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Efficient VideoEnhancement Based on Histogram Equalization

Asma Ayesha
M.Tech,
Anurag Engineering College,
Kodad, Telangana State, India.

M.Basha, M.Tech
Associate Profesor,
Anurag Engineering College,
Kodad, Telangana State, India.

ABSTRACT:

Video enhancement plays an important role invarious video applications. In this paper, we propose a new intraand-inter-constraint-based video enhancement approach aimingto: 1) achieve high intraframe quality of the entire picturewhere multiple regions-of-interest (ROIs) can be adaptively andsimultaneously enhanced, and 2) guarantee the interframe qualityconsistencies among video frames. We first analyze features fromdifferent ROIs and create a piecewise tone mapping curve for theentire frame such that the intraframe quality can be enhanced.We further introduce new interframe constraints to improve thetemporal quality consistency. Experimental results show that theproposed algorithm obviously outperforms the state-of-the-artalgorithms.

I. INTRODUCTION:

VIDEO services have become increasingly important in many areas including communications, entertainment,healthcare, and surveillance. However, in many applications, the quality of video service is still hindered by severaltechnical limitations such as poor lightening conditions, bad exposure level, and unpleasant skin color tone. Thus, it iscrucial to enhance the perceptual quality of videos. The first aim of this paper is to set out a concise mathematicaldescription of AHE. The second aim is to show that the resulting framework can be used to generate a variety of contrast enhancement effects, of which HE is a special case. This is achieved by specifying alternative forms of a function which wecall the cumulation function. Several contrastenhancement techniques have been introduced to improve the contrast of animage. These techniques can be broadly categorized into two groups: direct methods and indirect methods.

A.Intra frame Quality Enhancement with Multiple Regions of Interest (ROIs):

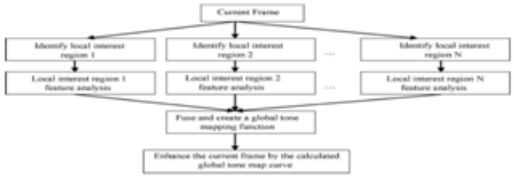

Fig1.1: Intra frame Quality Enhancement with Multiple Regions of Interest.

Since a frame may often contain multiple ROIs, it is desirable for the enhancement algorithm to achieve high intra framequality of the entire Picture where multiple ROIs can be adaptively and simultaneously enhanced.

B.Inter frame Quality Enhancement among frames:

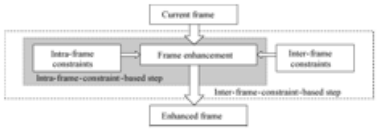

Fig1.2:Inter frame Quality Enhancement among frames.

They are not suitable for enhancing videos since the inter frame quality consistencies among frames are not considered.Some state-of-the-art algorithms can be extended for enhancing.Inter frame qualities under some specific applications. Forexample, Liu et al. proposed a learning-based method for video conferencing where frames share the same tone mappingfunction if their backgrounds do not change much. Although this method can achieve good inter frame quality in videoconferencing scenarios, it cannot be applied to other scenarios if the video backgrounds or contents change frequently. Todericietal.introduced a temporally coherent method by combining the frame feature and the shot feature to enhance aframe. Their method can effectively enhance both the shot change frames and the regular frames.

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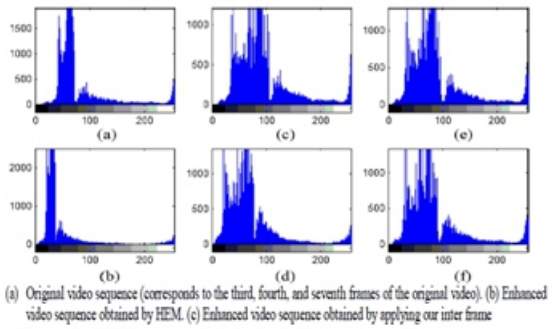

(a) Original video sequence (corresponds to the third, fourth, and seventh frames of the original video). (b) Enhanced video sequence obtained by HEM. (c) Enhanced video sequence obtained by applying our inter frame

Fig 1.3:Video sequence

II. HISTOGRAM EQUALIZATION:

Histogram Equalization Methods:

The most popular technique for contrast enhancement of images is histogram equalization (HE). It is one of the well-known methods for enhancing the contrast of a given image in accordance with the samples distribution. HE is a simple and effective contrast enhancement technique which distributes pixel values uniformly such that enhanced image have linear cumulative histogram. It stretches the contrast of the high histogram regions and compresses the contrast of the low histogram region. The HE technique is a global operation hence; it does not preserve the image brightness. HE has been widely applied when the image needs enhancement, such as medical image processing, radar image processing, texture synthesis, and speech recognition. HE usually introduces two types of artefacts into the equalized image namely over-enhancement of the image regions with more frequent gray levels, and the loss of contrast for the image regions with less frequent gray levels. To overcome these drawbacks several HE-based techniques are proposed and are more focused on the preservation of image brightness than the improvement of image contrast. Few methods often generate images with annoying visual artefacts and unnatural appearances, though the image brightness is preserved to some extent.

