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A NOVEL HYBRID FEATURE EXTRACTION TECHNIQUE FOR CONTENT BASED IMAGE RETRIEVAL

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Abstract
Content based image retrieval has increased in large part due to the rapid growth of the World Wide Web. The traditional text based search and retrieval has its own limitations and hence we move to a facial expressions images are search and retrieval system. In this paper we present a facial expression retrieval system that takes an image as the input query and retrieves images based on image content. Face recognition system is recognizing based on dimensionality reduction derived image features. Facial expressions recognition is the application of computer vision to the image retrieval problem. In this recognition context might refer colours, shapes, textures, or any other information that can be derived from the image itself.

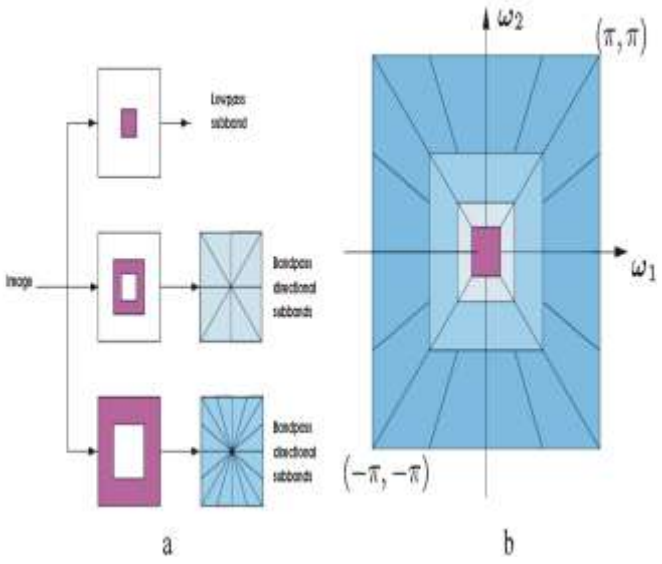
Introduction
Today, content based image retrieval (CBIR) is most popular and powerful technique for security system, medical, crime, and etc... There have been numerous types of improvement in content based image retrieval. The first type of improvement is supervised pattern which seeks to improve the performance of content based in recognition problems by exploiting the class label in sequence of samples in the training. The second type of improvement is unsupervised content based uses only the distance between samples to determine neighbour samples. The major difference between supervised content and unsupervised content is unsupervised content based uses only the distance between samples to determine neighbour samples but supervised content is applicable for both the distance measure and the class label of samples to find neighbour samples. CBIR aims to improve an efficient content based method to browse and search from large database collections. CBIR techniques take out low-level features of different objects of color, texture, shapes, and spatial layout of objects are used to measure the similarities among images by comparing the feature differences. Color is one of the most important feature based on low-level visual, which is mostly used in the applications of content based image retrieval of the pattern recognition. It has the different characteristics to computational easy calculation and invariant in image rotation, scaling, and translation. Texture is another type of most important low-level visual features extraction technique. It can express the relationship between the two natural surface objects and the surrounding environment. In shape feature extraction there are two types of shape features which are commonly used in digital image processing. One is region-based feature which is mostly used in clusters of patterns and the other is content-based feature which is widely used in searching engine based on different contents. the normalized distance from the region center to the image center, different contributions from color and texture features, and different contributions from regional, global, and semi-global features. It is noteworthy that the objective of the proposed method is to match entire images, including backgrounds and main objects. It may not perform very well for situations where the goal is to find images containing a specific object where the background is not important.

Discrete wavelet transform (DWT) and Contourlet transform (CT) are discussed in section II. Proposed method is discussed in section III. Experimental results are presented in section IV. Concluding remarks are discussed in section V.

Dwt And Contourlet Transform
A. Discrete Wavelet Transform (DWT)
B. Contourlet Transform (CT)

In decades, most of the researchers are proposed two dimensional image representation method, namely, contourlet transform (CT), which is based on nonseparable filter banks and provides an efficient directional

