Approaches and Trends in Content based Image Retrieval

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Abstract— Interest in research on content-based image retrieval has paved the way for a large number of new techniques and systems. Given a query images are retrieved which is voluminous in nature. The drawback is that the image data retrieved is not relevant and hence need to be eliminated. In this paper, we discuss some of the key contributions in the current decade related to image retrieval. We also discuss some of the key challenges involved in the adaptation of existing image retrieval techniques to build useful systems that can handle real-world data. The study leads to new trends in volume and impact on retrieval of images with respect to keywords only.

Index Terms— Content-based image retrieval, SVM , Semantic description, relevance feedback

I. INTRODUCTION

Content-based image retrieval is a technology that helps to retrieve picture images based on the given query. With the rapid growth of computing power and digital image acquisition devices available, effective retrieval of images is still a highly challenging. Content Based Image Retrieval (CBIR) plays a vital role in the field of medicine, geography, security, databases & its applications etc. Some of the popular CBIR systems are QBIC[6], MIT's Photobook[7], VisualSeek[8], PicSOM[9] and Viagem [10].

So far, a major breakthrough in image retrieval has not been achieved. Furthermore, there is no single universal approach to the content-based retrieval problems, even in a restricted domain application [1]. CBIR attempts to match similar objects based on shape, color and texture. RGB. HSV and other proposed methods is analyzed. Such Image retrieval using colour histograms has both advantages and limitations [2, 3].

Past efforts have made it clear that semantic description and retrieval approach for the image content should be involved in the CBIR technology to reduce the semantic gap [4]. Hence it is it is desirable for the relevance feedback based on the user participation in image retrieval system [5]. Through the user's feedback, the corresponding high-level semantic will be obtained based on machine learning theory. the gap between image content understanding and machine visual perception emphasized simulating human perception of visual contents via the human-computer interaction (HCI) - also known as Human-controlled or Relevance Feedback (RF). [11]
Though there exists several systems, CBIR requirement is not fulfilled. The paper lists out the pros and cons of several CBIR techniques and finally provides directions for the new trends and challenges that are available. The paper is organized as follows. Section 1 presented some of the basics on CBIR. Section 2 presents the literature review. Approaches and trends in CBIR are discussed in section 3. Section 4 presents the conclusion and future directions.

II. RELATED RESEARCH

Miguel Arevalillo Herráez et al presented a novel probabilistic framework to process multiple sample queries in content based image retrieval (CBIR) [12]. The proposed framework is independent from the underlying distance or (dis)similarity measures which supports the retrieval system, and only assumes mutual independence among their outcomes. The framework also gives rise to a relevance feedback mechanism in which positive and negative data were recombined in order to optimally retrieve images according to the available information. The authors have set a particular setting in which users interactively supply feedback and iteratively retrieve images both to model the system and to perform some objective performance measures.

M.E. ElAlami proposed a model for content-based image retrieval (CBIR) which depends only on extracting the most relevant features according to a feature selection technique [13]. The suggested feature selection technique aims at selecting the optimal features that not only maximize the detection rate but also simplify the computation of the image retrieval process. The proposed model is divided into three main techniques, the first one is concerned with the features extraction from images database, the second is performing feature discrimination, and the third is concerned with the feature selection from the original ones. As for the first technique, the 3D color histogram and the Gabor filter algorithm are used to extract the color and texture features respectively. While the second technique depends on a genetic algorithm (GA) for replacing numerical features with nominal features that represent intervals of numerical domains with discrete values. The GA is utilized in this technique to obtain the optimal boundaries of these intervals, and consequently to reduce the complexity in feature space. In the third technique, the feature selection performs two successive functions which are called preliminary and deeply reduction for extracting the most relevant features from the original features set. Indeed, the main contribution of the proposed model is providing a precise image retrieval in a short time.

