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An Efficient Transformation Technique for Contrast Improvement

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Abstract:
This paper demonstrates an efficient technique for contrast improvement. To do so two main functions are used first is cumulative distributive function and the other is gamma correction. As we know improvement of contrast of an image plays an important role digital image processing (medical diagnostic, pattern recognition). In Respect to an image HSV is Hue (H), Saturation (S) and luminance (V), the given image can be enhanced by preserving hue and saturation, while by modifying luminance. Above both functions are applied on luminance value to get the enhanced image. Technique also can be applied to a video to enhance it frame by frame. For comparison and to show the efficiency details of proposed technique we compare proposed technique with adaptive histogram equalization method (AHE).

1. Introduction

For digital image processing, computer vision, pattern recognition, contrast improvement plays an important role in the improvement of visual quality of that given image. Low contrast in digital images can occur from many factors like, low luminance, lack of knowledge, moving object, and other factors such as indoor light, presence of clouds etc. The techniques are used to improve the visual quality of an image can be divided in two categories, one is direct enhancement method-contrast is improved by using some kind of specific contrast term and second is indirect enhancement method-contrast is improved by redistributing the pdf.

2. A Brief Survey on Existing System

In last decades to improve the visual quality of image TGC and THE methods were used but if contrast improvement is done with the methods problems like unvaried modification of histogram and under or over enhancement of images were noticed. To overcome problems associated with THE and TGC method more work was done in last decades like, Brightness Preserving Bi-histogram Equalization (BBHE) method that helps to find out the mean intensity as threshold value while in Dualistic sub-Image histogram equalization (DSIHE) method uses median value.

Contextual and Variational Contrast (CVC) is more effective if we want to show the visual quality of the image and for doing so it constructs a prior probability but in cvc method while enhancing contrast the grey level differences between neighboring pixels needed to be increased. Dynamic Contrast Ratio Gamma Correction (DCRGC) method uses directly set parameters as ratio to enhance the given image while it doesn't provide the automation. In recent adaptive histogram (AHE) method to improve the contrast is also used. Where to enhance the contrast of images that is suitable for digital chest radiography cdf were used.

3. Proposed Technique

This section provides a brief description about proposed technique to improve the contrast of image. Technique helps to provide progressively increment of low intensities. Technique can be implemented in real time environment with low resources and provides better efficiency with low computational cost. For video enhancement it does it by evaluating each frame and uses a buffer to store. To enhance video, the proposed image enhancement method uses temporal information regarding the differences between each frame to reduce computational complexity**.** In this technique we are using gamma correction function with cumulative distributive function first time. As we are using both functions together gamma correction that was used in TGC and cdf that was used in AHE so this technique also can be called as hybrid technique. Here mapping before enhancing the visual quality of image is done by mapping curve. The mapping curve is defined with the help of gamma correction function.

Cumulative distribution function (cdf). It can be formulated as follows:

$$\text{cdfw} = \sum_{l=0}^{lmax} \text{pdfw}(l) / \sum \text{pdfw} \quad (1)$$

Where lmax is maximum value of luminance of a single pixel.
The gamma correction function can be written as:

$$T(l) = lmax(l/lmax)^{\gamma} \quad (2)$$

$$T(l) = lmax(l/lmax)^{1-cd\,fw(l)} \quad (3)$$

Eq. 2 and 3 can be written as:

