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MINIMUM MEAN BRIGHTNESS ERROR DYNAMIC HISTOGRAM EQUALIZATION FOR BRIGHTNESS PRESERVING IMAGE CONTRAST ENHANCEMENT

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Abstract. *Histogram equalization (HE) is a widely accepted image contrast enhancement technique due to its simplicity and effectiveness. However, it often changes the mean brightness of image to the middle level of gray-level range which is not desirable for consumer electronic products like television. In addition, HE method tends to introduce unnecessary visual deterioration including saturation effect. Preserving the input brightness of the image and keeping PSNR in the desired range are required to avoid the generation of non-existing artifacts in the output image. To surmount this drawback, this paper proposes a novel image enhancement method, known as Minimum Mean Brightness Error Dynamic Histogram Equalization (MMBEDHE) for image contrast enhancement to attain maximum brightness preservation. This method partitions the input image into several subimages and then applies the classical HE process to each one. A primary partition of the input image is assessed based on local minima which can ensure the absence of dominating portions. Final partition is done based on minimum absolute brightness error between two local minima and assigns specific gray level range for each partition. The proposed method has been compared with other five existing conventional methods. The absolute average error for brightness preservation given by MMBEDHE method is about 0.91, which is very small compared to other methods. It is evident from the experimental results that the MMBEDHE method not only can preserve brightness with minimum error but also can keep peak signal to noise ratio (PSNR) in the required range and produces natural looking images.*

Keywords: Image enhancement, Brightness preservation, Dynamic histogram equalization, AMBE, PSNR

1. **Introduction.** Digital image enhancement is necessary to improve the interpretability or perception of information contained in the image for human viewers. It is also important to provide a better representation for further automated image processing such as image analysis, detection, segmentation, recognition and data hiding [1-5]. Usually image enhancement is performed by improving the contrast of the image. However, digital image enhancement, preserving brightness and keeping PSNR in the desired range, is a crucial issue in the field of digital image processing specially for consumer electronics.

Histogram equalization (HE) is one of the most commonly used algorithms to perform contrast enhancement [6,7]. HE flattens and stretches the dynamic range of the image histogram and results in overall contrast enhancement [8]. There are some gray levels in the image, which occur more frequently and dominate other gray levels having lower frequency of occurrence. This results in loss of brightness of the original image.

Despite of its success for image contrast enhancement, HE is not commonly used in consumer electronics such as TV and video surveillance because it significantly changes