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Editorial

Emerging Methods for Color Image and Video Quality Enhancement

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Digital color imaging devices, ranging from the low-end camera phones to the high-end digital cinema cameras, are ubiquitously used in the current e-world, while the image/video quality, including the color fidelity, resolution, signal to noise ratio, and sharpness, are among the most common concerns of the consumers. Therefore, how to enhance the quality of digital images/videos is an important topic in both the academia and industry. On the other hand, how to apply the image processing techniques to solve real problems is also of great concern.

This special issue focuses on the recent advances of color image and video enhancement techniques and applications. We received 40 submissions and 14 papers were accepted, which cover various topics including high dynamic range (HDR) imaging, color and image content enhancement, video quality assessment, and some color image processing applications.

Two papers discussing HDR techniques are included in this special issue. S. Cvetkovic et al. overviewed the current techniques for managing camera acquisition systems with a lot of technical details about real solution implemented in consumer camera devices. The faithful display of HDR images on low dynamic range (LDR) devices requires a tone mapping process. T. Horiuchi et al.'s paper proposes a novel tone mapping algorithm incorporating the mechanisms of global adaptation and local adaptation in the algorithm to imitate brightness constancy in Human Vision System.

Eight papers present several image color and content enhancement methods. Inspired by the Multiscale Retinex model, S. Chen et al. propose a color enhancement solution that works in a sequential way. Also inspired by the Retinex theory, A. Choudhury et al. propose a novel contrast enhancement method for color images. Denoising techniques are employed to separate the illumination component from the reflectance component of the image, where the illumination part is enhanced to achieve "visually better" color images with enhanced contrast. A. Menotti et al. present a solution for the tone-mapping problem using an adaptive strategy that is able to preserve the main oriented structures (e.g., edge) of the images.

Chroma noise is a serious problem in color imaging under low light conditions. A. Buemi et al. present a simple and efficient chroma noise reduction algorithm based on soft-thresholding. The contribution of the DCT coefficients having highest probability to be corrupted by noise is reduced while preserving the image regions containing edges. The algorithm has been designed as an additional feature of a JPEG encoder with negligible hardware and computational resources. In L. Huang et al.'s paper, a new nonconvex variational model for multiplicative noise removal is proposed under MAP framework. They prove the existence and uniqueness of a minimizer for the new model and develop an associated iterative algorithm.

H. M. Oh et al. propose an edge adaptive color demosaicing algorithm that adaptively estimates the edge direction. The method improves the overall image quality in terms of consistent edge directions around the edges. In the paper by V. A. Nguyen et al., they address a new and

interesting research problem of blindly enhancing the video reconstructed from multiple compressed video copies with different levels of quality. Analytical and experimental results show that the video reconstructed by their method not only yields a lower distortion but also achieves a significant PSNR gain compared to the best copy.

Moreover, there are two papers about video quality assessment. M. Ivanovici et al. introduce the concepts of fractal geometry into the field of video quality assessment. In particular, two fractal measures that are new to the color vision and image processing, namely, fractal dimension and lacunarity, are adapted to characterize quality degradations of color video signals. H. Rehman and B. L. Evans propose novel measures to quantify two types of temporal artifacts, dirty-window-effect and flickering, that are commonly observed in video halftoning. Furthermore, these measures are effectively incorporated into video halftoning algorithms to reduce these artifacts.

Other three papers present various applications of color image processing. In E. Ardizzone et al.'s work, a novel solution is proposed to properly detect multidirectional scratches and remove them so that the digital video can be restored. In S. Battiato et al.'s paper, an advanced red-eyes removal pipeline is proposed for digital cameras and camera phones. In the last paper, an automatic segmentation strategy is proposed for specular high saturated regions present in endoscopy videos so that these regions can be properly inpainted to enhance the overall quality.

Finally, we hope that this special issue can provide the readers useful and interesting information for color image/video enhancement and its applications.

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