Color Video Contrast Enhancement using Effective Intraframe Histogram Equalization Technique

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***Abstract*—This paper proposes a scheme for Video contrast enhancement based on histogram equalization (HE). Digital images and videos are everywhere these days. The application areas for the same are industries, research, medical, intelligence, security etc. The ability to process image and video signals is therefore an incredibly important skill to master for engineering/science students, software developers, and practicing scientists. Digital image and video processing continues to enable the multimedia technology revolution we are experiencing today. Some important examples of image and video processing include the removal of degradations images suffer during acquisition (e.g., removing blur from a picture of a fast moving car), and the compression and transmission of images and videos. Study of images and videos, trying to improve the quality through enhancing brightness, improving contrast, decreasing blurriness, removing noise, all these things are known as image processing and video processing. Image or Video enhancement is a process involving changing the pixels' intensity of the input image, so that the output image should subjectively looks better [5]. Several methods like Brightness preserving Bi-Histogram Equalization (BBHE) and Quantized Bi-Histogram Equalization (QBHE) use the average intensity value as their separating point. Dual Sub-Image Histogram Equalization (DSIHE) uses the median intensity value as the separating point. Minimum Mean Brightness Error Bi-HE (MMBEBHE) uses the separating point that produces the smallest Absolute Mean Brightness Error (AMBE). Recursive Mean-Separate Histogram Equalization (RMSHE) is another improvement of BBHE. The Brightness preserving dynamic histogram equalization (BPDHE) method is actually an extension to both MPHEBP and DHE. Weighting mean-separated sub-histogram equalization (WMSHE) method is to perform the effective contrast enhancement of the digital image [1]. The purpose of image or video enhancement is to improve the interpretability or perception of information contained in the image for human viewers, or to provide a "better" input for other automated image processing systems [5].**

I. INTRODUCTION

Video processing systems require a stream processing architecture in which video frames from a continuous stream are processed one (or more) at a time. A video signal is the term used to describe any sequence of time varying images. A still image is a spatial distribution of intensities that remain constant with time while a time varying image has a spatial intensity distribution that varies with time. Movies (films) and television are both examples of video signals as are the signals that drive computer monitor, laptop and PDA displays. It is widely expected that video communications in particular will be the next application driving the mobile and handheld device market. This course should give you the tools to understand the components that are necessary for such systems to operate effectively Video enhancement is one of the most important issues in low-level video processing. Its purpose is to improve the quality of low contrast video, i.e., to enlarge the intensity difference among objects and background [2]. As we know that some time we record some video from surveillance video camera, quality is so clear, video films we record.

The aim of image/video processing is often to improve the visual quality, typically for a human observer and throughout this report some concepts from this field will arise time and time again and we need to familiarize ourselves with them. In this chapter we will start with the basics and describe the fundamentals of images and videos in a digital form, we will cover the basics of contrast and illumination enhancement and, after that, what we mean by digital noise and a few different ways of getting rid of it [4].

One most important observation regarding HE and AHE is that, these methods basically work on one simple assumption that the cumulative distribution function is always invertible but practically this is not the case when the video frames or images are in discrete form. While in the continuous case, statistical models of histogram equalization/specification would yield exact results, their discrete counterparts fail. This is due to the fact that the cumulative distribution functions one deals with are not exactly invertible. Otherwise stated, exact histogram specification for discrete images is an ill-posed problem. Invertible cumulative distribution functions are obtained by translating the problem in a K dimensional space and further inducing a strict ordering among image pixels.

II. METHODOLOGY

The proposed project work basically deals with the modification/equalization of poor contrast input video frame histograms followed by histogram specification processes for contrast restoration. The proposed method is basically single channel technique, so the second part of this project work is the implementation of the single channel proposed intraframe histogram equalization for color video contrast enhancement. For the implementation of proposed single channel technique for color video contrast enhancement this project work employed RGB color model. In this process the input poor contrast color video frame is first divided into red, green and blue constituent components and then their poor contrast is stretched by simultaneously applying proposed single channel method on each constituent component

In the chapter, we are going to discuss, how to approach the above title. The method and steps for enhancing the video quality, is very simple and easy to understand.

