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Performance Analysis Of Artifact Reduction In Astro Images

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Abstract:
Traditional block-based video coders such as H.261, MPEG-1, and MPEG-2 suffer from annoying blocking artifacts when they are applied in low bit-rate coding because inter block correlation is lost by block-based prediction, transformation ,and quantization. In order to overcome the blocking artifact problem, various non block-based coding schemes are used.In Existing Artifact Reduction method, the quality of astrophysical images produced by means of the generalized least square (GLS) approach may be degraded by the presence of artificial structures, obviously not present in the sky.In this project, we analyze these artifacts and introduce a method to remove them using GLS and Feature extraction techniques. The method is based on a post-processing of GLS image that estimates and removes the artifacts subtracting them from the original image[1]. The method we present here is termed post-processing for GLS (PGLS) and is based on an artifact estimation procedure. Once the artifacts are estimated, they are subtracted from the GLS image to produce a clean image. The PGLS algorithm is simple and robust. Its computational complexity is affordable and comparable to that of the GLS map maker itself. The Proposed method will be compared with existing approach.

Key words: *artifact, gls algorithm, blocking artifact, ringing artifact*

1.Introduction

A compression artifact (or artefact) is a noticeable distortion of media – an image, audio, or video – due to the application of an overly aggressive or inappropriate lossy data compression algorithm. These lossy data compression schemes discard some data to simplify the media sufficiently to store it in the desired space (data-rate) – if there is not enough data in the compressed version to reproduce the original with acceptable fidelity, artifacts will result. Alternatively, the compression algorithm may incorrectly determine certain distortions to be of little subjective importance, but they may in fact be objectionable to the viewer.

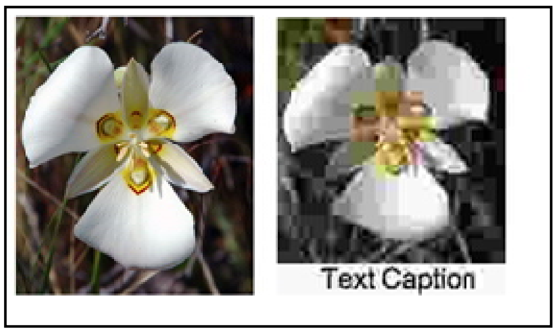

Figure 1: Original and Compressed Images

The Figure 1, shows that the natural and compressed images. Compression artifacts occur in many common media such as DVDs, common computer file formats such as JPEG, MP3, or MPEG files, and Sony's ATRAC compression algorithm[2]. Uncompressed media (such as on Laserdiscs, Audio CDs, and WAV files) or losslessly compressed media (FLAC, PNG, etc.) do not suffer from compression artifacts.

The minimization of artifacts is a key goal in implementation of lossy compression schemes. However, artifacts are occasionally intentionally produced for artistic purposes, a style known as glitch art.

Technically speaking, a compression artifact is a particular class of data error that is usually the consequence of quantization in lossy data compression. Where transform coding is used, they typically assume the form of one of the basis functions of the coder's transform space.

2.Image Artifact Reduction

Various approaches have been proposed to reduce the effects of image compression, but in order to utilize standardized compression/decompression techniques and to retain the benefits of the compression (for instance, lower transmission and storage costs), many of these methods have focused on "post-processing" – that is, processing the images when they are received or viewed[3]. No post-processing technique has been shown to improve image quality in all cases; consequently, none has garnered widespread acceptance, though some have been implemented and are in use in proprietary systems. Many photo editing programs, for instance, have proprietary JPEG artifact reduction algorithms built-in.

2.Occuring Of Artifacts

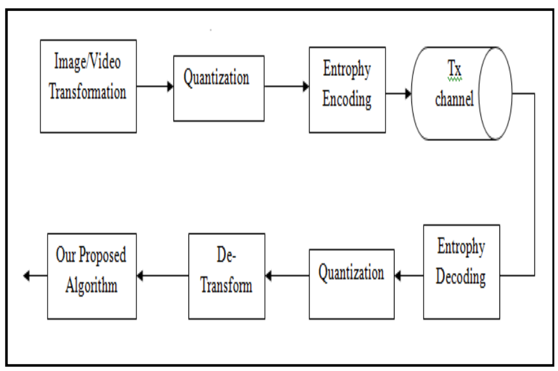

Figure 2: Occuring of Arifacts In Images

The Figure 2 shows that , how the artifacts occurring in the image.Digital image compression is commonly employed in many practical and commercial systems, where storage or transmission of the image is required over limited resources.

JPEG compression is based on quantization of the Discrete Cosine Transform (DCT) coefficients of each size 8×8 non-overlapping block that tile the image completely by a quantization table followed by a lossless entropy encoder.3, 4 Different compression ratios can be achieved by scaling the elements of the quantization table as a function of user-selectable quality factor (Q). As Q increases, more quantization noise is introduced on the DCT coefficients, which makes the quantized coefficients get closer values to each other. Consequently, the entropy coder can achieve higher compression ratios.

