MATLAB BASED IMPLEMENTATION AND COMPARATIVE ANALYSIS OF DE-BLOCKING ALGORITHMS

Wasim Khan
B.I.T.M, Lucknow
Khanwasim051@gmail.com

Mr. Sameer Awasthi
B.I.T.M, Lucknow
Sameer.awasthi@gmail.com

ABSTRACT

The demand for communication with moving video picture is increasing rapidly. Video compression is the extended field of communication engineering and computing that deals with video data illustration, for storage space and / or broadcast. The motion-estimation and motion-based recompense techniques are widely used in most video encoding standards, including H.264 / AVC (Advanced Video Coding) to compress the raw video. To improve the quality of the reconstructed video, the releases of several algorithms have been proposed. The step-change algorithm based on message filtering and innovative algorithm are one of them. In this paper, the offset-shift algorithm is applied to motion compensation frames and a method is provided for calculating the motion-based adaptive threshold associated with the motion sequence. This paper also describes directional de-blocking algorithm and averaging de-blocking algorithm. Experimental results indicate that proposed offset algorithm provides better improvement in PSNR (dB) and SSIM compared to de-blocking algorithm with fixed threshold, novel de-blocking algorithm, directional de-blocking algorithm and averaging de-blocking algorithm, for highly compressed standard test images and video sequences.

KEYWORDS: Deblocking filter, Blocking artifacts, Novel de-blocking method, Offset-shift de-blocking method, Directional de-blocking method, Averaging de-blocking method, PSNR(pick signal to noise ratio), SSIM(structural similarity index).

1. INTRODUCTION

Compression is the process to dense data by reducing the quantity of bits. With eye specific appearance and removal of superfluous data we can accomplish compression. Compression occupies a harmonizing pair of systems, a compressor known as encoder and a decompressor known as Decoders and is commonly known as CODEC, the method executes encoding & decoding on digital images and videos. Image compression is an appliance of data compression that encodes the original input image in a small number of bits. The reason of image and video firmness is to decline the redundancy of the input image or video and to build up or broadcast data in a practical form. The major goal of such organization is to diminish the storage space quantity as much as feasible, and the decoded image is obtainable on monitor can be analogous to the novel image as much as potential. Image compression system is a class of data compression approach applied to digital images to reduce cost, size and time for storage or broadcast. Image compression has two form first one is lossy and other is lossless. Lossless compression is favored for sensitive purposes and often for medical imaging, scientific illustrations, snap art, or caricatures. Lossy compression techniques, mainly when used at low bit rates, bring in compression artifacts. Data rate required for 30 frames per Second full High Definition color video is 30x1920x1088x3x8 = 1.5 GBPS, which is impractical for today’s communication or storage infrastructure [1]. Such lofty data rate point outs the requisite of video encoding and hence a number of video coding principles have been urbanized for compression of raw inputs. The majority of the video coding principles (together with H.264) use block based Movement Estimation and Movement Compensation technique for raw multimedia compression. Other than quantization of the convert coefficients and motion recompense of chunk can reason for visually troubling interruption at the chunk boundaries and reduce visual quality of decoded videos. Here interruption at the chunk borders is known as Blocking-Artifacts [2].
2. LITERATURE REVIEW

There are two major moves towards the assimilation of de-blocking filters into video codec. There are two way to use De-blocking filters one is as post filters and other is as loop filters [3]. H.264/AVC de-blocking filter [3] is in-loop filter which apply 1-D weak filter or strapping filter on block boundary using threshold. Since Post filtration use to operate only on buffer display outside the coding loop, that’s why post-processing needs no alteration of obtainable principles to get improved class and it is the most sensible explanation to eliminate the blocking artifacts. In other words post-filters offer maximum freedom for decoder implementations [6],[7]. Whereas loop filters operate within the coding loop. For encoding of successive frames here filtered frames are used as allusion frames. This forces all standard decoders to perform identical filtering in order to stay in synchronization with the encoder and increases the computational complexity [3],[4],[8],[9]. According to [8] and [10], post filtering based de-blocking algorithm is better compared to in-loop filtering based algorithm due to less computational complexity. Y. L. Lee et al. [11] classify the blocking artifacts in BDCT-coded images into three types as follows: grid noises in the smooth area, staircase noises along the image edges, and corner outliers in the cross points of the four 8 x 8 DCT blocks. Numbers of post filtering based de-blocking algorithm have been proposed to remove above all three kinds of noises. De-blocking filter in [9] first remove high frequency components from frame and then according to block activity it uses smooth filtering mode, non-symmetric filtering mode, boundary adjustment mode and corner outliers removal mode to remove blocking artifacts. Lee et al.’s method [11] applied a 2-D filter to the edge map obtained by sobel operator. However, Lee et al.’s method exhibits poor de-blocking performance in edge or texture areas, since sobel operator often detects blocking artifacts as real edges. The filters [12] is applied only to the boundary pixels, which are two pixels straddling the block boundary, and thus do not remove the grid noises. Offset-shift algorithm in [8] is able to remove all three kinds of noises but it uses non adaptive fix threshold T to remove noises. Due to fix threshold this algorithm gives poor improvement in PSNR for other images.

Novel algorithm proposed in [10] is not able to remove above all three kinds of noises as they apply 1-D filter or 2-D filter only in middle boundary pixels of two adjacent 8x8 block of frame for horizontal filtering and vertical filtering.