1. Loading the poor quality color video.
2. Converting the video in to number of color frames.
3. Loading the individual poor color frames one by one.
4. Separating the RGB components of the color frames one by one.
5. Loading the individual components of color frames one by one.
6. Applying the Histogram Equalization Technique in each color frames for the contrast enhancements.
7. After enhancement joining the all separated enhanced RGB components in a single frame.
8. Joining the frames, to convert the enhanced frames in to a single video.
9. Playing the enhanced video.

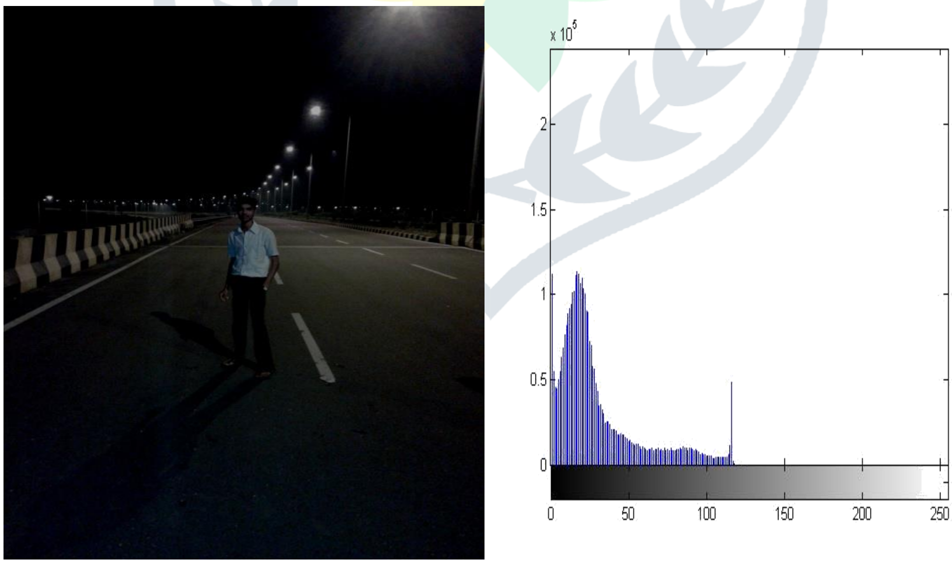
III. RESULTS

In the basis of Hisogram equalization contrast intensification has been successfully implemented for gray as well as color video frames in MATLAB. In this project work, for the proportional comparative analysis of the developed technique and available histogram equalization techniques.

TABLE I

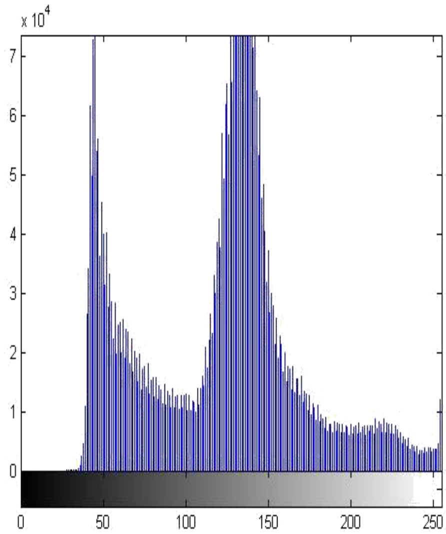
CONTRAST COMPARISON OF A SINGLE VIDEO FRAME USING DIFFERENT ENHANCEMENT TECHNIQUES

S. No.	Video frame No.	Initial Contrast value of video frame	Contrast value using Histogram Equalization Technique(HE)
1	05	0	0.0605
2	10	0	0.0612
3	15	0	0.0650
4	20	0	0.0621



(a) **(b)**

(c)



(d)

Fig 1. Video Contrast Enhancement. (a) Original image frame of low quality video and histogram, (b) Histogram of corresponding video frame (c) The result of video frame and histogram (d) Histogram of corresponding video frame.

IV. CONCLUSION

Image enhancement is one of the most important issues in low-level image processing. All the methods are based either on local information or on global information. A novel approach using both local and global information to enhance image is studied in this paper. This method adopts the traits of existing methods. It also makes the degree of the enhancement completely controllable. Experimental results show that it is very effective in enhancing images with low contrast, regardless of their brightness. Multi-peak GHE technique is very effective to enhance various kinds of images when the proper features (local information) can be extracted.

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