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REMOVAL OF ARTIFACTS IN COMPRESSED IMAGES & VIDEOS USING ADAPTIVE FUZZY FILTERING

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Abstract- A fuzzy filter adaptive to both sample's activity and the relative position between samples is proposed to reduce the artifacts in compressed multidimensional signals. For JPEG images, the fuzzy spatial filter is based on the directional characteristics of ringing artifacts along the strong edges. Block based compressed signals suffer from blocking, ringing, mosquito, and flickering artifacts, especially at low-bit-rate coding. Separately compressing each block breaks the correlation between pixels at the border of neighboring blocks and causes blocking artifacts. Ringing artifacts occur due to the loss of high frequencies when quantizing the DCT coefficients with a coarse quantization step

Index Terms- Adaptive fuzzy filter,Artifacts, Image coding, Image sequences,Image compression.

I. Introduction

Block based compressed signals suffer from blocking, ringing, mosquito, and flickering artifacts, especially at low-bit-rate coding. Separately compressing each block breaks the correlation between pixels at the border of neighboring blocks and causes blocking artifacts. Ringing artifacts occur due to the loss of high frequencies when quantizing the DCT coefficients with a coarse quantization step. Ringing artifacts are similar to the Gibbs phenomenon and are most prevalent along the strong edges.

Many filter-based de noising methods have been proposed to reduce these artifacts, most of which are frame-based enhancement. For blocking artifact reduction, a linear low-pass filter was used into remove the high frequencies caused by blocky edges at borders, but excessive blur was introduced since the high frequencies components of the image were also removed.

To reduce ringing artifacts, the methods utilized are the linear or nonlinear isotropic filters to the ringing areas. As an encoder-based approach, proposed a noise shaping algorithm to find the optimal DCT coefficients which adapts to the noise variances in different areas. All of these methods can only reduce ringing artifacts in each frame.

II. Existing Work or Literature Survey

Here methods are basically adopted for reducing theseartifacts.In the first one, there is decrease of delaying artifacts which isimplemented at the encrypting side since due to the givendisadvantage. Some of these suggested schemes are enclosed blocktransform and combined transform and so on. post processing ofthe recreated picture is done in this methodology and as a result ofwhich visual quality without any modification in the encoding ordecoding side is improved.

Spatial domain Techniques:The following concept suggested a symmetrical,2D 3x3 Gaussianspatial cleaning idea which includes the pixels which are along theblock boundaries. But ,it lead to distortion in the image because ofits low pass sieving nature.Another proposal which uses theadaptive separable median filter.

Frequency Domain Techniques:Another new concept for decreasing the obstructive artifact infrequency domain. new index is used to analyse the obstructiveeffects. It shows that the expected value of MSDS rises afterquantized DCT coefficients. The following concept eliminates theblocking effect by reducing the MSDS, while putting linearlimitations equivalent to quantization bounds

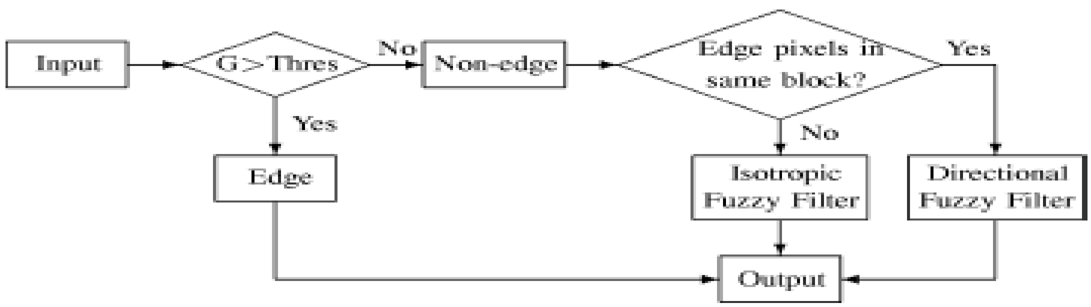
Fuzzy based Approaches: While implementing compression of image, their is a need topreserve prominent visible edges or boundaries for human insight.the blocks of images with containing many pixel edge give ainformation which could be used aa result so that it could bedecided when it should be less compressed.

III. PROPOSED WORK

Artifact is the result of an aggressive data compression scheme applied to an image, audio, or video that discards some data that may be too complex to store in the available data-rate, or may have been incorrectly determined by an algorithm to be of little subjective importance, but is in fact objectionable to the viewer.

Compression artifacts occur in many common media such as DVDs, common computer file formats such as JPEG, MP3, or MPEG files, and Sony'sATRAC compression algorithm. Uncompressed media (such as on Laserdiscs, Audio CDs, and WAV files) or losslessly compressed media (FLAC, PNG, etc.) do not suffer from compression artifacts.A distortion that appears in compressed video material as abnormally large pixel blocks. Also called "macroblocking," it occurs when the encoder cannot keep up with the allocated bandwidth. It is especially visible with fast motion sequences or quick scene changes.

