Recent Trend of Content Based Image Retrieval Using Intelligent Fusion Techniques

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Abstract— the goal of this paper is to present use of fusion techniques in content based image retrieval. This techniques improve semantic value of user queries. Hence, improve performance of content based image retrieval system. Basically, Images are expressed at different semantic levels. Content Based Image Retrieval is growing technologies for bridging the semantic gap that presently prevents deployment of image content-based search engines. Typically, content-based methods are based on low-level descriptions, while high-level or semantic descriptions are beyond current capabilities. for bridging semantic gap in content based image retrieval, researcher proposes fusion techniques. There are three fusion methods are used like early fusion, late fusion and intermediate level fusion methods. Among which late fusion is used with semantic to improve performance of image retrieval. In this paper, we focus on recent image fusion techniques and study current image retrieval system using fusion techniques.

Keywords— CBIR, fusion techniques, semantic value

I. INTRODUCTION

Even today, content based image retrieval system is suffer from only one problem that is “semantic gap”. Basically, image database such as images are stored in machines into a computational representation which consists of low-level features. At a same time, humans search images by expressing their needs by using high-level concepts such as keywords. It is a difficult task to map both representations in order to match the information need of a user and the items of the collection. In particular, it is very challenging to automatically extract the semantic content of an image or a video.

The main focus of use of fusion techniques in content based image retrieval is to improve results by evaluation of different weighting models in text retrieval and then choose the best low-level feature of images for fusion with text only results. During the combination of text and low-level features, then check the variation of methods to gain the best result.

II. RELATED WORK

Fusion techniques used for satellite images retrieval like multispectral and panchromatic image fusion for the ZiYuan-satellite[1]. Traditionally, image fusion quality is assessed by measuring the spectral distortion between the original and the fused MS images. The traditional methods focus on the spectral information at the data level but fail to indicate the image content at the information level, which is more important for specific remote sensing applications. In this context, an information-based approach is proposed for assessing the fused image quality by the use of a set of primitive indices which can be calculated automatically without a requirement for training samples or machine learning. Here, an appropriate image quality index should take into account the global and local image features at both the data and information levels.

A CBIR is proposed based on colour & texture based search where feature vector is generated by fusion of Modified Block Truncation Coding technique and Kekre Transform techniques [2]. Modified Block Truncation Coding (MBTC) is used for colour information retrieval. To extract texture information we are using pattern generated by transforms, currently we are considering Kekre Transform.

In CBIR, a semi-supervised learning technique is used to address the problem of fusing multimodal information sources [3]. In CBIR approach, user's preferences in the form of reference feedback are treated as labeled data, and the key idea is to devise an on-line scheme to effectively transform the abstract semantics into useful training data.
for improving the query performance. This fusion method can be characterized with the following three advantages first, Kernel matrices are used to encode each modality of information so that the fusion can be conveniently carried out via boosting, second is base kernel matrices are derived from eigendecomposing the graph Laplacian, and further refined to satisfy a pivotal monotone property that ensures intrinsic structure will be reasonably maintained for each modality and final advantage is adopted optimization criterion in boosting is to align with a target kernel matrix accounting for relevance feedback, and the learned multimodal kernel matrix can be used for training.

CBIR with two related RF methods is developed where performance of the proposed methods is studied on two image collections with different characteristics and compared against an existing RF method [4]. In this system, fusion of result of two RF method is done. These two methods are based on a general classificatory analysis based framework for RF in CBMR that considers RF independently from retrieval. The proposed methods show how the user's information need expressed as a set of "proto-reducts" can be used as the basis of a re-weighting technique that can improve subsequent retrieval.

A fusion-based similarity matching framework is developed for content-based image retrieval on a combination of global, semi-global and local region specific features at different levels of abstraction [5]. In this framework, an image is represented by global color and edge histogram descriptors, semi-global color and texture descriptors from grid based overlapping sub-images and local color features from a clustering-based segmented regions. As a result, image similarities are obtained through a weighted combination of overall similarity fusing global, semi-global and local region-based image level similarities. This fusing approach decreases the impact of inaccurate segmentation and increases retrieval effectiveness as constituent features are of a complementary nature. Aggregation or fusion-based technique in CBIR provides an effective and flexible tool for similarity calculation.

A novel fusion approach to content-based image retrieval is proposed in which an image is represented by a set of color-clustering-based segmented regions and global/semi-global edge histogram descriptors [6]. As a result, the resemblance of two images is measured by an overall similarity fusing both region-based and global/semi-global-based image level similarities. In this approach, each segmented region corresponds to an object or parts of an object and is represented by two sets of fuzzified color and texture features. A fuzzy region matching scheme, which allows one region to match several regions, is then incorporated to address the issues associated with the color/texture inaccuracies and segmentation uncertainties. The matched regions, together with the simple semantics for determining the relative importance of each region, are further used to calculate the region-based image level similarity. The global/semi-global EHDs are also incorporated into our retrieval system since they do not depend on the segmentation results. These EHDs not only decrease the impact of inaccurate segmentation and but also reduce the possible retrieval accuracy degradation after applying the fuzzy approach to the accurate segmentation for images with distinctive and relevant scenes. The Manhattan distance is used to measure the global/semi-global image level similarity. Finally, the overall similarity is computed as a weighted combination of regional and global/semi-global image level similarity measures incorporating all features.

For CBIR, a rough set based general framework called CAFe for RF and a re-weighting strategy based on a rough set theoretic analysis of the user feedback is proposed [7]. Relevance feedback is a widely used technique to deal with the issues of user subjectivity and the semantic gap in content-based image retrieval. This method uses the approximation of the information need distilled from the user classification as the basis for multiple distinct retrievals. The final result set that is presented as the subsequent iteration to the user is obtained by fusing the result sets from the different retrievals. The method is demonstrated in the context of a simple test image collection for clarity. An analysis of the sample iterations of feedback is presented. The method relies on a conceptually appealing model of the user feedback and serves to establish the utility of the general framework.

