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A NEW ADVANCED APPROACH FOR CONTENT BASED IMAGE RETRIEVAL USING TEXTON PATTERN

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Abstract
In this paper, a new advanced approach for content based image retrieval using texon pattern is proposed. The proposed method collects the texton pattern which gives the structure of the query image or database image. First, the color image is converted into HSV (hue, saturation and value) color space. Second, the V color space is divided into overlapping sub blocks of size 2 × 2 and textons are collected based on the shape of the textons. Then, local binary pattern operation is performed on the texton image between the center pixel and its surrounding neighbors. Finally, the feature vector is constructed based on the contourlet transform and local binary pattern. The performance of the proposed method is evaluated by testing on benchmark database, Corel-1K, Corel-5K and Corel-10K in terms of precision, recall, average retrieval precision and average retrieval rate.The results after investigation show a significant improvement as compared to the state-of-the-art features for image retrieval.

Introduction
CBIR has many challenges to retrieve the images based on color, texture and shape from different databases. In the real-world content of the training samples has different variations. Nowadays subspace methods for CBIR has been dynamically improved. In pattern recognition community, these methods are used to extract the features based on partitioned method of different database training set. Any content based image retrieval feature extraction must have satisfied the different invariants such as rotation, projection information, noise, translation, and scaling. There are some properties of the feature extraction conditions. Firstly, working out expenditure must not be more and should follow the any feature of the training database different and unique. Secondly the same feature should satisfy the dreadful conditions due to discontinuities and misplaced signals. Nowadays number of researchers extracts the feature on visual patterns of the given database for content based image retrieval. Some most important of the visual patterns are central moments, connectivity, compactness, Euler number, texture, color histogram, gaussian markow random feedback, differences of Gaussian (DOG), histogram of orientation gradient (HOG), speed up robust feature (SURF) and scale invariant feature transform (SIFT). There are some more special significant features based on information such as model parameters. Examples of these parameters are human matching methods (HMM), auto regressive moving average (ARMA), condition random feature (CRF), weight and tempo. In this proposed paper, we introduced the enhanced feature extraction of Gabor Wavelet Transform (GWT). It is based on most popular domain of texture technique. The gaussian wavelet transform is the most powerful technique to extract the information about text data. The applications of gaussian wavelet transform are content based image retrieval, language recognition, face recognition, security, entertainment, and medical appliances. There are so many approaches to detect the images from database of content based image retrieval like point detection and edge detection. Gaussian filter consisting gaussian function and Gaussian transform in both spatial and frequency but it is very difficult to extract the features. So, Gabor wavelet transform kernel can be represented as complex function of exponential modulated gaussian. To classify the test image from the training database is the challenge task. There are several distance measure techniques for content based image retrieval such as support vector machine, neural networks, angle based cosine measure, Manhattan, Euclidean, SSE and mean square error etc.…

Fundamentals ideas of LDA and GWT are discussed in section II. Proposed scheme is cited in section III. Experimental results are described in section IV. Concluding remarks of the proposed are discussed in section V.

Texton, Local XOR patterns

A. Texton

In this section, we briefly review some important contributions in the face recognition system based on local binary patterns (LBP). Timo Ahonen et al., (2003) studied a face recognition system based on LBP. They divided the face area into small regions and applied LBP. The histograms of LBP are extracted and concatenated, the resultant histogram represent the feature vector. The nearest neighbor classifier used for classification. Yann Rodriguez et al., (2006) analyzed an approach for face authentication, based on a LBP description of the face. A collection of LBP-histograms are considered for a generic face model. From this generic model, a client-specific model is obtained by an adaptation technique under a probabilistic framework. Yann Rodriguez et al., (2006) analyzed a face authentication experimental protocol. They compared their approach with the two approaches: LBP-b, LBP description of the face. This generic face model is derived by the collection of LBP-histograms. Hazim et al., (2007) studied a face recognition system with DCT and LBP. They divided the face image into several blocks. For each block of the face image LBP is applied. The obtained LBP representation is then decomposed into non-overlapping blocks and on each local block the DCT is applied to extract the local features. The extracted local features are then concatenated to construct the overall feature vector. Qian et al., (2007) considered a face authentication algorithm based on LBP. They applied the LBP for each block of the face image after dividing the face image into several blocks. After obtaining the LBP image, they applied likelihood ratio classifier. Xiaoyang Tan et al., (2007) studied a face recognition system with Gabor Wavelets and LBP. LBP concentrate on the textual features of the face image and Gabor features encode facial shape over a broader range of scales. For dimensionality reduction they applied PCA for both feature sets. After extracting the feature vector.

