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Analysing the Healthcare Image Data using JPEG Compression method to improve the Clarity

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ABSTRACT

The local variance of image intensity is a typical measure of image smoothness. It has been extensively used to measure the visual saliency or to adjust the filtering strength in image processing and analysis. In medical field the volume of medical image data produced every day is ever growing, particularly in grouping with the improved scanning resolutions and the importance of volumetric medical image data sets. However to the best of our knowledge no analytical work has been reported about the effect of JPEG compression on image. The theoretical analysis presented in this paper provides some new insights into the behaviour of local variance under JPEG compression. Moreover, it has the potential to be used in some areas of image processing and analysis, such as image enhancement, image quality assessment, and image filtering. In this paper we are proposing a new framework to process the image data using JPEG Compression technique.

Keywords: JPEG Compression, Image Processing, Image Enhancement, Image quality assessment, and Image Filtering.

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Introduction

The healthcare field have large amount of medical images.so they need decrease the large volume amount of medical images. The image compression is process the focused on decreasing the size without losing quality, decrease the storage of images and information of image. The image characteristics (e.g. brightness, contrast and texture) differ from image to image and even from the region to region in an image. For saving storage space or transmission bandwidth, an image is often JPEG compressed after capturing or editing it. As a result the compressed image is degraded to certain extent depending on the strength of compression. The JPEG standard includes lossless compressions. In this paper focuses on the study of JPEG Compression and image processing. The JPEG compression consists of three basic steps: block Discrete Cosine Transform (DCT), coefficient quantization and entropy coding. Image compression address the problem of reducing the amount of data required to represent a digital image. It is a process intended to compact representation of an image.

The reducing the image storage /transmission requirement. Compression is achieved by the removal of one or more of the three basic data redundancies, Coding Redundancy, inter pixel Redundancy, Psycho visual Redundancy. Coding redundancy is present when less than optional code words are used, Inter pixel Redundancy results from correlations between the pixels of an image. Psycho visual Redundancy is due to data that is ignored by the human visual system. The main aim in image compression is the reduction of image data while preserving image details. They are many compressions algorithms which compress images in various formats such as JPEG, GIF (Graphical Interchange Format), TIFF (Tagged Image File Format) and Bitmap Image (BMP), etc.

Related Work

One of the emerging concepts in image compression today is JPEG. The JPEG means Joint Photographic Experts Group. It is a standard committee that has its roots in international organisation for standardization (ISO). JPEG is better than the other compression formats in many ways. For example, it works best with photograph and complex Images.[1] It uses a compression method that remove non-human visible colours from images to decrease file sizes, JPEG store images with pixel depth between 6 to 24 bits with reasonable speed and efficiency, JPEG is a lossy method of compression and it removes useless data away during encoding. So, JPEG has better and superior compression ratio over most lossless schemes. [2]

In 2007 Jacques Levy Vehel, Franklin Mendivil and Evelyne Lutton introduce over compressing JPEG images with Evolution Algorithms these Evolutionary strategies are used in order to guide the modification of the coefficients towards a smoother image and the result was three compression ratios have been considered [3]. The compressed images are obtained by using the quantization values in table 1 multiplied by 5, 10, and 15.

In 2008 Jin Li, Jarmo Takala, Moncef Gabbouj and Hexin Chen used a detection algorithm for zero quantized DCT coefficients in jpeg show Experimental results show that the proposed algorithm can significantly reduce the redundant computations and speed up the image encoding. Moreover, it doesn't cause any performance degradation. Computational reduction also implies longer battery lifetime and energy economy for digital applications.[4]

In 2012 Bheshaj Kumar, Kavita Thakur and G. R. Sinha introduce performance evaluation of JPEG image compression using symbol reduction technique. In this paper, a new technique has been proposed by combining the JPEG algorithm and Symbol Reduction Huffman technique for achieving more compression ratio. The symbols reduction technique reduces the number of symbols by combining together to form a new symbol. As a result of this technique the number of Huffman code to be generated also reduced. The result shows that the performance of standard JPEG method can be improved by proposed method. This hybrid approach achieves about 20% more compression ratio than the Standard JPEG.[5]

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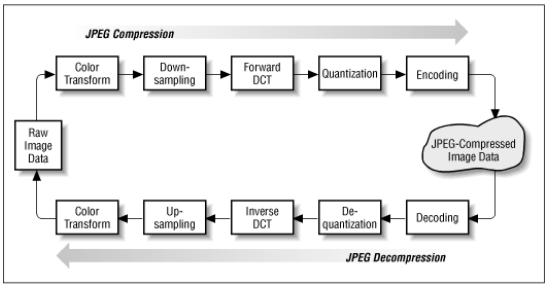

Figure 1. JPEG Compression and Decompression for Image Data

In this above figure 1, it is shown as the compression and decompression of Image data.