$$lmax(l/lmax)^{\gamma} = lmax(l/lmax)^{1-cd\,f(l)} \quad (4)$$

Hence from eq.4 the value of gamma function can be formulated as

$$\gamma = 1 - cd\,fw(l) \quad (5)$$

From eq. 1

$$\gamma = 1 - \sum_{l=0}^{lmax} \text{pdfw}(l) / \sum \text{pdfw} \quad (6)$$

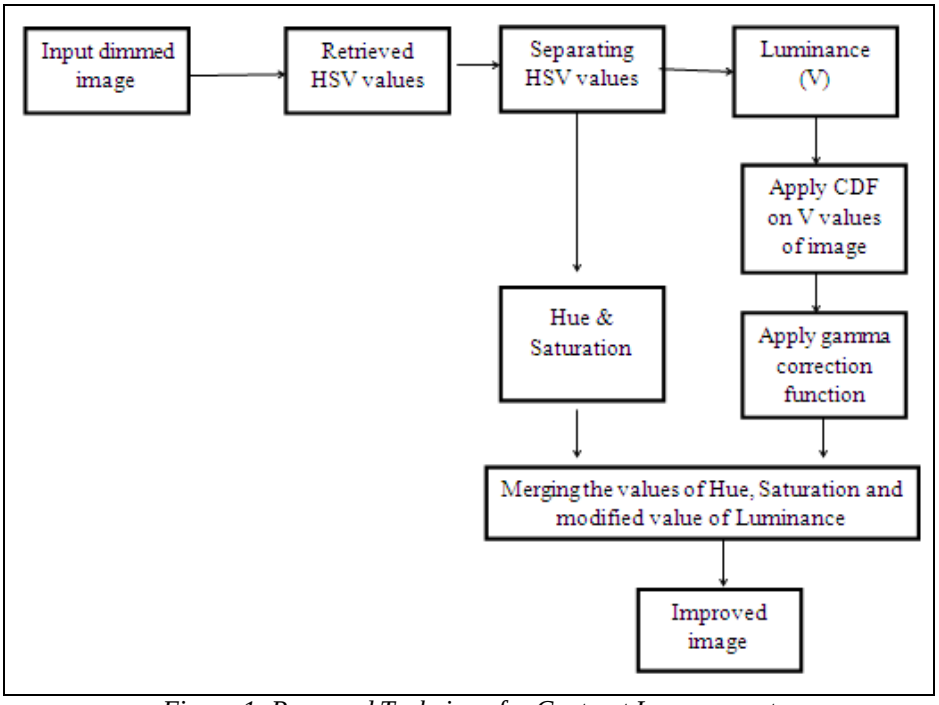

Figure 1: Proposed Technique for Contrast Improvement

Equation 5 and 6 define the gamma correction function that is used in proposed technique. The process of improvement of the contrast of a dimmed input image is shown in fig 1.
The proposed technique also can be applied to a video. Some consideration are required for that because before enhancing the image frame sequence number will be checked if it is the first frame then it will be sent directly to the storage buffer or if it is not then difference to the threshold value will be checked by calculating the entropy by entropy model. If difference is greater than the threshold value then the frame storage will be updated and then proposed technique is applied on the frame and if it is smaller than frame will be enhanced directly with the help of mapping curve. The algorithm for video enhancement process will be as follows:

1. Analyze each incoming frame from video source.
2. If it is first frame then send it to buffer.
   - Apply the proposed technique on particular frame.
   - And then enhance the frame using mapping curve.
3. If it is not a first frame then use the entropy model to find the absolute difference.
   - If difference is greater than threshold value than follow the second step
   - If difference is less than threshold value, enhance the frame directly using mapping curve.

4. Experimental Results

This section summarizes the experimental results produced by the AHE and by proposed method for image-contrast or for video quality improvement these two methods were applied to enhance these methods were applied on different images and videos.In

general, illumination changes can be caused by many factors common to outdoor scenes, such as the intensity of the sunshine the location of the light source, cloud cover, and many others. For images of indoor scenes, the quality is often affected by interior lighting. Therefore, we used several images to evaluate each method. In above figure video enhancement of a given video is presented, so now these experimental results shown in above figures led us to compare the performance parameter and then on the basis of that it can be proved that the proposed system is more efficient then the existed systems. Tables are drawn on the basis of obtained parameters from the above experimental results. Where effectiveness of proposed method has been satisfied with regarding of PSNR values are increasing; and MSE values are decreasing it means the system is working efficiently comparing to existed system. Above parameters are from two different images and for one video those are given in experimental phase.