B. Local XOR patterns

Aroussi et al., (2008) analyzed a face recognition system with LBP and DCT. For representing facial image they combined LBP (which provides micro texture in spatial domain) and DCT (which acquires macro information in frequency domain). The support vector machines (SVMs) is used to perform the classification of these feature sets. Chi Ho Chan et al., (2007) studied a face recognition system using Multi-scale Local Binary Pattern Histogram (MLBPH) descriptor. They also studied on other descriptor namely Multispectral Local Binary Pattern Histogram (MSLBP). Gritti et al., (2008) studied a system for facial expression recognition with LBP. They used histogram of oriented gradients (HOG) descriptors for facial representation. They applied LBP and local ternary patterns (LTP). Timo Ahonen et al., (2009) studied a face verification system based on kernel density estimation of local LBP distributions. The developed system is a spatially precise model. They used the weighted information fusion for each individual pixels by using the linear support vector machine. Hazim et al., (2010), evaluated four local descriptors, namely, A V1-like feature, the LBP and two patch-based variants, the three patch local binary pattern (TPLBP) and the four patch local binary pattern (FPLBP). An image pair is extracted as a feature from each image using one of the local descriptors. They used four different comparison methods: concatenating, similarity measure, block wise similarity measure and LDA one shot similarity score. Among the four local descriptors, V1-like features do not perform well. Pei-zhi Chen et al., (2010) studied a face recognition system based on DCT and LBP. They applied DCT for the input face image. For dimensionality reduction they used only few DCT coefficients. A few DCT coefficients on the left top corner are chosen as the global feature. The face image is divided into several blocks. For each block they applied LBP and then LBP histogram sequences (Uniform LBP used) are accepted as the local feature. For classification they used Support Vector Machine (SVM). Juefei Xu et al., (2010) investigated the feature extraction methods for biometric identification. They considered LBP, DCT and DWT. They used simple distance measures for the verification rate (VR). Rui et al., (2011) studied a face recognition algorithm by combining LBP with SRC. Divide-and-conquer technique is used in order to solve the problem of dimensionality and the discriminative power is strengthen via its pyramid architecture. Huang et al., (2011) analyzed a comprehensive survey of LBP methodology, including several more recent variations. The standard LBP approach was discussed and also

facial image analysis using this LBP approach is reviewed. In addition to this, its successful extensions, which deal with various tasks of facial image analysis, are also highlighted. Several variations to the LBP technique are also mentioned. In the local or component oriented LBP representations are effective representations for facial image analysis, as they encode the information of facial configuration while providing local structure patterns. Md Jan Nordin et al., (2011) analyzed combination techniques of appearancebased and feature-based feature extraction on the T-Zone face area to improve the recognition performance for the face recognition system. They studied the influence of T-Zone area and the combined technique on the face recognition rate. A TZone face image is first divided into small regions where LBP histograms are extracted and then concatenated into a single feature vector. The T-Zone area consists of only eyes and nose region. Further dimensionality reduction of feature vector, PCA technique is applied.

Proposed Method

The proposed block diagram of the content based image retrieval is mentioned below.

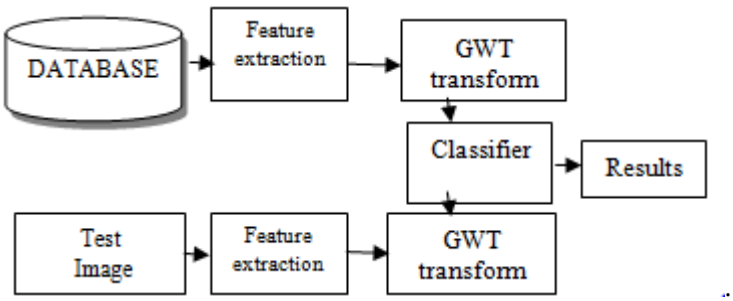

Figure 1: Block diagram of content based image retrieval

For deriving the features of each individual face image, we are considered LBP with DCT. Here, the input image is first transformed to the local binary pattern (LBP) image. For obtaining the local binary pattern image, local binary pattern operator is used. By subtracting the center pixel with its 3x3 neighboring pixels we obtain the binary code which further converted to decimal number. If the subtracted value with center pixel is less than zero it is represented with 0 and if it is greater than zero it is represented with one. The local binary pattern (LBP) operator converts each pixel into binary values. As a result of it, for each pixel a binary number is obtained by concatenating all these binary values in a clockwise direction. Usually, the process starts from top left neighbor. The associated decimal values that are generated by binary number are used for labeling the pixels. The derived binary numbers are called LBP's (Huang et al., (2011) and Chi et al., (2007)). To deal with the texture at different scales, the operator was generalized to use neighborhoods of different sizes (Ojala et al., (2002)). A local neighborhood is a set of sampling points evenly spaced on a circle, which is centered at the pixel to be labeled. The sampling points that do not fall within the pixels are interpolated using bilinear interpolation thus allowing for any radius and any number of sampling points in the neighborhood. The obtained local binary patterns image is divided into a number of non-overlapping blocks of 8x8 pixel resolution.. For each block DCT is applied. These DCT coefficients are ordered using zig-zag pattern and only 15 DCT coefficients are used for further computation purpose. Because for obtaining optimal recognition rate 15 coefficients are sufficient. (Ziad et al., (2005). Totally 64x15 DCT coefficients are used for further computation. The extracted DCT coefficients are nothing but the features of the face image. The features of the each face image represented with the feature vector.

