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MEDICAL IMAGE SEGMENTATION USING THE COMBINATION OF WATERSHED AND FCM CLUSTERING ALGORITHMS

Wen-Feng Kuo[1], Chi-Yuan Lin[2] and Wei-Yen Hsu[3,*]

[1]Department of Information Management
Chia Nan University of Pharmacy and Science
No. 60, Erh-Jen Road, Sec. 1, Jen-Te, Tainan, Taiwan

[2]Department of Computer Science and Information Engineering
National Chin-Yi University of Technology
No. 35, Lane 215, Sec. 1, Chung-Shan Road, Taiping, Taichung 411, Taiwan

[3]Graduate Institute of Biomedical Informatics
Taipei Medical University
No. 250, Wu-Xin Street, Taipei 110, Taiwan
*Corresponding author: shenswy@stat.sinica.edu.tw

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Abstract. *In this study, a new image segmentation technique that combines watershed algorithm and fuzzy clustering algorithms is proposed to minimize undesirable over-segmentation. Watershed algorithm invariably produces over-segmentation due to noise or local irregularities in the gradient images. In the proposed scheme, first, it presents a region merging method based on employing the Markov Random Field (MRF) model on the Region Adjacency Graph (RAG) to refine the quality of watershed algorithm, and then, the relationship of inter-region similarities is then performed by involving the spatial domain (watershed) and feature spaces (clustering) into image mapping in order to determine optimal region merging. To obtain the spatial domain and feature spaces representation of the image, spatial graph representation is used, which is derived from the watershed partitioning and feature spaces representation acquired from the Fuzzy C-Means (FCM) clustering technique. Experimental results show that the proposed technique gives more promising segmentation results in comparison with the conventional watershed algorithm by means of the assessment of several brain phantom and real data.*
Keywords: Image segmentation, Region adjacency graph, Watershed, Clustering, Fuzzy c-means

1. **Introduction.** Image segmentation plays an important role and is an essential process in computer imaging. General segmentation is the process of partitioning the image into disjointed regions, such that the characteristics of each region (e.g., the intensity gray value, the texture) are homogeneous [1]. A large number of homogeneous regions are spatially connected groups of pixels. In the literature, a large number of image processing methods dealing with image segmentation issues have been discussed [2-8]. From these methods, numerous efficient surveys on image segmentation algorithms can be classified into the categories of clustering and spatial-based approaches.

In the category of clustering techniques, the algorithms appeared in early studies and had been used in several applications [9], such as image processing [2]. By using image features such as color or texture, the global characteristics of an image can be captured. Clustering methods ignore spatial information and use a particular distance measure, the pixels of the image being grouped into clusters. When the clustering process is complete, the pixels of the image are mapped onto the image plane to produce the final regions.