Overview of Healthcare Data to demonstrate the Image Compression

Healthcare data is rapidly growing with the large volume and multi-dimensional data generation from cyber, physical, and social space. Heterogeneous healthcare data in various forms, such as image, text, video, raw sensor data, etc.., are required to be effectively stored, processed, queried, indexed and analysed.[6] This section is concerned about how individuals (and patients in specific) can improve healthcare analytics through understanding the small and personal data, as well as educate themselves in how to collaborate with the healthcare data analytics to reach a high level of efficiency and accuracy. The compression addresses the problem of reducing the amount of data required to present the digital image. We can achieve compression by removing of one or more of three basic data redundancies.[7]

Dataset		# people	# nodes					# links to Record nodes				Density
			Record	Test	Mental	Profile	Total	Test	Mental	Profile	Total Real	
GHE@10class		26,771	73,642	55	26	55	73,778	601,062	119,952	523,387	1,244,401	0.1242
Synthetic	(100,100)	1,100	3,013	55	26	55	3,149	28,071	4,611	22,552	55,234	0.1348
	(300,300)	3,300	9,054				9,190	84,052	13,982	68,053	166,087	0.1349
	(500,500)	5,500	15,092				15,228	139,736	23,134	113,231	276,101	0.1345
	(1000,1000)	11,000	30,201				30,337	280,412	46,655	227,932	554,999	0.1351
	(1000,3000)	13,000	35,463				35,599	323,101	55,263	265,067	643,431	0.1334
	(1000,5000)	15,000	40,695				40,831	365,005	63,974	301,661	730,640	0.1320
	(1000,10000)	20,000	53,674				53,810	469,575	85,167	393,486	948,228	0.1299
	(1000,15000)	25,000	66,841				66,977	575,360	106,694	485,914	1,167,968	0.1285
	(1000,20000)	30,000	79,979				80,115	682,022	128,357	579,269	1,389,648	0.1278

Figure 2. Healthcare Dataset representation with Records, Test, Mental and Profile of the Patient

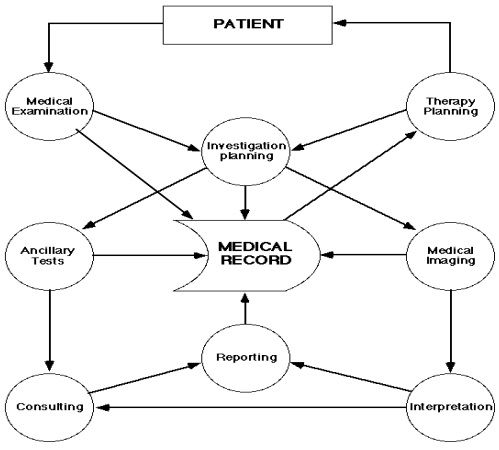

Figure 3. Various Stages of Healthcare Treatment Diagnosis

A New Framework for Image Processing on Image Data using JPEG Compression

In this section, we are going to deal with Image processing and a new framework for image compression using JPEG methods.

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Image Processing

Image processing is processing of images using mathematical operations by using any form of signal processing for which the input is an image, a series of images, or a video, such as a photograph or video frame. The output of image processing may be either an image or a set of characteristics or parameters related to the image. Most image processing techniques involve treating the image as a two dimensional signal and applying standard signal processing techniques to it. Images are also processed as three dimensional signals where the third dimension being time or the z-axis. Image processing usually refers to digital image processing, but optical and analogy image processing also are possible. This article is about general techniques that apply to all of them. The acquisition of images (producing the input image in the first place) is referred to as imaging.[8]

Closely related to image processing are computer graphics and computer vision. In computer graphics, images are manually made from physical models of objects, environments, and lighting, instead of being acquired (via imaging devices such as cameras) from natural scenes, as in most animated movies. Computer vision, on the other hand, is often considered high level image processing out of which a machine-computer-software intends to decipher the physical contents of an image or a sequence of images (e.g., videos or 3D full-body magnetic resonance scans).In modern sciences and technologies, images also gain much broader scopes due to the ever growing importance of scientific visualization. Examples include microarray data in genetic research, or real time multi asset portfolio trading in finance.