Histogram Equalization based Techniques:

Histogram equalization is a simple and an effective contrast enhancement technique which distributes pixel values uniformly such that enhanced image have linear cumulative histogram and is a global operation.

Hence, it does not preserve the image brightness. To overcome these drawbacks and increase contrast enhancement and brightness preserving many HE-based techniques have been proposed.

A) Bi-Histogram Equalization Methods:

Bi-histogram equalization methods divide the histogram into two sub-histograms based on different dividing points. Later, each sub-histogram is equalized individually based on histogram equalization. These methods can preserve image brightness more, when compared to Histogram Equalization method.

B) Multi Histogram Equalization Methods :

In order to enhance contrast, preserving brightness and improve natural looking of the images, multi-histogram equalization technique decomposes the input image into several sub-images, and then applies the classical histogram equalization process to each of sub-histogram. Image processed by Multi-HE methods preserves the image brightness and prevent introduction of undesirable artefacts but not significantly enhance the contrast.

C) Clipped Histogram Equalization Methods :

Generally, histogram equalization stretches the contrast of the high histogram regions, and compresses the contrast of the low histogram regions. As a result, when the object of interest in an image only occupies a small portion of the image, this object will not be successfully enhanced by histogram equalization and this method also extremely pushes the intensities towards the right or the left side of the histogram, causing level saturation effects. To overcome these problems, Clipped Histogram Equalization (CHE) methods are used to restrict the enhancement rate. CHE modifies the shape of the input histogram by reducing or increasing the value in the histogram's bins based on a threshold limit before the equalization is taking place. This threshold limit is also known as the clipping limit, or the plateau level of the histogram. The histogram will be clipped based on this threshold value. In some cases clipped portion will be redistributed back to the histogram and then histogram equalization is carried out.

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Clipped Histogram Equalization (CHE) is far more effective for contrast enhancement than the existing HE-based method.

Adaptive Histogram Equalization:

The AHE process can be understood in different ways. In one perspective the histogram of grey levels (GL's) in a windowaround each pixel is generated first. The cumulative distribution of GL's, that is the cumulative sum over the histogram, isused to map the input pixel GL's to output GL's. If a pixel has a GL lower than all others in the surrounding window theoutput is maximally black; if it has the median value in its window the output is 50% grey.This section proceeds with aconcise mathematical description of AHE which can be readily generalized, and then considers the two main types ofmodification. The relationship between the equations and different (conceptual) perspectives on AHE, such as GLcomparison, might not be immediately clear, but generalizations can be expressed far more easily in this framework.

III. A+ECB Video Enhancement:

A. Motivations:

As mentioned, most existing approaches have various limitations in enhancing videos. It shows enhanced results bymodified global histogram equalization algorithm and region based method. Since image is enhanced based on globalcontrast metric without considering region differences such as face are not properly enhanced. Since region based methodidentifies the face region and performs enhancement, the visual enhancement is much improved. The tone mappingfunction trained from face region will be applied to an entire image the quality of some other regions such as screenbecomes poorer.

From the above discussions, we have the following observations:

1) In order to achieve suitable enhancement results, features from ROIs need to be considered;
2) It is desirable to enhance the entire frame "globally" but with the consideration of different ROIs at the same time.

B.Intra-and-Inter-Constraint-Combined Algorithm:

The framework of our A+ECB algorithm can be described an input frame is first enhanced by the proposed ACB step forimproving the intra frame quality. Then, the resulting frame will be further enhanced by the proposed ECB step forhandling the inter frame constraints. The ACB step and the ECB step will be described in detail in the following.

ACB Step:

Fig3.1:Implementation of acb step

The processes of the ACB step can be further described by multiple ROIs are first identified from the input video frame. Inthis paper, we use video conferencing or video surveillance as example application scenarios and identify ROIs (such ashuman faces, screens, cars, and whiteboards) based on an AdaBoost-based object detection method. Other object detectionand saliency detection algorithms can also be adopted to obtain the ROIs.

