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Analysis a Low Complex Scalable Spatial Adjacency Acc-DCT Based Video Compression Method and Local Estimation of Video Compression Artifacts

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Abstract: In decoded digital video, the local compression Artifact level depends on the global compression ratio and the local video content. Local Estimation of Video Compression Artifacts describes an algorithm to create estimators of the local ringing and blocking artifact levels from the decoded video signal. Its estimators enable high quality video enhancement in consumer TV. And low complex Scalable ACC-DCT based video compression approach which tends to hard exploit the pertinent temporal redundancy in the video frames to improve compression efficiency with less processing complexity. In which used model consists on 3D to 2D transformation of the video frames that allows exploring the temporal redundancy of the video using 2D transforms .This technique transforms each group of pictures (GOP) to one picture .This model is also incorporated with up/down sampling method (SVC) which is based on a combination of the forward and backward type discrete cosine transform (DCT) coefficients.

Keywords: SVC (Scalable Video Coding), Group of Pictures (GOP), ACC-DCT, Spatial and Temporal Correlation.

I. INTRODUCTION

Videos are the most useful and most appealing approach to represent some information. Today all the communication approaches are working with such kind of media. The only problem with such kind of media is the large size. Either we have to store the data in database or to transfer video over some communication medium, video size always effect the efficiency. Because of this video compression is required to save the storage space. The most common compression techniques find the redundancies in the movie frame and the correlation between the scenes to get high degree of compression.

Lossy compression of images and video typically leads to compression artifacts, like blocking and ringing. Over time, many post-processing algorithms have been proposed to reduce such compression artifacts, e.g. [1], [2]. Recent artefact reduction methods adapt to the content [3]. Nonetheless,

Knowledge of the artefact level is helpful to prevent over smoothing of high quality content and insufficient reduction in low quality content. Therefore, locally optimal artefact reduction requires local artefact level estimation. However, techniques that have been proposed can only (globally) detect the *location* of artifacts, e.g. the location of the block grid [1], [4], or the *average level* of artifacts in an image [5], [6]. Techniques in the first category indicate where compression artifacts may occur, but do not indicate the level of the artifacts locally. For ringing artifacts, most of the described techniques can only determine the average Level of the artefact [6].In this research at a local, pixel accurate, estimation of the artefact level in an image for blocking (in flat and non-flat areas separately) as well as for ringing.

And in The main objective of video coding in most video applications is to reduce the amount of video data for storing or transmission purposes without affecting the visual quality. The desired video performances depend on applications requirements, in terms of quality, disks capacity and bandwidth. For portable digital video applications, highly integrated real-time video compression and decompression solutions are more and more required. Motion estimation based encoders are the most widely used in video compression. And exploits inter frame correlation to

Provide more efficient compression. However, Motion estimation process is computationally intensive;

Its real time implementation is difficult and costly [10] [11]. This is why motion-based video coding standard MPEG [21] was primarily developed for stored video applications, where the encoding Process is typically carried out off-line on powerful computers. So it is less appropriate to be implemented as a real-time compression process for a portable recording or communication device (video surveillance camera and fully digital video cameras). Coder based on 3D transform produces video compression ratio which is close to the motion estimation based coding one with less complex processing [12][13][14][15]. The 3D transform based video compression methods treat the redundancies in the 3D video signal. It is possible to achieve more efficient compression by exploiting more and more the redundancies in the temporal domain.

A. Three dimensional DCT

The discrete cosine transform (DCT)[13][16] has energy packing efficiency close to that of the optimal Karhunen-Loeve transform. In addition, it is signal independent and can be computed efficiently by fast algorithms. For these reasons, the

DCT is widely used in image and video compression. Since the common three-dimensional DCT kernel is separable, the 3D DCT is usually obtained by applying the one-dimensional DCT Along each of the three dimensions. Thus, the N ×N ×N

