Chapter 2
Content-Based Image Retrieval Using Shape Features

ABSTRACT

This chapter presents CBIR methodologies for extracting geometric and margin features of objects in images and constructed as feature vector. This approach is unique in nature as the size of the feature is relatively small and capable of discriminating the query object with the database object. These geometric features measure the object characteristics in terms of its shape and margin. Manhattan distance is used for measuring the similarity between query images and the database images for retrieving relevant images from the database.

INTRODUCTION

In Content Based Image Retrieval (CBIR) applications, various well-known low-level features such as color, texture and shape are extracted for describing the image semantics. It is noticed that the size of the image database for image retrieval applications is increasing exponentially and hence it is necessary to propose and use effective tools for retrieving images. The common ground for CBIR system is to extract a signature for every image based on its pixel value for comparing the images. The signature can be shape, texture, color or any other information with which two images are compared. A retrieval system retrieves both from the controlled image database and from WWW. The geometrical, margin and statistical properties of the objects present in

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images are extracted and the feature is constructed. Shape of an image is also proved as powerful representation as it characterizes the geometry of the object. From the geometrical and margin features, the shape information is approximated and used for describing objects present in images.

**BRIEF HISTORY ON CONTENT-BASED IMAGE RETRIEVAL**

Colour histograms like Human Colour Perception Histogram (HCPH) (Vadivel, Shamik & Majumdhar, 2008), (Deng et al. 2001) & (Gevers & Stokman, 2004) and histograms specified in (Lu et al. 2009) as well as color-texture features like Integrated Colour and Intensity Co-occurrence Matrix (ICICM) (Vadivel, Shamik & Majumdhar, 2007) show high precision of retrieval in such applications. Similarly, other important low-level feature used for retrieval is based on shape and margin properties of the object present in images (Tran & Ono, 2003). Shape of the object is represented by a density histogram of features points (Jain & Vailaya, 1996). Based on Euclidean distance, the images are retrieved and searched by comparing the query image and the images in the database. It has been noticed that combining more low-level feature certainly improve the precision of retrieval. Both the shape and color features are combined using various strategies such as weighting (Pentland, Picard & Sclaroff, 1996), Histogram-based (Rui, She & Huang, 1998), Kernel-based (Gudivada & Raghavan, 1995) and Invariance-based (Tao & Grosky, 1999). Shape and texture using elastic energy-based approach has been proposed for measuring image similarity (Lu & Sajjanhar, 1999).

An automated color extraction and texture information using binary set representations explained in (Smith & Chang, 1996). Few research articles focus on image retrieval by segmentation found in (Freeman & Saghri, 1978). A detailed overview on the various literatures that are available on CBIR can be found in (Arkin et al. 1991) and discussion on the various similarity measurement techniques can be found in (Safar, Shababi & Sun, 2000). Though the growth of research on image retrieval is witnessed to be exponential over the past, only a very few algorithm addresses the issues related to real-time systems or applications. From the various combinations of low-level features which are tried and tested, it is noticed that they are suitable fora generic system applications. Hence, it is more relevant to build image retrieval systems that are specialized to domains. Further, the selection of appropriate features for CBIR and annotation systems remains largely ad-hoc.
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