

Announcing the Final Examination of Ning Yu for the degree of Doctor of Philosophy

Time & Location: November 2, 2011 at 1:00 PM in HEC 450

Title: The techniques for boosting the performance in Content-Based Image Retrieval Systems

Content-based Image Retrieval (CBIR) is a core technology for a broad range of applications ranging from image search engines, electronic commerce, and medical diagnosis to computer aided drug design. It is an emerging technology that can have a profound impact on society. In an image database using CBIR techniques, each image is represented by a large number of visual features which are computed from the image itself, and the data is managed as data points in this multidimensional feature space. As it is generally implausible for humans to reason in terms of these feature vectors, querying is typically accomplished with the aid of example images. Given an image, its similar images are computed as its k nearest neighbors in the feature space (i.e., k -NN computation). This strategy requires the user to provide good query images in order to find other matching images. This is generally achieved with user relevance feedback (RF). However, the low correlation between the retrieval objects and their appearances in images is the most fundamental problem in CBIR. While this so called "semantic gap," has been an active area of research for several years.

In this dissertation, we addressed this grand challenge from a new perspective by investigating the following new approach: Query Decomposition (QD). This is a relevance feedback technique designed to directly address the implausibility of quantifying semantic information in a feature vector that is calculated based upon visual information observed in an image. In each round of relevance feedback, local clustering is applied to the current query result. If this process results in the discovery of multiple new clusters in the feature space, the initial query is decomposed and each new cluster is processed as a separate query. These multiple queries continue the navigation process along different paths to find the semantically similar clusters that are separated in the feature space. Thus, a QD search surpasses the traditional k nearest neighbors by finding the k best-matching images, wherever they might lie in the feature space.

Major: Computer Science

Educational Career:

Bachelor's of Computer Science, 2000, Tsinghua University

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Kien A. Hua, Chair, Computer Science

Ronald D. Dutton, Computer Science

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Approved for distribution by Kien A. Hua, Committee Chair, on October 3, 2011.

The public is welcome to attend.