3D DCT can be defined as

$$X(u,v,w) = \sum_{i=0}^{N-1} \sum_{j=0}^{N-1} \sum_{k=0}^{N-1} x(i,j,k)C(i,u)C(j,v)C(k,w) \quad (1)$$

$$x(i,j,k) = \sum_{u=0}^{N-1} \sum_{v=0}^{N-1} \sum_{w=0}^{N-1} X(u,v,w)C(i,u)C(j,v)C(k,w) \quad (2)$$

$$\text{where } C(p,q) = \begin{cases} \frac{1}{\sqrt{N}} & ,q=0 \\ \sqrt{\frac{2}{N}} cos\left(\frac{(2p+1)q\pi}{2N}\right) & ,q \neq 0 \end{cases}$$

II. RELATED WORK

A. Local Estimation of Video Compression Artifacts

However, the approach of Viola and Jones cannot be applied to create a local estimator of compression artifacts without adaptations. Object detection is generally handled as a binary major difficulty is that, although detection of compression artifacts is possible on pixel basis, level estimation of these artifacts requires statistics of a larger area. In which solved this by grouping similar pixels into segments, such that a level can nonetheless be assigned at the pixel grid. To create an accurate estimator of compression artifacts, In which designed the following three-step procedure:

1) *Pixel-based detection* of compression artifacts
2) *Segment-based estimation* of the artifact level
3) *Pixel-based assignment* of the artifact level In the first step, a local (binary) detector of compression artifacts is created with AdaBoost. This requires a 'ground truth' labelling of the training data. Next, potentially relevant features were calculated for each pixel, e.g.

- ADRC code [9] using a window *W*3 of 3x3
- Variance for a window *WN* of *N*x*N*, *N* = 3, 5, 7... 13
- Dynamic range, *DR*, for a window *WN* of *N*x*N*, *N* =

3, 5, 7... 13
Where the ADRC code of each pixel _*xi* ∈ *W*3 is defined as
ADRC (*xi*) =

_
0 *V* (_*xi*) ≤ *Vav*
1 otherwise (1)
Where *V* (_*xi*) is the luminance value of pixel _*xi*,
Vav = 1/9

_
_*xi*∈*W*3
V (_*xi*), (2)

And:
DR = *max* − *min*,
max = max_*xi*∈*WN*

_
V (_*xi*)

_
,
min = min_*xj*∈*WN*

_
V (_*xj*), (3)

Furthermore, a global blocking detector was added as feature. Using the training data, AdaBoost selects and combines relevant features to a so-called strong classifier or detector. In the second step, the level of the compression artifacts is estimated using segments. K-Means clustering is used to create segments of similar pixels of an image, based on the attributes variance, dynamic range and mean in a window of 5x5. Each segment is semi-automatically labelled according to its level of compression. More visible compression artifacts in the segment,stronger level. Histograms of local features are calculated per segment. AdaBoost is used multiple times to create a cascade of strong classifiers, where each layer of the cascade corresponds to one level of compression see Fig.1

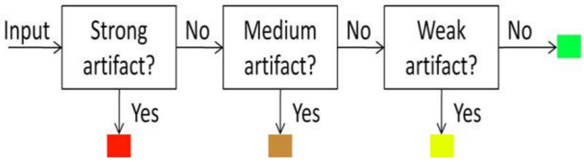

Fig.1.Cascade of strong classifiers

Finally, in the last step the level of the compression artifacts, estimated by the cascade of strong classifiers on segment basis (step 2), is assigned to pixels determined by the detector (step 1).

B. ACC-DCT Based Video Compression Method

This is the performance of the proposed low complex scalable ACC-DCT based video compression model. Compression rate is obtained with GOP=8. Here Figure.2.GUI model is created to integrate the encoder and decoder sections.Figure.3. shows the progress of frame separation from video sequence. Encoder model is shown in Figure.4. And Figure.5: Is the example Accordion representation for one GOP video cube. Figure.6: GUI for Decoding and Validation Process. Figure.7: GUI for Reconstructed output validation, then history of entire simulation is specified as **ans.**