Jun Yue et al presented a method to extract color and texture features of an image quickly for content-based image retrieval (CBIR) [14]. First, HSV color space is quantified rationally. Color histogram and texture features based on a co-occurrence matrix are extracted to form feature vectors. Then the characteristics of the global color histogram, local color histogram and texture features are compared and analyzed for CBIR. Based on these works, a CBIR system is designed using color and texture fused features by constructing weights of feature vectors. The relevant retrieval experiments show that the fused features retrieval brings better visual feeling than the single feature retrieval, which means better retrieval results.

Nidhi Singh, Kanchan Singh and Ashok K. Sinha [15] dealt with the problem of content based image retrieval in dynamic environment. The authors felt that, it is not feasible for systems that analyze images in real-time where the images are stored or added on an ongoing basis. The authors proposed framework was able to select the most appropriate features to analyze newly received images thereby improving the retrieval accuracy and efficiency. An improved algorithm is proposed by the authors, where the algorithm comprises of designing feature vectors after segmentation which will be used in similarity comparison between query image and database images. The framework is trained for different images in the database. The algorithm was also tested on various real images and its performance is found to be quite satisfactory when compared with the performance of conventional methods of content based image retrieval.

Deniz Kýlýnç and Adil Alpkocak [16] introduced the concept of query expansion and reranking approach for annotation based image retrieval from Web pages. The author’s suggestions were considered for image retrieval system using the surrounding texts nearby the image in a Web page as annotations. However, annotations may include too much and uninformative text such as copyright notice, date, author. In order to choose indexing terms effectively, the authors have proposed a term selection approach, which first expands the document using WordNet, and then selects descriptive terms among them. Notably, term selection methodology to both document and query was applied. This is because applying either of documents or query does not help to increase retrieval performance. On the other hand, term selection process increases the number of terms per documents, and both documents and queries become more exhaustive than original. Consequently, this results in high recall with low precision in retrieval. The authors also proposed a two-level
reranking approach. In order to evaluate the proposed approach, ImageCLEF2009 WikipediaMM subtask venue is chosen for participation. The results we obtained are superior to any participating approaches and the approach has obtained the best four ranks, in text-only image retrieval. The results also showed that document expansion and effective term selection to annotations plays an important role in text-based image retrieval.

Ying Liu demands that content-based image retrieval, two merits are becoming more desirable [17]. The first is the reduced search space, and the second is the reduced semantic gap. The proposed semantic clustering scheme approach achieve these two goals. By performing clustering before image retrieval, the search space can be significantly reduced. The proposed method is different from existing image clustering methods as follows: (1) it is region based, meaning that image subregions, instead of the whole image, are grouped into. The semantic similarities among image regions are collected over the user query and feedback history; (2) the clustering scheme is dynamic in the sense that it can evolve to include more new semantic categories. Ideally, one cluster approximates one semantic concept or a small set of closely related semantic concepts, based on which the “semantic gap” in the retrieval is reduced.

III. APPROACHES AND TRENDS

A sample CBIR system is presented in Figure 1. The steps involved in our proposed system is given in Figure 2. The sequence of steps involved in our system are given below:

- Given a sample query, images are obtained (Fig 1)
- Retrieved images from databases are iteratively compared with another image
- Comparison of images is done using similarity computation, extracting several attributes like color, shape, texture etc

![Figure 1: Sample CBIR system](image1.png)

![Figure 2: Proposed CBIR architecture](image2.png)

The sample query and the image obtained for two different samples is given in figure 3 & Figure 4. The following observations were made:

- Few images are totally irrelevant
- Images are also repeated in few cases

We try to give attention to give these two areas. Analyzing figure 4, we could find that we get textual advertisements.
IV. CONCLUSION

CBIR tries to draw out the images from the database which is voluminous in nature. The major drawback is that the image data retrieved adopts combination of several features not focusing on semanticity. The paper also discussed some of the key contributions in the current decade related to image retrieval. The key challenges involved in the adaptation of existing image retrieval techniques to build useful systems handling real-world data is presented in the paper. The paper proposed a new scheme for CBIR, there by improving the precision and recall values.

ACKNOWLEDGEMENT

The authors would like to express our special thanks to insightful suggestions for the anonymous reviewers. The first author would extend the support rendered by the management for carrying out the research work successfully.

REFERENCES


