Visual Based Retrieval Systems and Web Mining—Introduction

GUEST EDITOR

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Introduction

A current trend in the proliferation of computing technology throughout society is development, manipulation, and storage of multimedia information. Images, video, and sound are now considered first-class data types alongside traditional alphanumeric textual information, even in a traditional setting such as the global marketplace. The ability to store, retrieve, and analyze multimedia data for relevant and profitable information is a daunting task, given the perceptual nature of the information and the massive amounts that are continuously created. The latest technology that addresses these and other problems is Web mining and image retrieval. This research area uses sophisticated statistical analysis and machine-learning techniques to uncover patterns and relationships in multimedia and traditional databases that traditional methods might not discover.

Web mining and image retrieval techniques discover patterns and relationships by constructing predictive and descriptive computational models. Predictive computational models, such as supervised neural networks, use data with known results to develop models that can be used explicitly to predict values for different data. Alternatively, descriptive computational models are implicitly constructed and describe patterns contained in the database.

A relatively newer aspect of information/decision fusion problems in emerging applications is the requirement of fast and efficient computation of information fusion operations. Although recent advances in computing systems and methods enable us to execute vision-based retrieval algorithms faster, it is necessary to design these systems to be computationally efficient to have greater impact in practical problems given the amount of visual data generated and stored.

This special issue is composed of articles focused on Web content mining, artificial neural networks as tools for image retrieval, content-based image retrieval systems, and personalizing the Web browsing experience using media agents.

Summary of Papers

The articles of this special issue display the diversity of image retrieval algorithm both in terms of theory and prac-

tice. Chen et al. presents an effective approach for image retrieval from the Internet using Web mining techniques. The novelty of this method is that the system can also serve as a Web image search engine. The key idea in this approach is to extract the text information on the Web pages to semantically describe the images.

Among the many visual features that have been studied, the distribution of color pixels in an image is the most common visual feature studied. Zachary et al. propose a theoretical foundation of image entropy and practical description of the merits and limitations of image entropy compared to color histograms. This result suggests that image entropy is a promising approach to image description and representation. "A Media Agent for Automatically Building a Personalized Index of Web Media Objects" by Wenyin et al. describes a multimedia approach to solve image retrieval problems.

Content-based image retrieval is based on the idea of extracting visual features from images and using them to index images in a multimedia database. The comparisons that determine similarity between images depend on the representations of the features and the definition of appropriate distance functions. Most of the research literature uses vectors as the predominate representation given the rich theory of vector spaces. Although vectors are an extremely useful representation, their use in large databases may be prohibitive given their usually large dimensions and similarity functions. The article by Zachary and Iyengar proposes similarity measures and an indexing algorithm based on information theory that permits an image to be represented as a single number. When used in conjunction with vectors, the method offers improved efficiency when querying large databases.

Finally, Wu et al. present a neural network approach for effective retrieval process using a Self-Organizing Feature Map (SOFM) neural network algorithm.

Summary

The development in computing algorithms and the global network known as the World Wide Web enable the processing, storage, and retrieval of information from large data repositories that were deemed impractical a couple of decades ago. These developments have the potential to solve a number of information/decision fusion problems arising in

real-life applications. But to exploit these new computational techniques, it is necessary to further develop efficient algorithms with guaranteed performance bounds based on realistic sample sizes that can be effectively processed. This special issue addresses a solution to many of these problems.

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