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A Survey on Scalable Face Image Retrieval Using Attribute-Enhanced Sparse Code-Words

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ABSTRACT- The rapidly growing popularity of social networking platforms these days, has led to a sudden influx in the number of facial image photos that are needed to be stored, shared or processed. The sheer volume of facial image data proves to be a major challenge for effective image retrieval. The objective of using attribute enhanced sparse coding is to use automatically detected facial attributes to form sparse code-words for each image. The use of attribute-enhanced sparse coding and attribute-embedded inverted indexing allows for faster image retrieval by exploiting hamming distances between sparse code-words generated for each image. The process aims to drastically reduce search space during retrieval phase thus, increasing overall efficiency.

KEYWORDS: attribute- enhanced sparse coding, attribute-embedded inverted indexing, Scale-Invariant Feature Transform (SIFT), Content-Based Image Retrieval (CBIR).

I. INTRODUCTION

Traditional content-based image retrieval systems largely encourage the use of low-level facial attributes (eg: expression, posing)to classify images. However, such attributes are unable to produce acceptable results due to the fact that face images of various people may be strikingly similar in traditional low-level feature space. This problem is further aggravated in case of large-scale image databases due to large low-level feature space. This issue can be resolved by the combined use of both low-level and high-level (eg: gender, race) human facial attributes to give better retrieval results. Algorithms that promise to achieve this feat include attribute-enhanced sparse coding and attribute-enhanced indexing.

Increased access to smart phones and digital cameras to the public in general, (not to mention the rise of social networking/photo sharing services like Facebook, Flickr,etc) has led to a revolution in the field of image retrieval owing to the sheer volume of image data that is required to be stored. Facial image photos form a sizable proportion (estimated to be about 60%) of the enormous number of photos stored in an image database. Effective image retrieval in large-scale image databases is crucial in order to provide timely access to clients and gain certain useful insights from available data. The main aim of scalable face image retrieval using attribute-enhanced sparse code-words is to be able to provide accurate results for a given query image, while reducing the time complexity of the search operation even in large-scale image databases. It promises to yield great results in the fields of face authentication, criminal investigation, and so on.

II. RELATED WORK

In [1]authorsproposed a learning framework to automatically find distinguishing facial attributes. With the help of these automatically detected human attributes, they achieved excellent performance on keyword-based face image retrieval and face verification. In [2] authorsfurther extended the framework to deal with multi-attribute queries for greater efficiency in keyword-based face image retrieval. A Bayesian network approach was proposed in [3] to utilize human attributes for face identification.In [4] authors proposed a face image retrieval system using component-based local

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features with identity-based quantization to deal with scalability issues of earlier systems which paved the way for efficient face-image retrieval in large-scale image databases. To compensate for quantization losses, they further recommended the use of state-of-the-art features with principal component analysis for re-ranking of results to achieve more accurate results.In [5] authorsproposed the use of component-based local binary pattern (LBP) features for face recognition, combined with sparse coding in order to construct semantic code-words for efficient content-based face image retrieval. They recommended the use of sparse code-words to reduce search space during retrieval stage. The use of sparse code allows system to skip images with large hamming distance with respect to query image thus, reducing unnecessary burden on available resources and achieving faster results.In[6] authorsproposed a machine learning framework that uses un-labelled data along with sparse coding for image classification tasks.This framework was applied on SIFT descriptors along with spatial pyramid matching and maximum pooling to improve classification results in [7].In [8]authors proposed to use sparse representation for face recognition in order to achieve state-of-the-art performance in face-image retrieval systems.