Typically to reduce blocking artifact reduction a linear low pass filter was used to remove high frequency components caused by blocky edges at borders, but excessive blur is introduced since the high frequency components of the images were also removed.



Fuzzy logic works the way that humans think as opposed to the way that computers typically work. For example, consider the task of driving a car. You notice that the stoplight ahead is red and the car ahead is braking. Your mind might go through the thought process, "I see that I need to stop. The roads are wet because it's raining and there is a car only a short distance in front of me. Therefore I need to apply a significant pressure on the brake pedal." In fuzzy, non crisp ways, our final actions are crisp. The process of translating the results of fuzzy reasoning to a crisp, non fuzzy action is called defuzzification.

The Motion Compensated Filtering module is performed by using the mcfilter.dll which should reside in the working directory of DIVA3D where DIVA3D.EXE resides. When DIVA3D starts, a sub-menu called Motion CompensatedFiltering appears under the DIVA3D Modules menu. The options of this sub-menu provide several different implementations for motion-compensated temporal or spatio temporal filtering of a grayscale (single-channel) noisy video sequence. In all implementations, motion estimation is performed by a three-step search block matching method on the noisy image sequence. For all the available options, the same procedure is followed: the user first selects the input video stream (containing the video sequence to be filtered) and then specifies the input parameters for the selected filter through a filter specific dialog box. The operations of this module are supported by the Camera IO module. The input parameters of each filter are described below.

The directional fuzzy filter is extended for Artifact reduction in compressed video sequences. To increase the correlation between pixels, the surrounding frames are motion compensated before applying the MCSTF as shown in Fig. 4.5. The chroma components are first up sampled to the same size of the luma component. To obtain more accurate motion vectors, each frame is enhanced by an isotropic spatial fuzzy filter before the motion estimation phase. Next, the adaptive fuzzy filter is applied to the setΩ of spatiotemporal surrounding pixels centred by the pixel of interest I'[t,m,n].

IV. Results and discussion

Simulations are performed to demonstrate the effectiveness of the directional fuzzy filtering scheme. The qualities of the different approaches are compared in terms of visual quality and PSNR. In the experiments, a 1-D fuzzy de blocking filter as in is applied prior to the proposed directional fuzzy de ringing-filter to reduce the blocking artifacts.

In the case of the JPEG image with only vertical edges,shows the enhanced images using the isotropic fuzzyfilter and the directional fuzzy filter. For this simulation, the spread parameter of the isotropic fuzzy filter is fixed with $\sigma = 15$.

. Comparison of filter results for MJPEG sequences. (a) Compressed; (b) fuzzy spatial filter; (c) proposed fuzzy spatiotemporal filter

To see the individual contributions of the spatial and directional adaptations respectively, another simulation was performed for thecases of using only the spatial adaptation (without directional adaptation), using only the directional adaptation (without spatial adaptation) and using both the spatial and directional adaptations. The blurriness is caused by using the fixed amplitude of the spread parameter σ_m for all pixels.

To demonstrate the advantage of using temporal correlation, the simulation in this section is performed on MJPEG sequences. In this codec, each frame is compressed separately using the JPEG standard and the temporal redundancies between frames are not utilizedfor coding as in other codec's. Therefore, it is expected that the use of such temporal redundancies (i.e., correlation among frames) forpost filtering could lead to more pronounced quality improvement in this case. For the purposes of practical implementation and focusing on demonstrating the advantage of using extra information from surrounding frames, the motion compensation stage is omitted .

Compared to Chen's method and Liu's method which are DCT-based methods, the proposed directional fuzzy filtering method is performed in the pixel domain and has less computational complexity. On the other hand, the proposed filter requires an edge detection phase, which increases the complexity of the proposed method slightly compared to the conventional fuzzy filter. However, with the merit of the directional fuzzy filter in further removing the ringing artifacts around the edges, this extra complexity seems well-justifiable in many applications.

V. CONCLUSION

In this project, we implemented a new adaptive post-filtering algorithm to remove coding artifacts. It detects the possible locations of artifacts and adapts the filtering strength to the detected artifact level. Then, a fuzzy filter based on detection results is used. An effective algorithm for image and video de noising using an adaptive fuzzy filter is implemented.This novel method overcomes the limitations of conventional nonlinear filters by accounting for pixel's activity and the direction between pixels. It is shown that the adaptive fuzzy filter improves both visual quality and PSNR of compressed images and videos compared to existing approaches. Also, the experiment results showed that this method outperforms the others in both objective and subjective comparisons. Moreover, its processing speed is fast, especially the de-blocking part, which can satisfy the real-time application requirements.

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