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An Analytical Study on the Medical Image Compression Techniques

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***Abstract*:An region of interesting compression algorithm of still image is introduced. The algorithm that is based on embedded block coding with optimized truncation (EBCOT) encodes the interested region of the image. According to the character of image edge, an improved canny edge detection algorithm is proposed before the wavelet transform, without the participation of automatic extraction of artificial region-of-interest (ROI) by using the dilation and erosion operation in morphology. The ROI coding algorithms is analysed. ROI information can be encoded with high priority at the same time by con structing a weighted function, giving reasonable weight for ROI code block, and reducing the wavelet coefficients effect on the context region of the ROI code block. The proposed method improves the quality of the reconstructed image of ROI. Experiments show that the reconstructed ROI image quality is significantly improved under low bit rate or high, and the reconstructed image background region (BG) quality can be also improved.**

Index Terms: ROI, Region Of interest, Embedded Block Coding

I.INTRODUCTION

Medical imaging is an evolving and growing area of research and development both in academia as well as in industry. It involves interdisciplinary research and development encompassing diverse domains. New techniques and directions are being proposed in the literature every day. The medical equipment's of today's modern era are creating huge number of high resolution images that are used by medical practitioners during analysis and diagnosis. These images while are revolutionizing the healthcare industry creates the problem of storage and transmission. For example, an image of size 512 x 512 pixels created by CT (Computed Tomography) requires about 1/4 MB of storage space, thus stressing the need for image compression algorithms. Image compression is the process of eliminating redundant data in an image in a fashion that minimizes the storage space requirement while maintaining the quality of the image. The algorithms used for this purpose are categorized as lossy and lossless, out of which lossless techniques are more popular in the medical domain. The reason behind this popularity is the need for recovering the decompressed image which is exactly the same as the original image. As healthcare professionals require accurate and clear picture, lossless techniques are not frequently used. Owing to the great demand for high compression ratio while maintaining high image quality, recently, Region of Interest (ROI) techniques have become acknowledged in medical compression. The main advantage of using ROI-based compression techniques is that it combines the usage of both lossy and lossless techniques to compress images. Here, an image is initially segmented into two regions, interested and not-interested regions. It is assumed that the Interested Region (IR) consist of the most important part that has diagnostic/medicinal important, while the Not-Interested Region (NIR) has data that are not considered vital for diagnosis purposes. During Compression, a lossless technique is used for IR while a lossy technique is used on NIR. The method used for determining the ROI in medical images is still an active research area. The method used can be either manual or automatic, both with the same aim of achieving optimal compression balance between lossy and lossless regions.

II. RELATED WORK

ROI Based Image Compression

Lossy compression techniques give better compression results with the accuracy compromised, they are used only for non crucial regions of the image. The crucial regions are compressed using lossless compression techniques. This increases the efficiency of process by retaining the accuracy of crucial region alone and the rest of the region is not given much importance on accuracy. For the industrial weld radiographic images, the modified Tsallis entropy expression gives the threshold value. Based on this threshold value, the image is divided into ROI and non-ROI. The ROI contains the details about weld part and non-ROI contains details about the rest of the part. Similarly for the medical radiographic image, the ROI contains details about bone or other diagnostically important parts (Gokturk., 2001). The non-ROI contains details about background of the image or rest of the parts.Generally, Huffman coding is used since it is lossless coding algorithm. It has many advantages like it uses small code words for high probability elements and the converse for the lesser probable elements. Applying Huffman coding in the digital image segmented using modified Tsallis entropy thresholding method satisfies the previously mentioned criteria. It compresses the region of interest effectively since the segmentation of image converts the pixels intensity at region of interest to white (1) while the other pixels into black (0). The ROI in the actualimage is identified by retaining the values of the pixel for which the values are 1 in the segmented image. The values of all other pixel are made as zero. The entire image obtained after this process is compressed using the Huffman compression.These steps constitute the compression part which completes by transmitting the compressed image to the required destination. Along with the compressed image the corresponding dictionary and some other important details like the size of image data at various stages that will be used for decompression or extraction. The transmission of compressed image has advantages like reduced bandwidth requirements, high speed and therefore low time. Also, security is increased since the compressed data is not meaningful if viewed by any third party without properdecoder. The other side receives these details and reconstructs the image using the same Huffman coding and the dictionary. The resulting image is of the same details at the region of interest i.e. crucial regions but varies at other non-crucial areas.

III.METHODOLOGY

Automatic image segmentation techniques can be classified into four categories, namely, (1) Clustering Methods, (2) Thresholding Methods, (3) Edge-Detection Methods, and (4) Region-Based Methods.

1. Clustering Methods

Clustering is a process whereby a data set (pixels) is replaced by cluster; pixels may belong together because of the same color, texture etc. There are two natural algorithms for clustering: divisive clustering and agglomerative clustering. The difficulty in using either of the methods directly is that there are lots of pixels in an image. Also, the methods are not explicit about the objective function that is being optimized. An alternative approach is to write down an objective function and then build an algorithm. The K-means algorithm is an iterative technique that is used to partition an image into K clusters, where each pixel in the image is assigned to the cluster that minimizes the variance between the pixel and the cluster center and is based on pixel color, intensity, texture, and location, or a weighted combination of these factors. This algorithm is guaranteed to converge, but it may not return the optimal solution. The quality of the solution depends on the initial set of clusters and the value of K .

2. Thresholding Methods

Thresholding is the operation of converting a multilevel image into a binary image i.e., it assigns the value of 0 (background) or 1 (objects or foreground) to each pixel of an image based on a comparison with some threshold value T (intensity or color value). When T is constant, the approach is called global thresholding; otherwise, it is called local thresholding. Global thresholding methods can fail when the background illumination is uneven. Multiple thresholds are used to compensate for uneven illumination. Threshold selection is typically done interactively.

3. Edge Detection Methods

Edge detection methods locate the pixels in the image that correspond to the edges of the objects seen in the image. The result is a binary image with the detected edge pixels. Common algorithms used are Sobel, Prewitt, Robert, Canny and Laplacian operators. These algorithms are suitable for images that are simple and noise free; and will often produce missing edges, or extra edges on complex and noisy images.

4. Region-Based Methods

The goal of region-based segmentation is to use image characteristics to map individual pixels in an input image to sets of pixels called regions that might correspond to an object or a meaningful part of one. The various techniques are: Local techniques, Global techniques and Splitting and merging techniques. The effectiveness of region growing algorithms depends on the application area and the input image. If the image is sufficiently simple, simple local techniques can be effective. However, on difficult scenes, even the most sophisticated techniques may not produce a satisfactory segmentation. Edge-based techniques are based on the assumption that pixel values change rapidly at the edge between two regions Operators such as Sobel or Roberts operators can be used to detect the edges. And some post procedures such as edge tracking, gap filling can be used to generate closed curves. Regionbased techniques are based on the assumption that adjacent pixels in the same region should be consistent in some properties. Namely, they may have similar characteristic such as grey value, color value or texture. The deformable models are based on curves or surfaces defined within an image that moves due to the influence of certain forces. And the global optimization approaches use a global criterion when segmenting the image**.**

IV.CONCLUSION

In this paper, a various methods of palm selection andextraction of ROI are discussed. ROI segmentation of palm is to automatically and reliably segment a small region from the captured palm image, it is very important step of palm print recognition because it greatly influences the accuracy and processing speed of the system. All various methods of extraction of ROI are useful by considering various constraints provide very good and accurate results.

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