

New Variational Approach for Contrast Enhancement of Color Image

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Abstract : In this work, we propose a variational technique for image contrast enhancement which utilizes global and local information around each pixel. The energy functional is defined by a weighted linear combination of three terms which are called on a local, a global contrast term and dispersion term. The first one is a local contrast term that can lead to improve the contrast of an input image by increasing the grey-level differences between each pixel and its neighboring to utilize contextual information around each pixel. The second one is global contrast term, which can lead to enhance a contrast of image by minimizing the difference between its empirical distribution function and a cumulative distribution function to make the probability distribution of pixel values becoming a symmetric distribution about median. The third one is a dispersion term that controls the departure between new pixel value and pixel value of original image while preserving original image characteristics as well as possible. Second, we derive the Euler-Lagrange equation for true image that can achieve the minimum of a proposed functional by using the fundamental lemma for the calculus of variations. And, we considered the procedure that this equation can be solved by using a gradient decent method, which is one of the dynamic approximation techniques. Finally, by conducting various experiments, we can demonstrate that the proposed method can enhance the contrast of colour images better than existing techniques.

Keywords : color image, contrast enhancement technique, variational approach, Euler-Lagrang equation, dynamic approximation method, EME measure

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