

A Semi-Vectorial Hybrid Morphological Segmentation of Multicomponent Images Based on Multithreshold Analysis of Multidimensional Compact Histogram

Submitted by Alain Cl ment on Mon, 02/26/2018 - 17:01

Titre	A Semi-Vectorial Hybrid Morphological Segmentation of Multicomponent Images Based on Multithreshold Analysis of Multidimensional Compact Histogram
Type de publication	Article de revue
Auteur	Kouassi, Adles Francis [1], Ouattara, Si� [2], Okaingni, Jean-Claude [3], Vangah, Wognin Joseph [4], Cl�ment, Alain [5]
Editeur	Scientific Research Publishing
Type	Article scientifique dans une revue � comit� de lecture
Ann�e	2017
Langue	Anglais
Date	8/11/2017
Num�ro	11
Pagination	597-610
Volume	7
Titre de la revue	Open Journal of Applied Sciences
ISSN	2165-3917
Mots-cl�s	classification [6], Fusion Inter-Class [7], Morphological Segmentation [8], Multi-Thresholds [9], Multidimensional Compact Histogram [10], Semi-Vectorial Segmentation [11], Vectorial Orders [12]

Résumé en
anglais

In this work, we propose an original approach of semi-vectorial hybrid morphological segmentation for multicomponent images or multidimensional data by analyzing compact multidimensional histograms based on different orders. Its principle consists first of segment marginally each component of the multicomponent image into different numbers of classes fixed at K . The segmentation of each component of the image uses a scalar segmentation strategy by histogram analysis; we mainly count the methods by searching for peaks or modes of the histogram and those based on a multi-thresholding of the histogram. It is the latter that we have used in this paper, it relies particularly on the multi-thresholding method of OTSU. Then, in the case where i) each component of the image admits exactly K classes, K vector thresholds are constructed by an optimal pairing of which each component of the vector thresholds are those resulting from the marginal segmentations. In addition, the multidimensional compact histogram of the multicomponent image is computed and the attribute tuples or 'colors' of the histogram are ordered relative to the threshold vectors to produce $(K + 1)$ intervals in the partial order giving rise to a segmentation of the multidimensional histogram into K classes. The remaining colors of the histogram are assigned to the closest class relative to their center of gravity. ii) In the contrary case, a vectorial spatial matching between the classes of the scalar components of the image is produced to obtain an over-segmentation, then an interclass fusion is performed to obtain a maximum of K classes. Indeed, the relevance of our segmentation method has been highlighted in relation to other methods, such as K -means, using unsupervised and supervised quantitative segmentation evaluation criteria. So the robustness of our method relatively to noise has been tested.

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DOI

[10.4236/ojapps.2017.711043](https://doi.org/10.4236/ojapps.2017.711043) [14]

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