A variational approach for exact histogram specification

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We focus on exact histogram specification when the input image is quantified. The goal is to transform this input image into an output image whose histogram is exactly the same as a prescribed one. In order to match the prescribed histogram, pixels with the same intensity level in the input image will have to be assigned to different intensity levels in the output image. An approach to classify pixels with the same intensity value is to construct a strict ordering on all pixel values by using auxiliary attributes. Local average intensities and wavelet coefficients have been used by the past as the second attribute. However, these methods cannot enable strict-ordering without degrading the image. In this paper, we propose a variational approach to establish an image preserving strict-ordering of the pixel values. We show that strict-ordering is achieved with probability one. Our method is image preserving in the sense that it reduces the quantization noise in the input quantified image. Numerical results show that our method gives better quality images than the preexisting methods.