Performance evaluation of compressed images by using Gradient based optimization and Edge restoration method

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Abstract-*The image compression can be applied to several field associated with image processing. The main goal of image compression is to decrease the area to get storage space and reduce transmission charges and also retain the visual quantity of images. The following paper describe the strategies that can be used for image compression and also explain the different artifacts along with their reduction methods. This paper present a edge based restoration technique to eliminate artifacts coming from compressed image. The most recent technique combined SVD-WDR compression as well as edge restoration technique for removing ringing artifacts from the compressed images.*

Keywords—Image Compression, Gradient Optimization, Edge restoration method

I. INTRODUCTION

Image compression can be used for data compression on various digital images. The main goal associated with image compression is usually to decrease the actual redundancy from the image data for storing and transmitting data within an effective way**.**

Multimedia data that is uncompressedneeds more transmission bandwidth and also more storage capacity. With the rapid growth in processor speeds and mass-storage density requires more storage capacity and data transmission bandwidth.The newprogessof web data demanding multimedia-based web programsrequires not onlybest way to encode information and images but also require communication tools andmore storage for compression of such signals. Image compression is classified as:

a) Lossy compression
b) Lossless compression
a) Lossy compression: To compressed multimedia data that is audio and video. Lossy compression is most commonly used. In Lossy compression data is reduced to such an extent where the original data cannot be achieved when the video is decompressed.
b) Lossless compression: As the name signifies, in lossless compression there is no data loss. Both original data as well as compressed data is same in lossless compression. The motive of this compression is to eliminate the redundant data in the compression and also add them in the decompression.GIF is an example of lossless images compression.

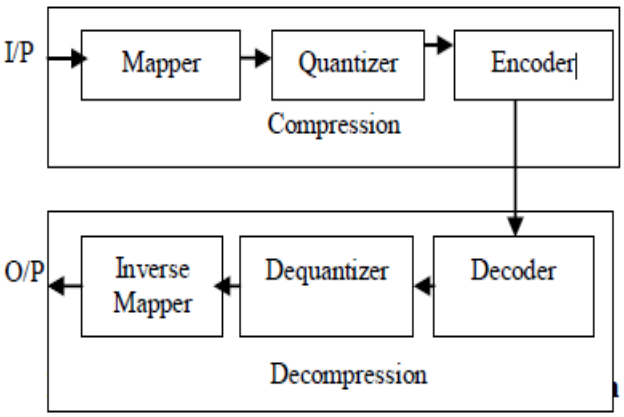

fig 1. compression and decompression

A. Overview of Gradient based optimization and Edge restoration method

a) Gradient based optimization

Any optimization method basically tries to find the nearest/next best parameter(s) form the initial parameter(s) that will optimize the given function (this is done iteratively with the expectation to get the best parameter(s)).The optimization method that uses gradient to get this parameter(s) is called gradient based method. In gradient based optimization, there is a high possibility that we might stuck in a local minima/maxima when traversing parameter(s). Gradient-based optimization can be described as follows:

- Compute a search direction.
- Test for convergence
- Update the design variables
- Compute the step length

b) Edge restoration

Edge Restoration is a process of changing the corrupt or noisy image into original image, estimated clear

image. Corruption or noisy image can be noise, motion blur and camera mis-focus. Image restoration is designed to highlight the features of the image that make the image more clearly to the viewer, but not essentially to create accurate data from a scientific point of view. The main goal of edge restoration methods is to decrease noise and improve resolution loss.

II. Methodology

This offers the flow chart of the proposed algorithm. Figure 2 explain the different ways of attaining the data compression through planned algorithm standards.

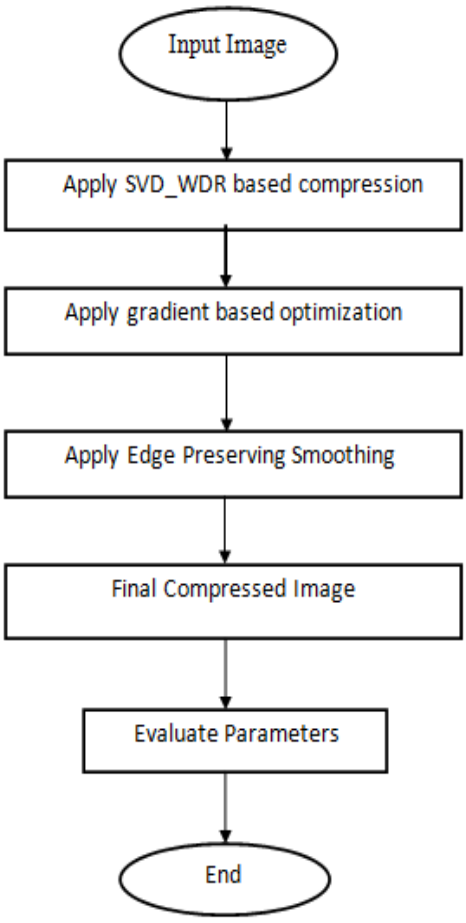

Fig2: flowchart of proposed algorithm

Step 1: Firstly input the actual image.
Step 2: After step 1, SVD and WDR based compression is applied to the image.
Step 3: Implement gradient based optimization to the Outcome of step 2.
Step 4: To make use of edge preserving smoothing.
Step 5: By using this process, final compressed image is produced from step 4.
Step 6: And then, the actual parameters are generally calculated.
Step 7: End.

III .EXPERIMENTATION AND RESULTS

Each of the research is carried out using the Lena image (668× 586).