De-blocking filter [13] applied offset-shift technique to remove blocking artifacts but it modified only two pixels on either side of boundary in smooth filter and only one pixel on either side of boundary in complex filter. This filter also proposed corner outliers removal mode. But both filters [9] and [13] were not able to remove grid noise efficiently as both filters were applied only on middle pixels of 8x8 blocks.

Adaptive de-blocking filter [14] applies 1-D or 2-D strong or default filter on pixels based on their position in block. But this filter offers more computational complexity with less considerable improvement in frame quality. Next section describes concepts and working of de-blocking filter.

John kim [15] proposed a post-processing algorithm based on the offset-and-shift technique in order to remove the blocking artifacts in HDTV and digital camera images. The proposed deblocking filter consists of 1-D signal adaptive filters to remove grid noises and a 2-D directional filter to deal with staircase noises and corner outliers. The 1-D signal adaptive filtering was applied non-symmetrically for each block type obtained by simple gradient-based classification.

Jagroop singh [13] proposed new adaptive post-filtering algorithm to remove coding artifacts. The method detects all possible regions of artifacts and adapts the filtering strength to the detected artifact level. Thus, the time and the computational load of the deblocking method are condensed compared to other deblocking methods. The boundary regions between blocks are identified as smooth, non-smooth and intermediate regions.

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classification. In spite of its low complexity, experimental results show that the proposed algorithm effectively removes all types of the blocking artifacts and preserves the original details. The objective performance of the method measured in PSNR is improved by up to 1.4dB for the various test images. The algorithm achieves the best visual quality in terms of GBIM values. Moreover, the scheme takes less execution time compared with the related methods, since the classification and the filtering based on the offset-and-shift technique are simple. Taking into account good objective and subjective performance with low execution time, the proposed algorithm can be employed for real-time applications such as HDTV and digital cameras.

Hua-Chang Chung[5] proposed an adaptive in-loop deblocking filter (DF) is standardized in H.264/AVC to reduce blocking artifacts and improve compression efficiency. This paper proposes low power DF architecture with hybrid and intelligent edge skip filtering order. Further adopt a four-stage pipeline to boost the speed of DF process and the proposed Horizontal Edge Skip Processing Architecture offers an edge skip aware mechanism for filtering the horizontal edges that not only reduces power consumption but also reduces the filtering processes down to 100 clock cycles per macro block. In addition, the structural design utilizes the buffers professionally to hoard the provisional data without distressing the normal definite data addiction by a sensible strategy of edge filtering organize to enhance the reusability of the intermediate data. The system throughput can then be improved and the power consumption can also be reduced.

3. MATLAB IMPLEMENTATION

MATLAB based implementation is shown in this section. Figure 1 shows PSNR before filter. Here filter is applied at boundaries not only at a particular section. Figure 2 shows a clear PSNR after 1D filter improvement on image and figure 3 shows 2D improvement. Figure 4 and 5 shows PSNR mat 1D & 2D after filter. Figure 6 SHOWING Graph with Improvement for image city and similarly figure 7, figure 8, figure 9, figure 10 shows improvement on images and videos after proposed filtration. Table 1 Showing improved Result for proposed novel algorithm which clearly shows that the proposed algorithm shows a good amount of improvement percentage.

Figure 1. PSNR BEFORE FILTER
Figure 2. PSNR after 1D filter improvement

Figure 3. PSNR AFTER 2D filter improvement
Figure 6. Graph showing Improvement for image city

Figure 7. Graph showing Improvement for image crew
Figure 8. Graph showing Improvement for video foreman

Figure 9. Graph showing Improvement for video harbour
Table 1. Showing improved Result for proposed novel algorithm

<table>
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<tr>
<th>Sequence</th>
<th>AVG PSNR</th>
<th>AVG PSNR AVG 1D Im</th>
<th>AVG PSNR AVG 2D Im</th>
<th>SSIM before</th>
<th>SSIM after</th>
<th>SSIM after</th>
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</table>

Figure 10. Graph showing Improvement for Video novel
Filter proposed in [10] apply 1-D filter or 2-D filter only in middle boundary pixels of two adjacent 8x8 block of frame for horizontal filtering and vertical filtering. Now filtering procedure is slightly modified by applying 1-D filter or 2-D filter to all boundary pixels. Table 1 show the average PSNR and SSIM for standard video sequences and test images respectively. Result shows that such method proposed for novel de-blocking method give better PSNR (dB) and SSIM contrast to filter proposed in [10].

4. CONCLUSION

The anti-lock filter can be classified into two categories, loop filter and post filter. The post filter is better compared to the loop filter because the post-processing does not require any modification of the existing standards. A single disadvantage of the post filter is that it requires an additional frame buffer to hold the filtered frame. The proposed algorithm previously proposed was not able to effectively remove the blocking artifacts as it applies to the 1-D filter or the 2D filter only in the intermediate pixels of two adjacent blocks of 8 × 8 for horizontal and vertical filtering. The experimental results clearly demonstrate this method for a new filter; The average of the anti-lock filter and the directional de-blocking filter all have the ability to efficiently reduce the blocking artifacts of the encoded transformation as well as highly compressed images or images. Filter proposed in [10] apply 1-D filter or 2-D filter only in middle boundary pixels of two adjacent 8x8 block of frame for horizontal filtering and vertical filtering. Now filtering procedure is slightly modified by applying 1-D filter or 2-D filter to all boundary pixels. Table 1 show the average PSNR and SSIM for standard video sequences and test images respectively. Result illustrates that such method proposed for novel de-blocking method gives better PSNR (dB) and SSIM contrast to filter proposed in [10].

REFERENCES