multiresolution image representation in different aspects. In the contourlet transform, the main role is Laplacian pyramid (LP), which provides first employed to capture the point discontinuities, and then followed by a direction filter banks (DFBs), which provides to link point discontinuities into linear structures. Compared with the traditional DWT, the contourlet transform is not only concentrated on different aspects of multiscale and localization, but also with multi direction and anisotropy. So the contourlet transform can represent edges and other singularities along curves much more efficiently. The contourlet transform consisting Laplacian transform and directional filter bank. These two follow the procedure of down sampling and up sampling. the contourlet transform is having number of shift-invariance and causes pseudo-Gibbs phenomena around singularities. Specially, during the process of realization in the contourlet transform consisting two filter banks such as the analysis filter banks and the synthesis filter banks for decomposition are nonseparable bi-orthogonal filter with band width. According to multiresolution process, down sample on filtered image may result in low pass and high pass frequency aliasing. Therefore, the frequency aliasing affects lie in directional subbands, which comes from the high pass subbands filtered by DFB The frequency aliasing will result in information in a direction to appear in different directional subbands at the same time. This must weaken the directional selectively of contourlets. Non subsampled contourlet transform To get rid of the frequency aliasing of the CT and enhance directional selectivity and shift-invariance, Cunha, Zhou, and Do proposed non subsampled contourlet transform (NSCT) based on non subsampled pyramid decomposition and non subsampled filter banks (NSFBs). The NSCT eliminates the down samplers and the up samplers during the decomposition and the reconstruction of the image; instead it is built upon the non subsampled pyramids filter banks (NSPFBs) and the non subsampled directional filter banks (NSDFBs).



The primary goal of the contourlet construction was to obtain a sparse expansion for a typical image that is piecewise smooth [18]. Two-dimensional wavelets are only good at catching the point discontinuities, but do not capture the geometrical smoothness of the contours [25]. To get rid of the limitations of wavelets, the contourlet trans- form was constructed by utilizing a double filter bank structure in which at first the Laplacian pyramid is used to capture the point discontinuities, and then a directional filter bank (DFB) is used to link point discontinuities into linear structure [18]. Due to its cascade structure accomplished by combining the Laplacian pyramid with a DFB at each scale, multiscale and directional decomposition stages in the contourlet transform are indepen- dent of each other. Therefore, one can decompose each scale into any arbitrary power of two's number of directions, and different scales can be decomposed into different numbers of directions. Moreover, it can represent smooth edges with close to optimal efficiency.

Multiresolution. The representation should allow images to be successively approximated, from coarse to fine resolutions. Localization. The basis elements in the representation should be localized in both the spatial and the frequency domains. Critical sampling. For some applications (e.g., compression), the representation should form

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a basis, or a frame with small redundancy. Directionality. The representation should contain basis elements oriented at a variety of directions, much more than the few directions that are offered by separable wavelets.

Proposed method

The basic steps involved in the proposed CBIR system includes database processing and resizing, creation and normalization of feature database, and then compare the query image with the database and finally that image can be retrieved. Proposed algorithm will be given in the steps wise.

1. By using Contourlet Transform we can decompose each image in the Contourlet Domain
2. In the first step calculate mean value of sub-pattern images. Each of them can be expressed in the form of a d by-N Column data matrix.

$$\sigma_k = \sqrt{((1/M*N)\sum_{i=1}^{M} \sum (W_k(i,j) - \mu_k)^2)}$$

Where

W_k = coefficient of K th contourlet transform of decomposed subband.

μ_k = mean value of K th sub band .

M*N = Size of the contourlet transform composed subband.

The resulting standard decoposed for contourlet transform is

$$f = [\sigma_1 \sigma_2 \sigma_3 ..... \sigma_n]$$

Similarly same procedure for remaining all subpatterns.

3. Each of them can be expressed in the form of d-by-L Eigenvector matrix.
4. Afterwards, S extracted local sub feature weights of an individual vertically are synthesized into a global feature.
5. At final stage necessary to identify a new test image, this image also partitioned into S sub-pattern images. Each of them is represented as C test i and it's vertically centered.
6. Finally, the identification of the test image is done by using nearest neighbor classifier with cosine measure, in which the cosine of the angle between the test image and each training image in the database.

Experimental Results

Retrieval performance in terms of average retrieval rate and retrieval time of the proposed CBIR system is tested by conducting as experiment on gale face database. Edge and texture orientations are captured by using CT decomposition with a 4-level(0,2,3,4) LP decomposition. At each level the number of directional sub-bands are 3,4,8 and 16 respectively. 'Pkva' filters [25] are used for LP decomposition and directional sub band decomposition .These parameters results in a 32- directional feature vector 9n=32 .Standard deviation (SD) Vector is used as image feature, which is computed on each directional sub band of the CT decomposed image and normalized [26] to range [0,1]. The normalized feature vector is used for the creation of the feature database.

