The HERON Project: Experiences in Using Object-Relational Databases for Content-based Image Retrieval in Digital Libraries

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Abstract

Today multimedia database systems are a most challenging area of database research. Traditional text-based information systems are increasingly extended to integrate multimedia data as for instance images, audio and video files. One special group of these extended systems are image databases for storage, management and retrieval of still images. At present, the most common technique for integrating images into a database is to store them together with some descriptive text or keywords assigned by human operators and subsequently retrieve them by matching the query texts with the stored keywords. Those texts assigned are not only very subjective and incomplete, but also very expensive. A far more promising technique -known as content-based retrieval- captures the image content automatically by visual features as colors, textures or the shape of image objects.

The interdisciplinary HERON-project investigates the impact of multimedia database technology and content-based retrieval on broad application areas in the humanities. As a first area of application heraldic image archives have been chosen due to the well-defined meaning of objects shown and their simple, stylized depiction. The HERON-project concentrates on merging application semantics and image processing techniques to gain adequate features for content-based retrieval, thus optimizing the relevance of result sets. A very important pre-processing step is the automatic segmentation of images for shape retrieval.

As image queries in general consist of multiple features combining visual features with full-text retrieval, further major areas of research in the scope of the HERON-project are algorithms allowing the efficient combination of ranked result sets, content synthesis and multimedia delivery. The HERON architecture proposes a middleware splitting complex image queries according to their atomic features, and then collecting and combining the individual ranked result sets efficiently. Finally the overall best results in a large variety of image formats and qualities are delivered according to the specific user's needs. Using a so called format optimization the set of physically stored and at delivery time converted image formats and qualities is chosen due to specific characteristics of both the image server and the application profile. This set can be automatically updated as the application profile changes.

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