Figure 2: Process of improving the visual quality implemented on image 1 using proposed technique

Figure 3: Process of improving the visual quality implemented on image 2 using proposed technique

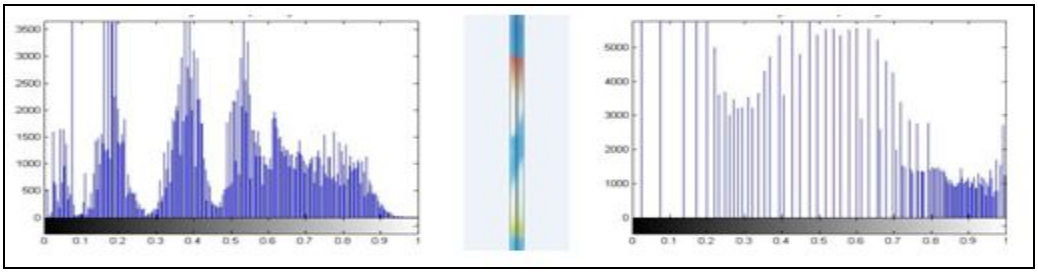

Figure 4: Output image histograms for both images

Figure 5: left side showing modified V frames and on right side showing the enhanced frames

Objects	Existed system	Proposed system
Image-1	8238.0593	8227.2073
Image-2	9183.3984	9168.813
Video	0.01088	0.0077785

Table 1: MSE performance for both image and video for both systems

Objects	Existed system	Proposed system
Image-1	8.9726	8.9783
Image-2	8.5008	8.5077
Video	63.2591	63.4024

Table 2: PSNR performance for both image and video for both systems

5. Conclusion

An automatic technique is proposed to generate an enhanced image from the noisy or dimmed image. Technique is helpful to improve the brightness quality of the images as well as of videos. It consists of two main function one is gamma correction which helps to enhance the image automatically. And second is cumulative distribution function. Given tables in experimental results shows how this technique is best to old technique. Technique also performed very well in point of time complexity, computational overhead etc. And if resources are limited, even then the technique performs very well for both image and video enhancement. To enhance video, the proposed image enhancement method uses temporal information regarding the differences between each frame to reduce computational complexity**.**

6. References

1. Rafael C. Gonzalez and Richard woods (aug 2007) “digital image processing”,
2. Rafael C. Gonzalez, Richard woods and Steven L. (2007) “digital image processing using matlab”,
3. Beghadadi and A.L. Negrate, (May 1989) “Contrast enhancement technique based on local detection of edges,” IEEE.
4. H.-D. Cheng and H. J. Xu,(May 2000) “A novel fuzzy logic approach to contrast enhancement,” IEEE.
5. R. Sherrier and G. Johnson, (jan 1987) “Regionally adaptive histogram equalization of the chest,” IEEE.
6. Polesel, G. Ramponi, and V. Mathews,(marh 2000) “Image enhancement via adaptive unsharp masking,” IEEE.
7. Y.-S. Chiu, F.-C.Cheng, and S.-C. Huang, (oct 2011) “Efficient contrast enhancement using adaptive gamma correction and cumulative intensity distribution,” . IEEE..
8. Y. Kim, (feb 1997) “Contrast enhancement using brightness preserving bi-histogram equalization,” IEEE.
9. Y. Wan, Q. Chen, and B. Zhang, (feb 1999) “Image enhancement based on equal area dualistic sub-image histogram equalization method,” IEEE
10. C. Wang and Z. Ye,(nov 2005) “Brightness preserving histogram equalization with maximum entropy: A variational perspective,” IEEE.
11. T. Celik and T. Tjahjadi, (dec 2011) “Contextual and variational contrast enhancement,” IEEE.
12. K. S. Sim, C. P. Tso, and Y. Tan, (jul 2007) “Recursive sub-image histogram equalization applied to gray-scale images,” IEEE.