C.ECB Step:

The ECB step can be implemented by the HEM-based framework. In our paper, besides we also propose another ECB step.

D.Results for the ACB Step:

It compares the enhancement results for different intra frame enhancement methods. Since the colors of the two people arefar different to each other, the learning-based method cannot properly enhance both faces simultaneously. As when itenhances the face of one person, the quality of another person's face becomes unsatisfactory. Although by using the factor-basedstrategy in the trade-off between the two faces can be improved, it is still less effective in creating a tone mappingcurve for enhancing both ROIs.

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We can see that the face of the right person is still dark in. Comparatively, our ACBalgorithm will select the piecewise strategy that calculates a fused piecewise global tone mapping function based on bothregions. We can achieve satisfactory qualities in both faces. Moreover, although the original video from each party mayhave large difference in illumination conditions, the enhancement results of different users are more coherent by ouralgorithm.

IV. PROPOSED SYSTEM and SIMULATION RESULTS:

In this paper, a new intra-and-inter-constraint-based (A+ECB) algorithm is proposed.

The proposed algorithm analyzes features from different ROIs and creates a "global" tone mapping curve for the entire frame such that different regions inside a frame can be suitably enhanced at the same time. Furthermore, new inter frame constraints are introduced in the proposed algorithm to further improve the inter frame qualities among frames.

Experimental results demonstrate the effectiveness of our proposed algorithm. As mentioned, most existing approaches have various limitations in enhancing videos. It shows enhanced results by modified global histogram equalization algorithm and region based method.

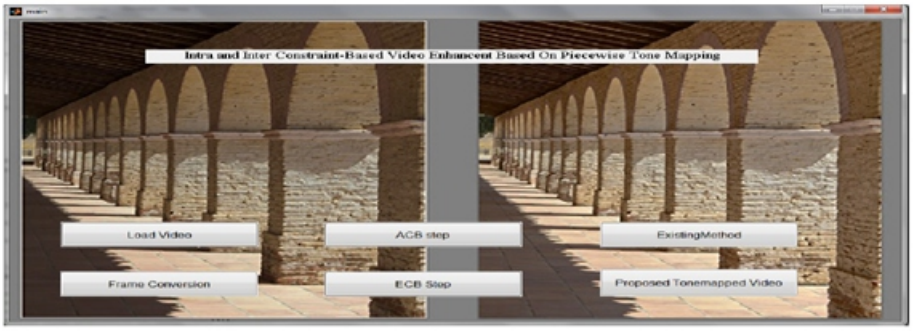

Fig.4. The designed video Enhancement system by using MATLAB GUI.

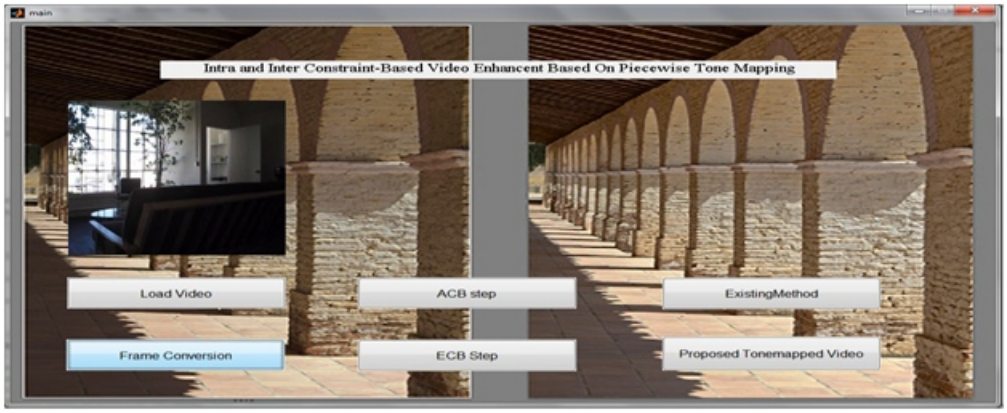

Fig.4.2. selected low resolution input video from data base.

The processes of the ACB step can be further described by multiple ROIs are first identified from the input video frame. In this paper, we use video conferencing or video surveillance as example application scenarios and identify ROIs (such as human faces, screens, cars, and whiteboards) based on an Ada Boost-based object detection method. Other object detection and saliency detection algorithms can also be adopted to obtain the ROIs.