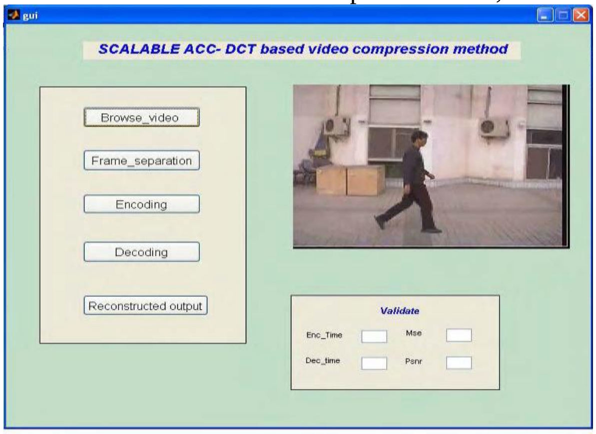

Fig.2: GUI Model

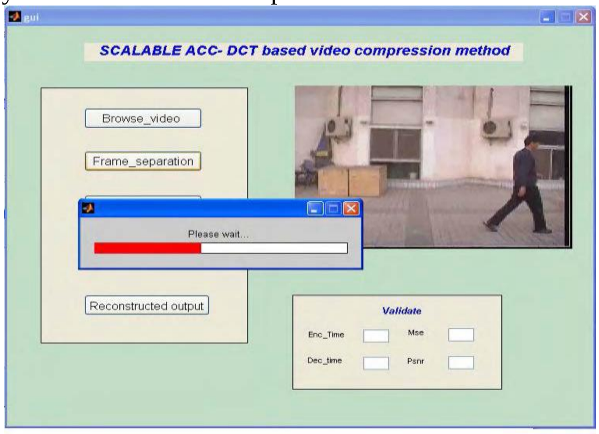

Fig.3: Frame Separation Model

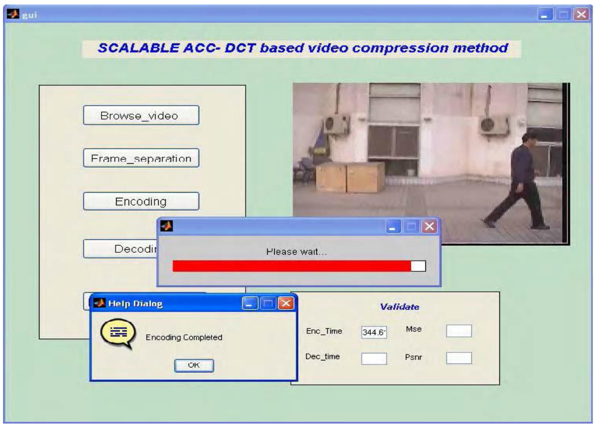

Fig.4: Encoding Model

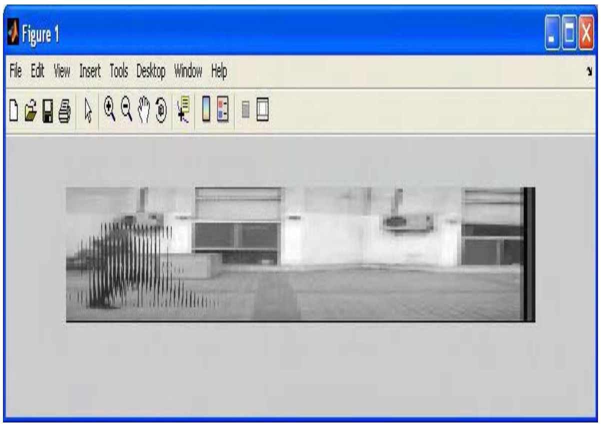

Fig.5: Accordion Representation example (Hall Monitor)

