Scalable Face Image Retrieval Using Attribute Patch Reinforcement and Sparse Coding

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Abstract:
In today’s life variety applications including face identification and also use face image retrieval method. This technique is quite challenging since all the faces will appear similar at initial level due to similar geometry of face structure configuration. This paper retrieves similar faces using content based method. In initial stage low level features such as appearance and posing is been done by Content Based Image Retrieval. But a low level feature does not give précised or correct semantic image description. For an e.g., different peoples face is retrieved as similar in low key features. By incorporating low level features with high level human attributes like facial color, hair color, gender etc this problem is solved. Two valuable methods such as attribute enhanced sparse coding and attribute embedded inverted indexing are used here for more effectively retrieve of image. These techniques can achieve above 43.5% improvement by comparing with existing techniques.

Keywords: Face image, Human Attribute, Content based image retrieval; Attribute enhanced sparse coding, Image retrieval, Attribute Embedded

I. Introduction
In day today life the use of social media is increasing. Use of Twitter, face books and various social interactive sites is on height. Most of such accounts have introduction or profile images as their facial image or image of any famous personality. Such kinds of images are used for purpose of search or mining operations. But at basic level problem may arise as many facial images may appear same. In such Content based image retrieval is concrete and latest technology for many real time running applications. But as different peoples can have same facial structure, so new problem may arise for similar face image retrieval. So Content Based Image Retrieval technique is used for basic features extraction (eg: - hair, gender, race) .But it can’t differentiate the different faces on basis of low level features, so high level image features (eg:-expression, posing) extraction is done using Scalable Indexing method which provide more deep extraction of features which proves efficient from basis of view of classification.

Incorporating both high and low image features gives the best result combining for image retrieval from dataset.

II. Related work
The image content like color, texture and gradient use content-based image retrieval (CBIR) techniques use to represent images. Two kinds of indexing systems are used [8]To deal with large scale data, mainly to achieve efficient similarity search High precision on object recognition can be achievable, but face low recall problem due to the semantic gap. Bride the semantic gap by finding semantic image representations to improve the CBIR performance is subject of search at head now.

Automatically detected human attributes have been shown By Kumar et al. propose to automatically find describable visual attributes [5] for generating code words. Using automatically detected human attributes, they achieve excellent performance on keyword ridden face image retrieval and face verification. Siddiquie et al. [7] further extend the framework to deal with queries and its multi-attribute, keyword-based face image retrieving. Scheirer et al. [6] propose a Bayesian network technique to utilize the human attributes for face rectification. To further improve the quality of attributes, Parikh et al. propose to use relative attributes and Scheirer et al. propose multi-attribute space [8] to normalize the maximum matching scores from different attribute detectors for similar attribute search.

The works demonstrate the opportunities for the human to achieve salient performance on keyword based face image retrieval and face rectification we propose to migrate for effective ways to combine low-level features and automatically detect facial attributes for scalable face image retrieving. To the best as per our knowledge, very few works aim to deal with this problem. Use of social media and image sharing there arises the need of (CBIR) Content-based face image retrieval is closely related to face recognition for scalable indexing systems.

Wu et al. [3] propose a face retrieval framework using component-based local features. To calculate quantization loss, further propose use of state-of-the-art features with re-ranking principal for component analysis.

Wang et. al. [2] propose an framework for automatic face annotation based on content-based face image retrieval A well known feature for face recognition, construction of sparse coding and partial identity information to construct semantic code words for CBIR together. Sparse coding can exploit the semantics of the data and achieve maximum positive results in many different applications such as face recognition, image classification. Raina et al. propose machine learning framework with unlabeled data and sparse coding for classification tasks.

Using component-based LBP combined with sparse coding to construct sparse code words for efficient content-based face image retrieval. Using annotations manually, focusing on utilizing automatically detected human attributes so as to construct semantic-aware sparse code words by using enhanced sparse coding for attribute. Additionally, we propose attribute-embedded inverted index for online ranking stage. This method can be easily combined with the method proposed in paper [6]. Also, low-level feature (i.e., LBP) can be replaced by other features such as descriptor used in [3].