A decision making framework for content-based retrieval of art images is developed which based on a combination of low-level features [8]. Traditionally, the similarity between two images has been calculated as a weighted distance between two feature vectors. This framework generalizes a wide set of previous approaches to similarity calculation, including the weighted distance approach. Image similarities are obtained through a decision making process based on low-level feature distances using fuzzy theory. This aggregation technique provides an effective, general, and flexible tool for similarity calculation based on the combination of individual descriptors and features. A classification-driven biomedical image retrieval framework is proposed which is based on image filtering and similarity fusion by employing supervised learning techniques [9]. In this framework, the probabilistic outputs of a multiclass support vector machine classifier as
category prediction of query and database images are exploited at first to filter out irrelevant images, thereby reducing the search space for similarity matching. Images are classified at a global level according to their modalities based on different low-level, concept, and keypoint-based features. It is difficult to find a unique feature to compare images effectively for all types of queries. Hence, a query-specific adaptive linear combination of similarity matching approach is proposed by relying on the image classification and feedback information from users. Based on the prediction of a query image category, individual precomputed weights of different features are adjusted online. The prediction of the classifier may be inaccurate in some cases and a user might have a different semantic interpretation about retrieved images.

A CBIR system for endoscopic image is describe which use new algorithm with multi-feature fusion[10]. Low-level features are proposed based on the study of single feature including color clustering, texture information. Then, relevance feedback technique is combined with the feature fusion algorithm in order to improve retrieval results.

CBIR for image representation to bridge the gap between visual features and semantics is invented which use two new combined feature extraction approaches are used to extract significant features from images [11]. Each approach is a hybrid of two feature extraction methods and tries to capture both colour and texture information. In order to improve the query processing time and avoid the linear search problem, a clustering technique is applied on the image dataset according to each feature extraction approach. The clustering outcomes of the two feature extraction approaches are combined together using a decision fusion technique.

A Shape-based image retrieval techniques are among the most successful content-based image retrieval approaches. In recent years, the number of shape-based image retrieval techniques has dramatically increased; however, each technique has both advantages and shortcomings. A consensus-based fusion algorithm integrate several shape-based image retrieval techniques so as to enhance the performance of the image retrieval process[12]. In this algorithm, several techniques work as a team: they exchange their ranking information based on pair-wise co-ranking to reach a consensus that will improve their final ranking decisions. Although the proposed algorithm handles any number of CBIR techniques, only three common techniques are used to demonstrate its effectiveness. The results indicate that this fusion algorithm significantly improves the retrieval process.

III. FUNDAMENTAL OF FUSION METHODS

In this section, we give general idea of fusion. Here, we focus on fusion strategies, fusion level and fusion types.

Fusion Strategies

Basically, fusion strategies include three strategies like Complementary fusion, Co-operative fusion strategy, Competitive strategy. Complementary fusion exploits the diversity between the information sources and combines multiple complementary information sources and generalizing over them. Co-operative fusion strategy exploits the dependence between the information sources e.g. majority voting and combines features cooperatively to get a more precise representation of the world. Finally about Competitive strategy is more related to expert selection than to combination.

Fusion level

Here, we focus on two level of fusion.

Low-level, early fusion (data, sensor or feature level):
Theoretically, low level fusion provides the best performance improvements, but mostly not feasible. It concatenation at feature level is the simplest but weakest form of information fusion. It can be improved by exploiting intermodal and/or inter-attribute relationships like dependency, correlation, co-occurrence, causality or mutual information.

High-level, late fusion (score, rank or decision level):
According to high level fusion, each modality/source/feature is processed separately and the results (ranks, scores) are combined for final decision. It is faster and easier to implement, no need for data alignment or feature selection. It if specificities of each sources/modalities can be better exploited.

Types of fusion techniques

Most commonly used fusion techniques in image retrieval include feature level fusion, fuzzy fusion and design level fusion.

- Feature level fusion

Feature level fusion combine more than one feature set extracted from image and high level feature from text query.

- Fuzzy fusion:

Fuzzy logic based information fusion is one of the best approach. This fusion is applies before or after features matching stage. Basically, it reduce data set for matching and comparison. If fusion is applied before matching stage to improve retrieval performance. Fuzzy fusion deals with quality of input image and quality of any system component.

- Decision level fusion
Decision level fusion consolidate the final design of matching phase. According to researcher, there are three basic rules for decision level fusion like AND rule OR rule and Majority voting rule are used to perform fusion. Among these three, majority voting rule gives better performance in image retrieval.

Fusion techniques used by CBIR

In CBIR, we make fusion of Visual and Textual Information. Here, fusion is categorized into three types such as earlier fusion, late fusion and intermediate fusion. Earlier Fusion: Earlier fusion is carry out with or without feature weighting .at Joint models such as CCA and sometime Translation models. Intermediate level fusion: It carry out with Relevance model, Tran media query expansion and Cross-media similarities. Basically, images are expressed at different semantic levels. In content based image retrieval, a fusion methods such as late fusion is used with semantic filters in order to go beyond image reranking techniques.

IV. CONCLUSION

In this paper, we focus on fusion techniques that combine low level feature of images with best text to improve content based image retrieval result. This paper also studied present image retrieval system using fusion techniques. The retrieval using fusion clearly show improved result indicate that proper fusion of different modalities improve the overall retrieval performance of content based image retrieval system.

VI REFERENCES