However, at the same time, this harsh quantization may introduce visible artifacts on the image. These artifacts are typically sorted as:

2.1.Blocking Artifacts

Blocking artifacts, which are mainly due to the coarse quantization of low-frequency DCT coefficients yielding decompressed image look like a mosaic at smooth regions, which is shown in the figure 3 , and

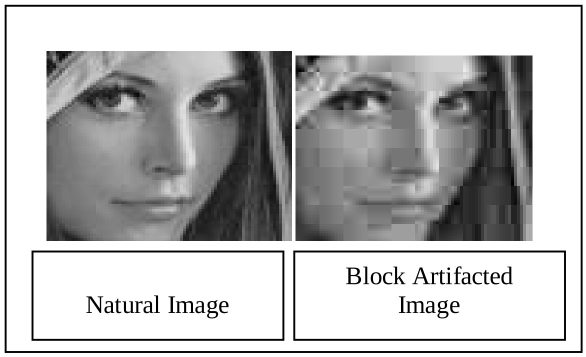

Figure 3:Blocking artifacted Image

2.2.Ringing Artifacts

Ringing artifacts, which are mainly due to the coarse quantization of high-frequency DCT coefficients making the decompressed image exhibit noisy patterns known as ringing or mosquito noise near the edges. Ringing artifact affected image is shown in figure 4.

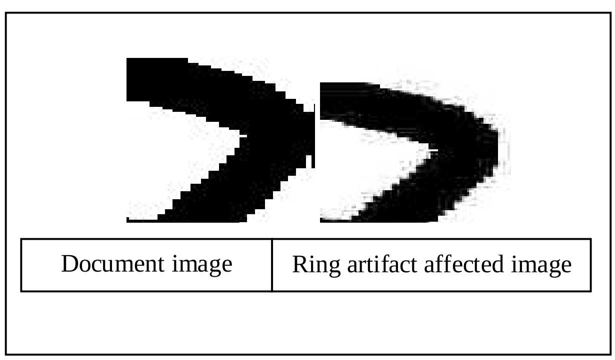

Figure 4: Ringing Artifact

Although the primary targets of JPEG compression are natural images, several other types of images such as document images can also be encountered in digital environments. Typical document images contain both textual and pictorial regions. Artifacts can also be observed on these regions. However, unlike natural images, which generally exhibit blocking artifacts at high compression ratios, in document images significant ringing artifacts are observed near the edges of textual components.

2.3.Need For Removing Artifacts

The Artifacts can be viewed in the Decompression stage of the image transmission process. It will be degrades the quality of the Compressed Video/Image. So it creates the Improper Perception for human eye, and the analysis of image will be more difficult. Due to artifact occur in the image, high amount of data will be losses from the original image. It will make many drawbacks in the analysis of satellite images and medical images. The artifacts also reduces the PSNR Value of the image. PSNR is the unit, which measuring the performance of the image.

3.Ringing Artifact Reduction

The figure 5, shows that the processes used in reducing the ringing artifact from the decompressed image. We first consider gray-level images. The results will be extended to color images at the end of this subsection[4]. For each textual region, a gray value histogram is first built. Three pieces of information are derived from the histogram, namely, the gray value of the background, a threshold that separates the text and the background, and a Signal-to-Noise Ratio (*SNR*) level for the region.

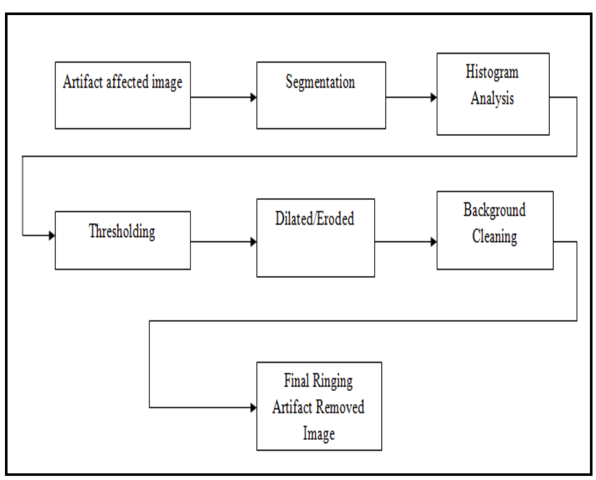

Figure 5: Block Diagram for Ringing Artifact Reduction

Since in most text regions, the background pixels are dominant in number, it is easy to determine the background color of the image by either choosing the most frequent gray level or the weighted average of several frequent gray levels as the background color of the image region. From the histogram, we also determine a threshold value that can be used as a metric to assign each pixel as a member of the text or background. Several powerful thresholding algorithms can be found in the literature,18 which generates a single (global) threshold for the whole image region or several (local) threshold values that vary according to the image content. Generally, local thresholding algorithms outperforms global thresholding techniques.

3.1.Segmentation

Segmentation is a procedure that partitions an image into multiple regions, each of which is uniform or similar in certain characteristics. Document images are often segmented into regions, such as text, synthetic graphics and natural pictures for various purposes.