II. Methods description:
There are various methods are used in this paper:

a) Attribute Enhanced Sparse Coding:
\[
\min_{D,V} \sum_{i=1}^{n} \left\| x^{(i)} - D v^{(i)} \right\|_2^2 + \lambda \left\| v^{(i)} \right\|_1
\]
subject to \( \left\| D_{*j} \right\|_2 = 1, \forall j \)

\( o \)-Pair wise Multiplication between two vectors,
\( f_a(i) = \) Attribute Score,
\( i=\)image,
\( z^{(i)} = \)mask vector for deciding codeword’s,
\( v_j^{(i)} = \)sparse representation.

This method combines human attributes with low level features to construct semantic code words in the offline stage. And it exploits global structure of features space. Attribute sparse coding generates global structure of feature space for construction of code meaning and words, important characteristics of human to consider in sparse representation. First code words contain different attribute with different images value to force dictionary use. For single characteristics of human, divided two different subsets dictionary centroids, with score with negative and positive attributes image will use subset of image with scores of other. Image with distinct characteristics would certainly different code words.

b) Attribute Embedded Invert Indexing:
\[
b_j^{(i)} = \begin{cases} 
1 & \text{if } f_a(i) > 0 \\
0 & \text{otherwise} 
\end{cases}
\]
The similarity score is then modified into,
\[
S(i,j) = \begin{cases} 
\left\| c^{(i)} \cap c^{(j)} \right\| & \text{if } h(b^{(i)}, b^{(j)}) \leq T \\
0 & \text{otherwise} 
\end{cases}
\]
\( d_k = \)dimension Binary signature, \( b^{(i)} = \)human attribute,
\( h(i,j) = \)denotes hamming distance between I and j. \( T = \)fixed threshold.

It considers human attributes of design query image in binary signature and provides efficient retrieval in online stage. Attribute-embedded inverted indexing locally consider human attribute of designed query image in binary signature and provides well organized retrieval in online stage.
Content based image retrieval used Viola-Jones face detector is applied to find locations of face in image present in every database. It takes 0.7 seconds for face detection and alignment for a single query, computing parse representation takes about 0.35 seconds, and more than one million retrieving index takes about 0.02 seconds.

III. Algorithms:

a) LBP Pattern (Local Binary Pattern)
   The LBP feature vector is created in the following manner, in simple format:
   - Divide the window to be examined into cells.
   - For each pixel in cell, compare the pixel to each of its 8 neighbors (on its top-left, middle-left, bottom-left, top-right, etc.). Follow the pixels along a circle, i.e. clockwise or counter-clockwise.
   - Where "1" is center pixel's value which if greater than the neighbor's value. Otherwise, write as "0". This 8-digit binary number (usually for convenience which is converted to decimal).
   - Histogram is computed, over the cell, of the frequency of each "number" occurring (i.e., each combination of pixels which are smaller and which are greater than the center).
   - Normalize the histogram optionally.
   - Concatenate (normalized) histograms of all cells. Feature vector for the window is given.

b) CBIR:
   It is also known as Query by image content based and visual data retrieval is application of computer vision idea to image retrieval problem, the problem of searching for digital in large huge database. And content based means the searches analyze contents of image preferably metadata such as description and keywords or tags about image.

IV. Result

In this given form when image is given as input with the help of browsing through the stored dataset.

In following form shows the ranking result of a above given query image.

In this form using query image patches can be generated.

V. Conclusion

Proposed system has two methods for automatically detecting human attributes and map retrieval up to 43%. Proposed system uses combination of low level as well as high level features combination to retrieve the probably similar image extraction. Attribute-enhanced sparse coding uses multiple human attributes to construct semantic codeword’s in the offline stage which describes all global structure of image. Attribute-embedded inverted indexing considers the local attribute signature of the query image and ensures efficient retrieval of image in online stage.
Using codeword’s generation fusing with above scheme, helps in reduction of quantization error and efficient face retrieval on datasets. Proposed indexing scheme integrating into inverse indexing, and can be efficient in maintain scalable framework. During this experimental computation we also discover that face retrieval across different datasets and these attributes are also promising for other applications.

VI. References