Fig:3 input image

The currentmethod (SVD-WDR) and the computed outcomes was as follow-:

Fig:4 output of existing techniquue

The current methodthat is used for compression offers weak vision quality image while using the distortion within the image pixel.

Fig:5 output with the proposed technique

The latest proposed methodusing the integration of (SVD-WDR) together with the introduction of gradient optimization compressed without exploiting its visual quality.

Applying compression method by taking the various images and their quality is calculated by various performance parameters.

A. PERFORMANCE ANALYSIS

This type of papers has created along with implemented the actual proposed technique within MATLAB tool u2013a. The proposed algorithm standard is actually tested upon different images. The algorithm is used by using various performance matrices that is Structural similarity index matrix (SSIM), Bit Error Rate(BER)to find out the evaluation in between compressed images depending on SVD-WDR compression as well as the proposed strategies which is depend on edge restoration for lowering of ringing artifacts on the images.

1) Structural similarity index matrix

Structural similarity index matrix (SSIM) is a technique that computing the similarity in between two different images. The SSIM is observed as a quality measuring of one of several images being matched, offered the other image is considered as of excellent quality.

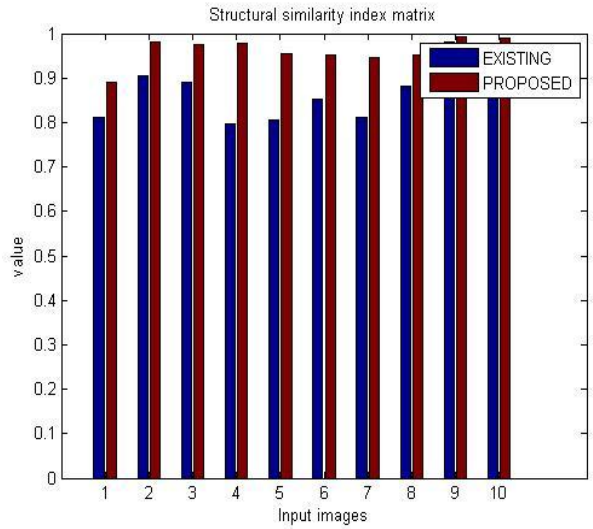

Fig 6indicates the exact evaluation of the SSIM associated with different images dealing with the SVD and WDR method through pre-existing method (blue color) along with edge restoration method (red color)

Table 1: Structural similarity index matrix

Images	Existing	Proposed
1	0.8112	0.8909
2	0.9054	0.9802
3	0.8911	0.9745
4	0.7967	0.9791
5	0.8042	0.9534
6	0.8514	0.9528
7	0.8115	0.9453
8	0.8826	0.9511
9	0.9818	0.9914
10	0.9345	0.9900

Table1: implies that SSIM value in the images through the help of proposed method that compared with pre-existing method that results in decreasing of the artifacts within images.

2) Bit Error Rate

This is identified as the rate where the problems arise within the transmission system. This is immediately converted into the number of problems which arise inside the string of a stated range of bits. The definition of bit error rate is converted into a simple formula:

$$BER = \frac{Number\ of\ problems}{Total\ number\ of\ bits\ sent}$$

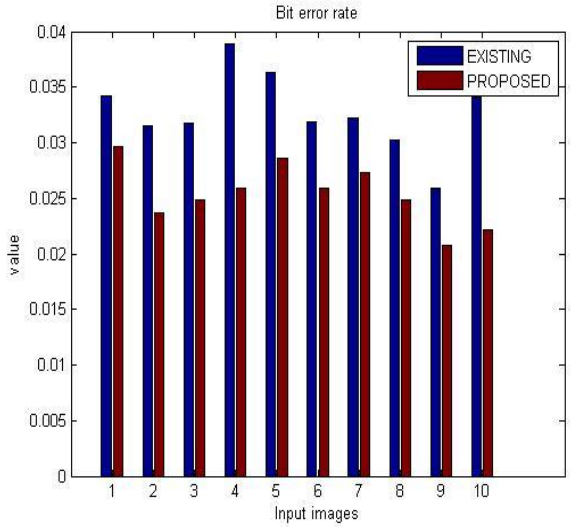

Fig 7 indicates the exact evaluation of the BER associated with different images dealing with the SVD and WDR method through pre-existing method (blue color) along with edge restoration method (red color)

Table 2: Bit Error Rate

Images	Existing	Proposed
1	0.0342	0.0297
2	0.0315	0.0237
3	0.0317	0.0248
4	0.0389	0.0259
5	0.0363	0.0286
6	0.0319	0.0259
7	0.0322	0.0273
8	0.0302	0.0248
9	0.0259	0.0208
10	0.0341	0.0222

Table 2: implies that BER value in the images through the help of proposed method that compared with pre-existing method that results in decreasing of the artifacts within images

IV.CONCLUSION AND FUTURE WORK

Transform-based compression is commonly usedfor image compression.This paper proposed the latest algorithm by using the SVD and WDR compression combined with edge restoration technique. The newly proposed method utilized the ordinary images for compression. The latest technique decreased the ringing artifacts within compressed images and the actual result indicates better improvement. The SVD and WDR compression combined with edge restoration method is computed by using performance evaluation parameters (BER, SSIM).So the main improvement in BER is 0.00732 and in SSIM is 0.09385.

In near future to enhance the results further, some other gradient optimization based technique will also be used. Also proposed technique will be tested on medical and underwater images.

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