III. PROPOSED SYSTEM

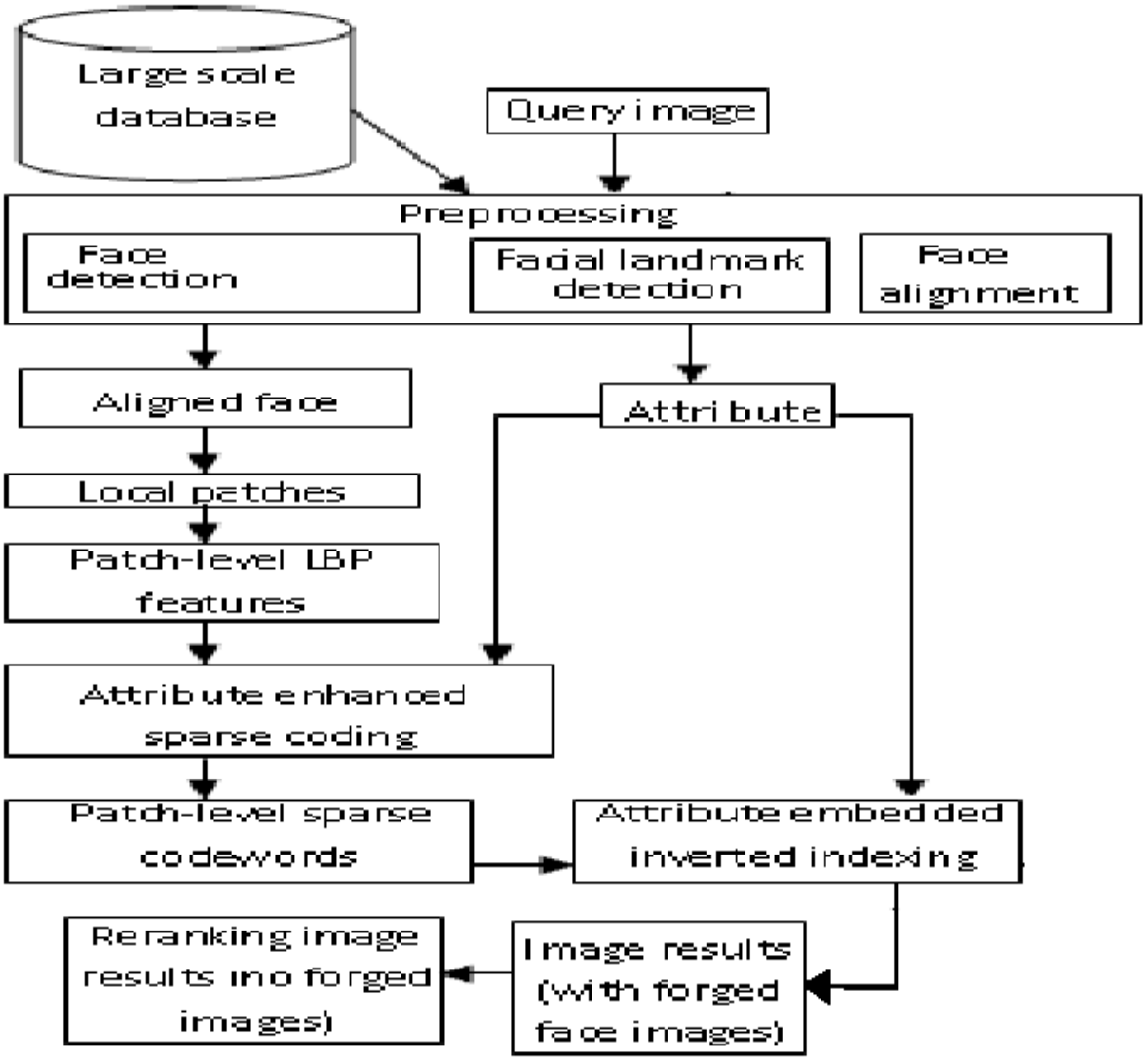

Fig. 1 Workflow of proposed System

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The proposed work is a facial image retrieval model for problem of face images searching and retrieval with search space comprising of a large-scale face image database by integrating content-based image retrieval (CBIR) techniques and face recognition techniques, with focus on the semantic description of the facial image. The aim is to reduce the semantic gap between high level query requirement and low level facial features of the human face image. The use of attribute-enhanced sparse coding exploits high-level feature information which significantly increases accuracy of results. By considering sparse code-words with attribute-enhanced indexing we can skip images with large hammingdistance in attribute hamming space and improve retrieval performance during retrieval stage.

IV. CONCLUSION AND FUTURE WORK

Large-scale content-based face image retrieval is a need of the hour. This comprises image retrieval techniques that do not burden underlying infrastructure, and other resources which is a major challenge for large-scale image databases due to the enormous amounts of image data that needs to be dealt with. To generate promising results for large-scale face image retrieval, it is imperative to exploit information contained in both low- level and high level human features. This is achieved with the help of attribute-enhanced sparse coding and attribute-embedded inverted indexing. The attribute-enhanced sparse coding algorithm, aims to generate semantic code-words for images, by using automatically detected facial attributes. By considering pre-generated binary attribute signatures of images, the attribute embedded inverted indexing algorithm allows for faster and accurate image retrieval by skipping images with large hamming distance with respect to the sparse code-word of a given query image. The above techniques promise to achieve about 40% relative efficiency compared to traditional content-based face image retrieval techniques. These techniques can further be extended to provide efficient results in the fields of criminal investigation, automatic face annotation,etc.

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BIOGRAPHY

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