3.2.Edge Detection

Edge detection is a well-developed field on its own within image processing. Region boundaries and edges are closely related, since there is often a sharp adjustment in intensity at the region boundaries.

3.3.Histogram Analysis

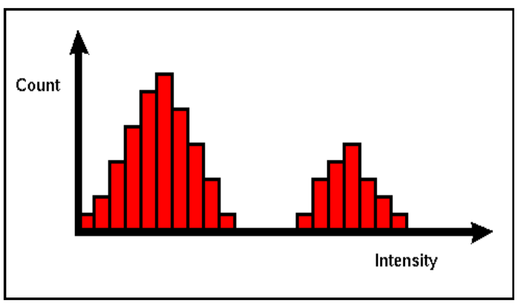

Figure 6: Histogram Analysis

In statistics, a histogram is a graphical representation showing a visual impression of the distribution of data. It is an estimate of the probability distribution of a continuous variable and was first introduced by Karl Pearson. Histogram analysis graph will we shown in the figure 6. A histogram consists of tabular frequencies, shown as adjacent rectangles, erected over discrete intervals (bins), with an area equal to the frequency of the observations in the interval. The height of a rectangle is also equal to the frequency density of the interval, i.e., the frequency divided by the width of the interval. The total area of the histogram is equal to the number of data.

3.4.Eroded/Dilated Process

Dilate is a function that accepts a black and white image. It is also known by the names "grow", "bolden", and "expand". It turns on pixels which were near pixels that were on originally, thereby thickening the items in the image.
Erode is the sister function to dilate. It is also known by the name "shrink". It turns off pixels which were near pixels that were off originally, thereby eating away at the edges of the items in the image.

4.Blocking Artifact Reduction

Traditional block-based video coders such as H.261, MPEG-1, and MPEG-2 suffer from annoying blocking artifacts when they are applied in low bit-rate coding because interblock correlation is lost by block-based prediction, transformation, and quantization.

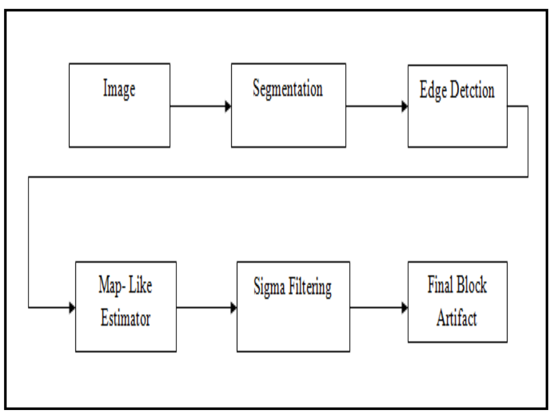

Figure 7: Block diagram for blocking artifact reduction

The block diagram used for reducing the blocking artifact was shown in the figure 7. In order to overcome the blocking artifact problem, various nonblock-based coding schemes have been proposed. Among them, the lapped orthogonal transform and embedded zero-tree wavelet coding have been proposed as a nonblock-based texture coding method, and warping prediction and overlapped block motion compensation (OBMC) have been proposed as a non block-based prediction method.

4.1.Sigma Filter

The filter smooths an image by taking an average over the neighboring pixels, but only includes those pixels that have a value not deviating from the current pixel by more than a given range. The range is defined by the standard deviation of the pixel values within the neighborhood

5.Screen Shots

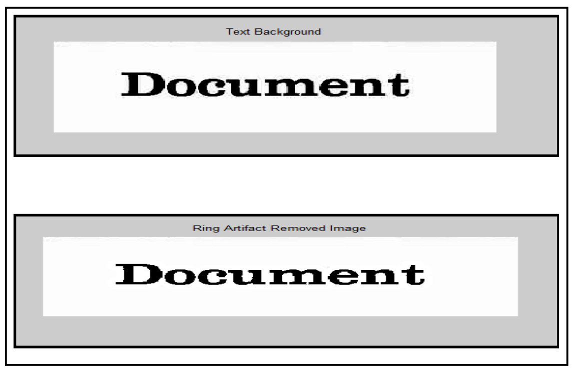

Figure 8: Ringing artifact reduction in document Image

The ringing artifact reduced image will be shown in the figure 8. Here the ringing artifact affected image was taken as input.

Figure 9: Blocking Artifact Removed Image

The result of blocking artifact reduced image will be shown in the figure 9. Here the blocking artifacted image will be given as input.

6.Conclusion And Future Enhancement

We proposed a method to reduce the artifacts in compressed astrophysical images. There are two types of artifacts occur in the astrophysical images, due to image compression. They are blocking artifacts and ringing artifact. In which, by using a post processing method the blocking artifacts and ringing artifacts are removed from the astrophysical images. The compressed input image will be processed with the post processing method and both of the ringing and blocking artifacts will be removed. And the expected image clarity was occure with more efficient than, when compared to the existing artifact removing method.

In future, to improve the quality of astrophysical images produced by means of the generalized least square (GLS) approach. And achieve better PSNR result for compressed astrophysical images.

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