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A NEW FRAMEWORK OF UNSUPERVISED IMAGE SEGMENTATION WITH WEIGHT OPTIMIZATION

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Abstract. *Image segmentation is an important preliminary step in the areas of image processing and pattern recognition. There exist a lot of approaches to perform image segmentation which utilize various types of features such as color and texture. However, very few of them study how to obtain more reasonable image segmentation results by optimizing the weights of color and texture features. The difficulty lies in the fact that image segmentation results are rather subjective and hard to be quantitatively evaluated which is needed in an optimization process. As a result, no image segmentation frameworks are available to automatically produce optimal feature weights. In this paper, we propose a novel framework called the Image Segmentation with Automatic Weight Optimization (ISAWO) that enables automatic weighting on each component of different types of features. Specifically, ISAWO first obtains two sets of segmented regions which are partitioned by clustering according to the color feature and the texture feature respectively. By iteratively maximizing the similarity between the two sets of segmented regions according to the designed similarity measure, we can obtain the optimized weight vector. Then ISAWO combines the color and texture features with the obtained optimal weights and performs the final clustering based on the combined feature vector. The final segmented regions are obtained after morphology filtering. Experimental results show that ISAWO can consistently achieve better perceptual segmentation compared to some classical image segmentation algorithm with fixed feature weighting.*
Keywords: Color-texture image segmentation, Weight optimization

1. **Introduction.** Image segmentation is a very important preliminary step in many applications, e.g. medical analysis, image processing and pattern recognition. The pixels in each segmented region have common properties, such as homogenous colors, similar gradients, same connectivity in graph and so on.

In general, the image segmentation algorithms can be categorized into two types: (1) Supervised learning based image segmentation algorithms [1], and (2) Unsupervised learning based image segmentation algorithms [2-10]. Supervised learning based algorithms design a classifier based on a set of given image pixels with known class membership. Then, the trained classifier is applied to new image pixels and the labels of these image pixels are predicted. For example, Taur et al. [1] proposed an image segmentation algorithm