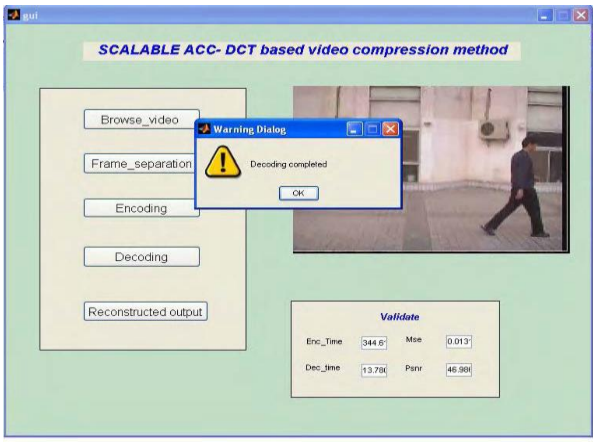

Fig.6: GUI for Decoding and Validation Process.

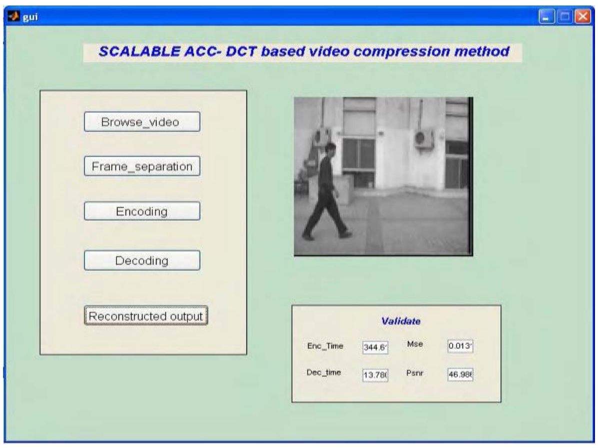

Fig.7: GUI for Reconstructed output validation

Ans =
HObject: 4.0011
Event data: []
Handles: [1x1 struck]
q: 1
str1: 'frame'
str2: '.bmp'
Bit stream: {[51782x1 double]}
Bits: 51782
j1: 2
f: 1
filename_1: '1.bmp'
Image1: [120x960 double]
row: 244
col: 356
out: [120x960 double]
Enc: [120x960 double]
r: 120
c: 960
Input_filesize: 921600
I: 120
j: 960
QEnc: [120x960 double]
ZQEnc: [1x115200 double]
Level: 8
Speed: 0
xC: {[1x115200 double]}
y: [51782x1 double]
Res: [2x4 double]
cs: 4
cc: 51782
dd: 51782
Compresed_file_size: 51782
Comp_RATIO: 71.1908
Enctime: 345.6888

This method presents several advantages:

1. This method transforms the 3D features to 2D ones, which enormously reduce the Processing complexity.
2. This encoder and decoder are symmetric with almost identical structure and complexity, which facilitates their joint implementation.
3. It exploits the temporal redundancies more than the space redundancies.
4. Offers flexibility that makes it possible to be adapted to different requirements of video applications: The latency time, the compression ratio and the size of required memory depend on the value of the GOP parameter.
5. That is allows the random frame access

III. CONCLUSION

We are analysis the both research in Local Estimation of Video Compression Artifacts have designed a generic technique to create local video compression artefact level estimators. Although detection is possible on the pixel grid, level estimation requires statistics of a larger area. By grouping similar pixels into segments, they could estimate the artefact level, which they assigned to the pixels in that segment for which the artefact was detected. The created estimators are designed to enable high quality consumer video enhancement. Future work will focus on complexity reduction of the proposed estimators.

Bit rate values. Over 2000kb/s bit rate values; this compression method performance becomes comparable to the MPEG 4 standard especially for low motion sequences. Transformations such as wavelet Transformation. And in A Low Complex Scalable Spatial Adjacency ACC-DCT Base Video Compression Method successfully extended and implemented a low complex scalable ACC-DCT based video compression algorithm. It is not only improved the coding efficiency in the proposed encoding algorithm but also it reduces complexity. As discussed in the experimental section, this method provides benefits of rate-PSNR performance at the good quality of base layer and low quality of enhancement layer. It presents some useful functions and features which can be exploited in some domains as video surveillance. In high bit rate, it gives the best compromise between quality and complexity.

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