

## MULTI-RELATIONSHIP BASED RELEVANCE FEEDBACK SCHEME IN WEB IMAGE RETRIEVAL

HAI JIN, RUHAN HE AND WENBING TAO

Services Computing Technology and System Lab  
Cluster and Grid Computing Lab  
School of Computer Science and Technology  
Huazhong University of Science and Technology  
Wuhan 430074, P. R. China  
hjin@hust.edu.cn

Received February 2007; revised July 2007

**ABSTRACT.** *Traditional Relevance Feedback (RF) in web image retrieval usually combines the two modalities of web images, i.e. text and visual content, to improve the retrieval performance. However, the combination scheme is either sequential or linear, and the used similarity metric is simply based on pair-wise distance. Therefore, the multiple relationships within and between the two modalities of web images are not fully explored. In this paper, a novel RF scheme, named Multi-Relationship Based Relevance Feedback (MRBRF), is proposed, which simultaneously utilizes both the intra-modal relationship and the inter-modal relationship among web images at each iteration of RF. The intra-modal relationship reveals the intrinsic global manifold structure within the textual and the visual feature spaces of web images, and the inter-modal relationship reflects the relationship between the two feature spaces via web hyperlinks. In this new approach, Manifold Ranking Algorithm (MRA) and Similarity Propagation Algorithm (SPA) are integrated to explore the multiple relationships of web images. The experiments are carried out in our web image retrieval system, named VAST (VisuAl & SemanTic image search), and the results show the effectiveness of the proposed MRBRF scheme.*

**Keywords:** Web image retrieval, Relevance feedback (RF), Manifold ranking algorithm (MRA), Similarity propagation algorithm (SPA)

**1. Introduction.** Relevance Feedback (RF) [1] has emerged as a powerful tool to boost the retrieval performance in Content-Based Image Retrieval (CBIR). In the current web image retrieval systems, RF is widely used to combine the two modalities of web images, i.e. text and visual content, for improving the retrieval performance. In [2-7], the combination scheme is sequential, i.e. only one modality of web images is used at each iteration of RF. In some other works [5], the combination scheme is linear, i.e. the two modalities of web images are utilized simultaneously at each iteration of RF and are subjected to simple linear weighted addition. However, the cross-modal correlation via web hyperlinks, which is also an important attribute of web images, is not explored in these RF schemes. Moreover, the similarity metrics in these RF schemes rely on the calculation of local consistency-based pair-wise distances (e.g. Euclidean distance, inner product), which oversimplifies the relationship among all the images in the dataset. The effectiveness of these RF schemes is limited because they do not fully explore the multiple relationships within and between the two modalities of web images.