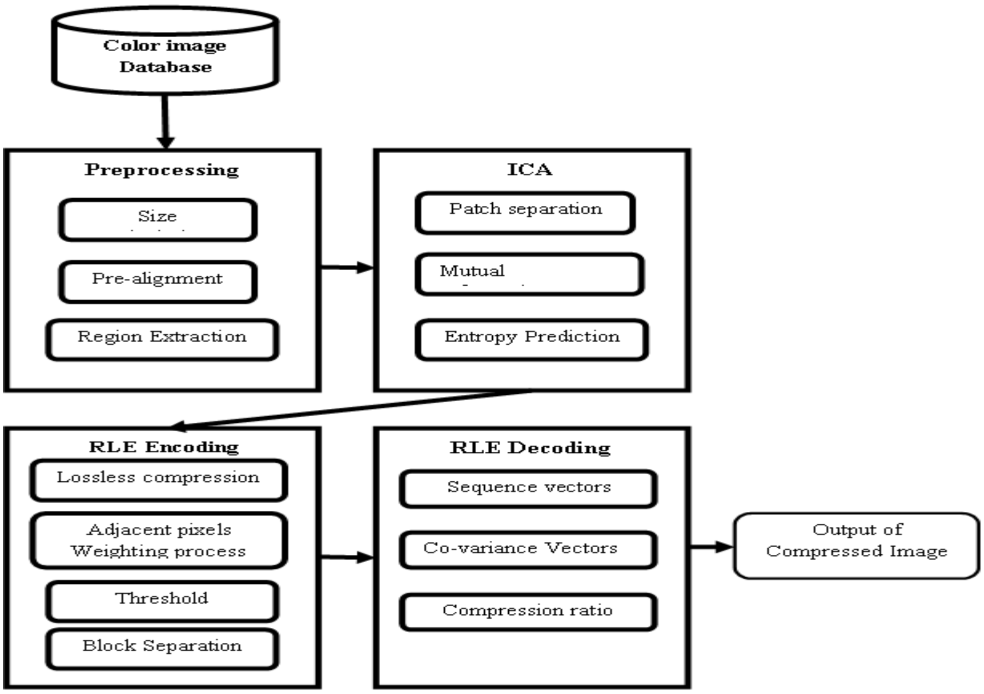

Fig.1. Proposed Framework flow diagram

B. *ICA Transform based Patch Separation*

The ICA Transformation method uses a statistical "latent variables" model. Assume that we observe *n* linear mixtures $x_1, \ldots, x_n$ of *n* independent components,

$$Xj = a_{j1}s_1 + a_{j2}s_2 + \ldots + a_{jn}s_n, \text{ for all } j. \quad \text{eqn. (1)}$$

In the ICA model, we assume that each mixture xj as well as each independent component sk is a random variable, instead of a proper time signal.

Matching Pursuit algorithm is normally use a full frame as a single block. It gives better compression without any blocking artifacts but it is not good for error resilience over noisy channels. Additively, computation is very heavy as MP is an iterative algorithm. To enhance error resilience capability along with reduced computational load, we have processed the image in blocks of 16x16 pixels. These blocks are encoded using variable number of coefficients until either of the stopping criteria is met which are minimum error threshold and maximum number of encoded coefficients.

C. *RLE Encoding Compression*

This encoding method is frequently applied to graphics-type images (or pixels in a scan line) — simple compression algorithm in its own right.

- RLE Approach is given below:
- Sequences of image elements $X_1, X_2, \ldots, X_n$ (Row by Row)
- Mapped to pairs $(c_1, l_1), (c_1, l_2), \ldots, (c_1, l_n)$
- where c_i represent image intensity or colour and li the length of the ith run of pixels.
- (Not dissimilar to zero length suppression above)

The patches have been employed firstly to produce separate streams of DC coefficients (Direct Current. It'll define the basic shade for the whole block. The DC may also refer as constant component). AC coefficients (Alternating Components. The remaining coefficients are called the AC coefficients) and their indexes. The correlation among DC coefficients is exploited by using differential pulse code modulation (DPCM). Similarly indexes of the AC coefficients are also de-correlated by DPCM.

D. *RLE Decoding*

The Run length decoding process is easy: If there aren't control pixel characters the coded symbol just corresponds to the original symbol, and if control pixel count occurred then it must be replaced with characters in a defined number of times. It can be noticed that the process of decoding image pixels. RLE algorithms are practically used in various image compression techniques like the well known BMP, PCX, TIFF, and is also used in PDF file format. Furthermore, RLE also exists as separate compression technique and there is also a file format called RLE (in various brands).

IV. PSEUDO CODE

Step 1: Read the Latent Finger print image.
Step 2: Get the height N and the width M for the image
Step 3: Create an array, let it RLE (N, M) ,each element of this array consists of three fields for image channels.
Step 4: Convert the image to the main array; ICA (N,M).
Step 5: ICA (N, M) image to the main array; RLE (N,M).
Step 6: Let X=RLE (0,0); RLE (0,0) is the first element in an array.
    Let TH=10, TH: the threshold.
Step 7: For I= 0 to N-1
Step 8: For J=0 to M-1
Step 9: If X-RLE (I,J) <= TH then
    Let C=C+1
    Else
    Let X=RLE(I, J) and C=0
Step 10: End.

V. CONCLUSION AND FUTURE WORK

In this paper presents a novel image compression on image local patch extraction using run length coding compression ass it is evident from the algorithm, that the exact image data (pixel values) are extracted from the compressed data stream without any loss. This is possible because the compression algorithm does not ignores or discards any original pixel value. 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 lay out. This technique will find extensive use in medical imaging sector because of its lossless characteristics and the medical images has large area of similar pixel layout pattern, like in color images large area are black. In future the X-Ray image compression system could be an extra option for processing in Latent images.

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