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Book review

Multimedia Systems and Content-Based Image Retrieval. By Sagarmay Deb, Idea Group Publishing, 2004, \$79.95 ISBN 1-59140-156-9

Content based image retrieval traditionally falls in the confluence of three separate research streams, namely machine learning, information retrieval, and computer vision. The growing need to digitize all forms of image information in the past few years has given birth to intelligent indexing and search methods using computers. The advancements made in content-based image retrieval (CBIR) over the last decade have carved an important niche for the research field. CBIR technology is particularly useful in studying art, biomedical, photographic and satellite images.

This book attempts to discuss some of the recent advancements in CBIR and explains how they are useful for the evolution of multimedia systems in today's information age. The book is divided into seven major sections each of which discusses a distinct aspect of CBIR.

Section 1 introduces the problem of semantics sensitive image search and retrieval and explains how CBIR forms an intrinsic part of present day multimedia systems. A brief account of work done in the last few years has been included. Section 2 presents certain techniques for enforcing security in multimedia systems. In particular, image duplication, watermarking and face recognition technologies have been emphasized upon. Security, in today's world has become a paramount issue and the need for intelligent solutions is rising by the day. Protection of multimedia data content is critical as sharing of information is widespread today with the advent of the Internet. A detailed description and comparison of various face recognition systems has been included in this section. Eigenfaces technology is already being used in crime detection systems.

In Section 3, certain methods for feature extraction have been compared and a new technique based on histograms in the HSV color space has been discussed.

A content based retrieval system for video has also been presented here. Identifying content in video is closely associated with CBIR. However, there are a few distinctions between the two as video is associated with a temporal axis whereas a digital image is a two dimensional entity. One of the prime focuses of computer vision community has been to build robust systems to identify and recognize unusual movement in video. Such a technology has been used for automated surveillance.

Feature engineering forms one of the most important components of CBIR systems. Local and global image features act as signatures of images and thus quantification of image similarity is heavily influenced by the choice of features. However, most feature extraction techniques work with low-level features (shape, color, texture, etc.) whereas human understanding of an image is considered to be much deeper based on years of acquired knowledge. This induces an obvious gap (referred to as semantic gap) in CBIR systems. Semantic gap has been constantly called a *bottleneck* of multimedia database access in the book. I would like to differ with the author in this issue. This semantic gap is an inherent feature or consequence of CBIR systems that work with low level features. Significant success has been achieved in the past despite the semantic gap.

Section 4 talks about a few methods employed for object representation and image retrieval based on objects present in images. This representation is proposed as an alternative to using low-level features in order to bridge the gap between perceptual property and semantic meaning. However, it is important to point out at this stage that precise segmentation of images into semantically distinct regions still remains an open problem in computer vision. Sections 5 and 6 talk about multimedia indexing and semantic search methods respectively while section 7 shows some latest query interfaces which have been developed to facilitate CBIR.

This book identifies some of the key issues involved in semantics sensitive image retrieval and lays down some of the proposed solutions. Certain important real world applications have also been discussed. However, the present state-of-the-art in CBIR is scantily reflected. Some of the papers included in the book ignore important work in this area. The organization of the book could be significantly improved. At present, it is just a collection of a few recent papers. Whereas it is fair to describe new ideas enthusiastically, the past published and recognized work in the field demands adequate importance. Ideally, a few chapters should have been devoted to describe past work on CBIR.

This book, can in no way, be regarded as a detailed treatise of the current state-of-the-art concerning CBIR technology. There is a significant amount of work done in the past few years that one book cannot capture. However, this book does provide a general overview of challenges involved in CBIR and proposes a few solutions and thus paves way for more detailed texts on this important subject.

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