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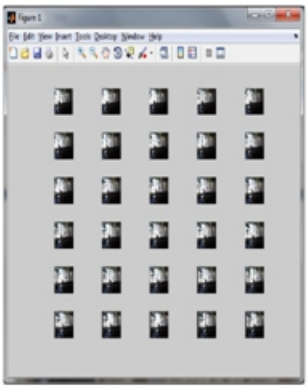

Fig4.3:Selected video frames conversion

Fig4.4: selected region of interest in the frame.

Fig4.5: Enhanced region of interested area by using ACB proceses.

The ECB step can be implemented by the HEM-based framework. In our paper, besides we also propose another ECB step. It compares the enhancement results for different intra frame enhancement methods. Since the colors of the two people are far different to each other, the learning-based method cannot properly enhance both faces simultaneously. As when it enhances the face of one person, the quality of another person's face becomes unsatisfactory.

Although by using the factor based strategy in the trade-off between the two faces can be improved, it is still less effective in creating a tone mapping curve for enhancing both ROIs. We can see that the face of the right person is still dark in. Comparatively, our ACB algorithm will select the piecewise strategy that calculates a fused piecewise global tone mapping function based on both regions.

V.EXPERIMENTAL RESULTS:

We can achieve satisfactory qualities in both faces; Moreover, although the original video from each party may have large difference in illumination conditions, the enhancement results of different users are more coherent by our algorithm.

Fig5.1:Enhanced Region of interested area by using ECB processes

Fig5.2:Enhanced Region of interested area combined intra and inter constraints base tone mapping method

VI.CONCLUSION:

In this paper, we proposed a new A+ECB algorithm forvideo enhancement. The proposed method analyzed featuresfrom different ROIs and created a "global" tone mapping curvefor the entire frame such that the intraframe quality of a framecan be properly enhanced. Furthermore, new interframe constraintswere introduced in the proposed algorithm to furtherimprove the interframe qualities among frames. Experimentalresults demonstrated the effectiveness of our algorithm.

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VII.References:

[1] M. Sun, Z. Liu, J. Qiu, Z. Zhang, and M. Sinclair, "Active lighting forvideo conferencing," IEEE Trans. Circuits Syst. Video Technol., vol. 19,no. 12, pp. 1819–1829, Dec. 2009..

[2] J. A. Stark, "Adaptive image contrast enhancement using generalizationsof histogram equalization," IEEE Trans. Image Process., vol. 9, no. 5,pp. 889–896, May 2000.

[3] C. Shi, K. Yu, J. Li, and S. Li, "Automatic image quality improvementfor videoconferencing," in Proc. ICASSP, 2004, pp. 701–704.

[4] Z. Liu, C. Zhang, and Z. Zhang, "Learning-based perceptual imagequality improvement for video conferencing," in Proc. ICME, 2007, pp.1035–1038.

[5] R. Schettini and F. Gasparini, "Contrast image correction method," J.Electron.Imag., vol. 19, no. 2, pp. 5–16, 2010.

[6] S. Battiato and A. Bosco, "Automatic image enhancement by content dependent exposure correction," EURASIP J. Appl. Signal Process., vol.2004,no. 12, pp. 1849–1860, 2004.

[7] G. D. Toderici and J. Yagnik, "Automatic, efficient, temporally-coherent video enhancement for large scale applications," in Proc. ACMMultimedia,2009, pp. 609–612.

[8]J. Zimmerman, S. Pizer, E. Staab, E. Perry, W. McCartney and B. Brenton, "Evaluation of the effectiveness of adaptive histogram equalization for contrast enhancement", IEEE Trans. Medical Imaging, (1988), pp. 304-312.

[9] T. K. Kim, J. K. Paik and B. S. Kang, "Contrast enhancement system using spatially adaptive histogram equalization with temporal filtering", IEEE Transaction on Consumer Electronics, vol. 44, no. 1, (1998), pp. 82-86.

[10] Q. Wang and R. K. Ward, "Fast image/video contrast enhancement based on weighted threshold histogram equalization", IEEE transactions on Consumer Electronics, vol. 53, no. 2, (2007), pp. 757-764.

[11] S.-D. Chen and A. R. Ramli, "Preserving brightness in histogram equalization based contrast enhancement techniques", Digital Signal Processing, vol. 14, (2004), pp. 413-428.

[12] C. Shi, K. Yu, J. Li, and S. Li, "Automatic image quality improvement for videoconferencing," in Proc. ICASSP, 2004, pp. 701–704.