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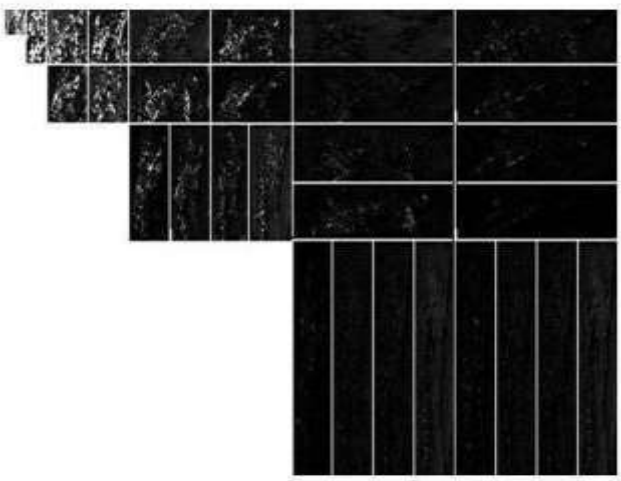

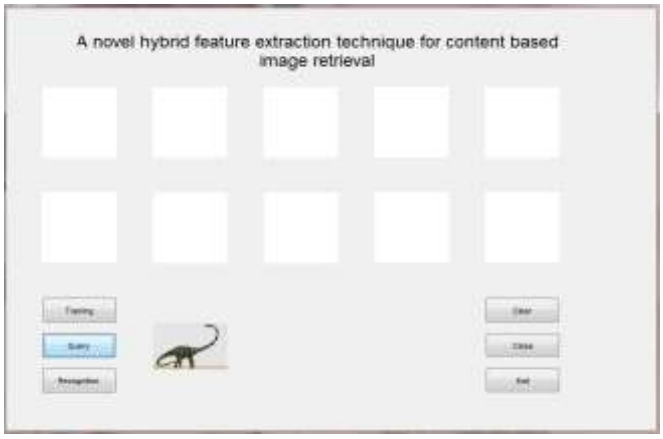

The mean of each image, it can be used to eliminate the effect of the values. In other words, the property of vertical centering process [9] can be helpful in eliminating the shifted values of original-pixels. Further, the sub-pattern technique can be utilized to encourage the efficiency of the vertical centering process. Therefore, sub-pattern technique is actually useful to vertical centering process of sub-pattern technique. The vertical centering may benefits for the recognition in varying illumination. Now, we have

confirmed this possible forecast and strongly increased the efficiency of the vertical centering process by sub-pattern technique in this paper. From the total experimental results, it can also be seen that for expression variant test, sub-pattern technique and Eigen vector can slightly improve weighted angle based approach classifier, the similarity between a test image and training image is defined as In the weighted angle based approach method cosine measurement.

Table 1. Recognized rate on face database.
(1, 3, 5,7,10 are Top 'N' recognized images)

	Number of top matches				
Methods	1	3	5	7	10
PCA	100	58.5	50.5	44.2	36.25
DWT	100	91	84	72	65
Combined technique (Proposed)	**100**	**98**	**95**	**87.4**	**78.5**

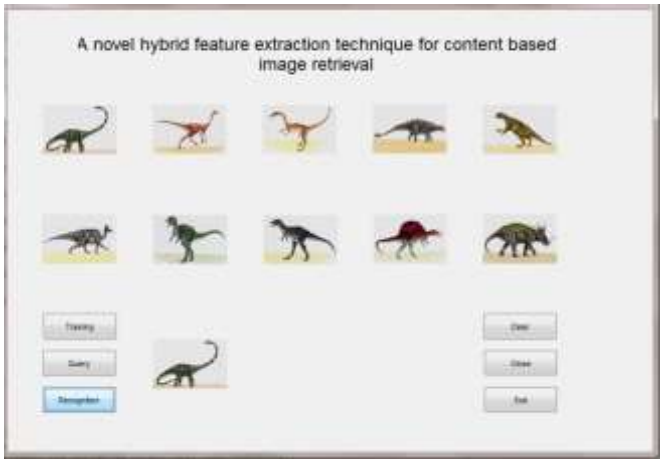

Figure 3. Recognized images.

Average recognized rate

In this work, retrieval performance of the proposed method is computed using Manhattan distance and minkowaskhi distance as similarity measures Manhattan distance takes the sum of the absolute differences but in our approach we can take the minkowaski distance in CBIR system in improved retrieval performance .The superiority of proposed method is ado observed in all cases i.e., when N is considered as 1,2 3,5,7,10(N is the no of retrieved images). When all the images in a class are retrieves (N=10) proposed method with minkowaski distance is able to produce an improved average retrieval rate of 29.25(i.e., from 38 to 67.25%).

Recognized Time

Face recognition system with weighted angle based approach technique for largest four eigenvector recognized time is 50.42 seconds (training time is 50 seconds and recognitized time is 0.42 seconds), hybrid approach technique for all positive eigenvector recognized time is 51.20 seconds, Existing method in PCA recognized time is 1.65 seconds, LDA time is 2.90 seconds and LPP method recognized time is 2.72 seconds.

Conclusions

Facial expressions recognition based on dimensionality reduction technique. Global feature vector is generated and used for face recognition. Horizontal and vertical variations are considered in feature vector. Facial expression recognition based on dimensionality reduction techniques gives better performance in terms of average recognized rate and retrieval time compared to existing methods.

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