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Contrast Enhancement Using Triple Dynamic Clipped Histogram

Equalization Based on Mean or Median

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Abstract

Many methods based on the histogram equalization have been introduced for the use in contrast enhancement. However, a technique that can produce proper natural enhancement simultaneously in images with brightness ranges of dark, medium, and bright, has been less presented. For this purpose, a powerful contrast enhancement algorithm based on the histogram equalization, called triple dynamic clipped histogram equalization (TDCHE) method has been proposed in this paper. In the proposed method, the histogram of the input image is first partitioned based on the mean or median into three portions. Then, the histogram clipping process is performed in each sub-histogram. Finally, prior to performing the equalization process of each sub-histogram independently, each sub-histogram is mapped to a new dynamic range. The proposed method is introduced to achieve multiple objectives of maximum average information content (entropy), enhancement rate control and reasonable brightness preservation. In addition, this method leads to natural enhancement by producing clear images and preserving maximum details. Performance assessment of the proposed method in terms of the entropy, structural similarity index as well as visual quality based on mean opinion score (MOS) demonstrates perceived superiority of the proposed algorithm in comparison with the previously presented techniques.

Keywords: Average information content; Contrast enhancement; Histogram clipping; Histogram equalization; Image contrast.

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