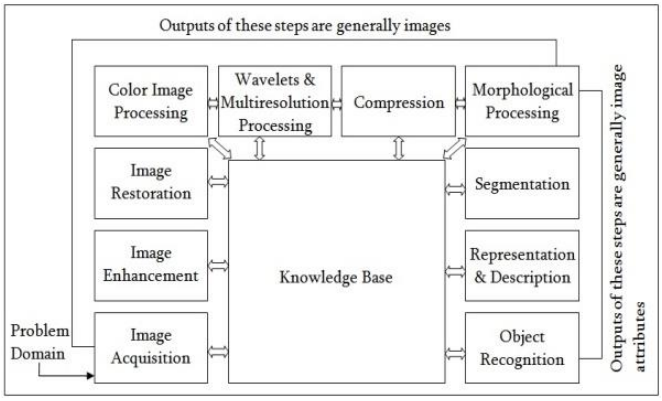

Figure 4. Various Stages of Image Processing

In the figure 4 above the first step of process is used as fundamental steps of digital image processing. Image acquisition could be as simple as being given an image that is already in digital form. The Image enhancement is among the simplest and most appealing areas of digital image processing. Basically the idea behind enhancement techniques is to bring out detail that is obscured, or simply to highlight certain feature of interest in an image. Such as changing brightness and contrast etc. The Image restoration is an area that also deals with improving the appearance of an image. However, unlike enhancement, which is subjective, image restoration is objective, in the sense that restoration techniques tend to be based on mathematical or probabilistic models of image degradation. The Colour image processing is an area that has been gaining its importance because of the significant increase in the use of digital images over the Internet. This may include colour modelling and processing in a digital domain etc. The Wavelets are the foundation for representing images in various degrees of resolution. These Images are subdivision successively into smaller regions for data compression and for pyramidal representation. The Compression deals with techniques for reducing the storage required to save an image or the bandwidth to transmit it. Particularly in the uses of internet it is very much necessary to compress data.

The Morphological Image processing method deals with tools for extracting Image components that are useful in the representation and description of shape. The Segmentation procedures partition an image into its constituent parts or objects. In general, autonomous segmentation is one of the most difficult tasks in digital image processing. A rugged segmentation procedure brings the process a long way toward successful solution of imaging problems that require objects to be identified individually.

The Representation and description almost always follow the output of a segmentation stage, which usually is raw pixel data, constituting either the boundary of a region or all the points in the region itself. The Recognition is the process that assigns a label, such as, "vehicle" to an object based on its descriptors.

Finally the Knowledge may be as simple as detailing regions of an image where the information of interest is known to be located, thus limiting the search that has to be conducted in seeking that information. The knowledge base also can be quite complex, such as an interrelated list of all major possible defects in a materials inspection problem or an image database containing high-resolution satellite images of a region in connection with change-detection applications.

A new Framework for JPEG Compression on Image Data

JPEG Stands for Joint Photographic Experts Group. Which is a standardization committee it also stands for the compression algorithm that was invented by this committee. The algorithm has been conceived to reduce the file size of natural, photographic like true colour images as much as possible without affecting the quality of the image as experienced by the human sensory engine.

As the JPEG has become an international standard for the image compression. We present techniques that allow the processing of the image in the "JPEG Compression" domain. The goal is to reduce memory requirements while increasing speed by avoiding decompression and space domain operations. In each case an effort is made to implement the minimum number of JPEG basic operations. Techniques are presented for scaling, previewing, rotating, mirroring, cropping, recompressing, and segmenting JPEG compressed data. While most of the results apply to any image, we focus on scanned documents as our primary image source.[9]

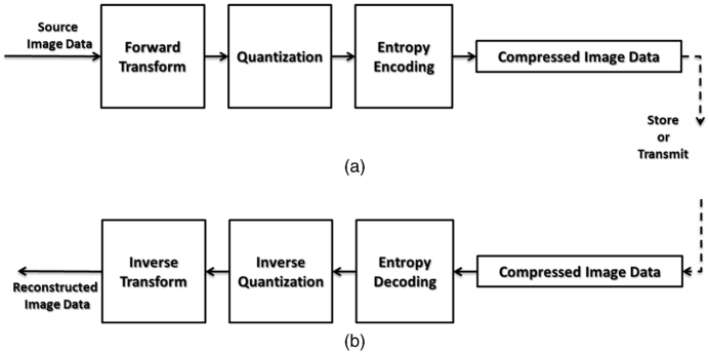

Figure 5. A New Framework with the Source Image Data Conversion to Reconstructed Image Data with various manipulation of Image Processing Technique

In the above figure 5, the forward transform technique consists of scanning all the pixels in the original image, and then computing their position in the new image is called the Forward Transform. The quantization involved in image processing is a lossy compression technique achieved by compressing a range of values to a single quantum value. When the number of discrete symbols in a given stream is reduced, the stream becomes more compressible. The entropy encoding is a type of lossless coding to compress digital data by representing frequently occurring patterns with few bits and rarely occurring patterns with many bits. Huffman coding is a type of entropy coding. The compressed image data uses the image compression may be lossy or lossless. Lossless compression is preferred for archival purposes and often for medical imaging, technical drawings, clip art, or comics. Lossy compression methods, especially when used at low bit rates, introduce compression artefacts. Lossy methods are especially suitable for natural images such as photographs in applications where minor (sometimes imperceptible) loss of fidelity is acceptable to achieve a substantial reduction in bit rate.

CONCLUSION

We presented techniques for processing compressed images. In this paper consider tempering in JPEG as a problem of detecting recompression. A theoretical expression has been derived for the expectation of a JPEG compressed image. This shows that the expectation is determined by the quantization step sizes of JPEG compression and the distribution parameters of coefficients of the original uncompressed image. The

analysis presented in the paper has provide some new frame work under JPEG compression. One of the emerging concepts in image compression today is JPEG. It uses a compression method that remove non-human visible colours from images to decrease file sizes, JPEG store images with pixel depth between 6 to 24 bits with reasonable speed and efficiency, JPEG is a lossy method of compression and it removes useless data away during encoding. So, JPEG has better and superior compression ratio over most lossless schemes.

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