Experimental Results

a. Feature extraction process

Each filter bank cell size is 40 by 40. After that apply each local binary pattern to the given input image then the size is [5*8] cell. Each Gabor filter bank cell size is 256 by 256. To extract the feature vector from the composed Gabor filter bank by using up and down sampling process. Here down sampling process based on

number of scales of the system. Then the down sampling size is [(256/5) *256] and up sampling size is [52*(256/8)] so the finally feature extraction size is 52*32. Applied the same procedure for all images. Finally, for all the training images can be represented as 1664 by 320. Here 1664 are features of the given input image and 320 is the feature size of the image. Apply the test image to the training image using different distance methods to get high recognition rate and computational time for top matching images. The query image has implemented in figure2. The content based image retrieval has been shown in figure 3 based on test image. With these initial estimates the refined estimates of the model parameters are obtained by using the updated equations of the EM algorithm. The parameters of the generic model are stored under the parametric set . The individual face image model parameters are stored with the parametric set , i= 1, 2, ... N. N is the number of face images in the database.

Figure 2: Query image

In this retrieval output the test image is other than training image.

Figure3: content based image retrieval output for testing

Similarly, same procedure for content based image retrieval but this output indicates the test image is purely belonging to one of the image in training set. The output of the content based image retrieval is shown in figure4.

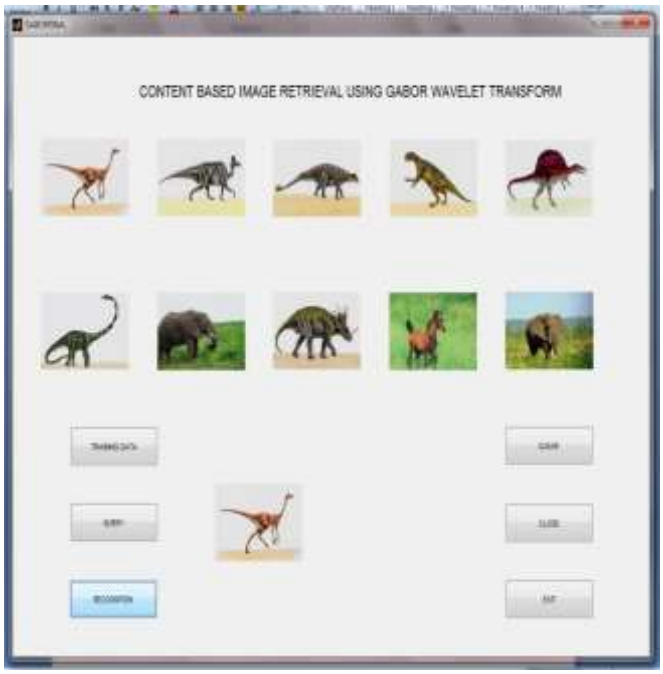

Figure4: content based image retrieval for testing

b. Recognition rate

Content based image retrieval using enhanced Gabor wavelet has been better recognition rate and computational time as compared to obtainable methods. Table1 indicates top ten matching images for the content based image retrieval based known and unknown test image. The proposed method gives top one matching image efficiency is 100%, top three images is 98%, top five images is 96.5, top seven images is 88% and top ten images is 79.5%. So, this paper gives good results as compared to previous existing methods.

Table 1: Recognized efficiency on content based image retrieval database

	No. of top recognized matches				
Methods	***1***	***3***	***5***	***7***	***10***
Single value decomposition	*100*	*59.5*	*54.5*	*52.5*	*52.4*
Principal component analysis	*100*	*62*	*59*	*58.6*	*56*
Linear discriminant analysis	*100*	*85*	*72*	*70.9*	*64.5*
LBP Method	***100***	***98***	***95***	***81***	***69.5***

c. Comparative recognition rates

In this proposed paper shows the Enhanced Gabor wavelet transform(EGWT) is compared with different existing methods such as SVD, principal component analysis PCA, and LDA. The recognition rate for top ten

images to single value decomposition technique, PCA, LDA and EGWT are 51.9%,56.5%,65.5%, and 79.5% and the computational time for all existing methods are 40.95sec,42.56sec,58.26sec, 50.26sec respectively. Figure5 shows the comparative results on recognition rate for CBIR.

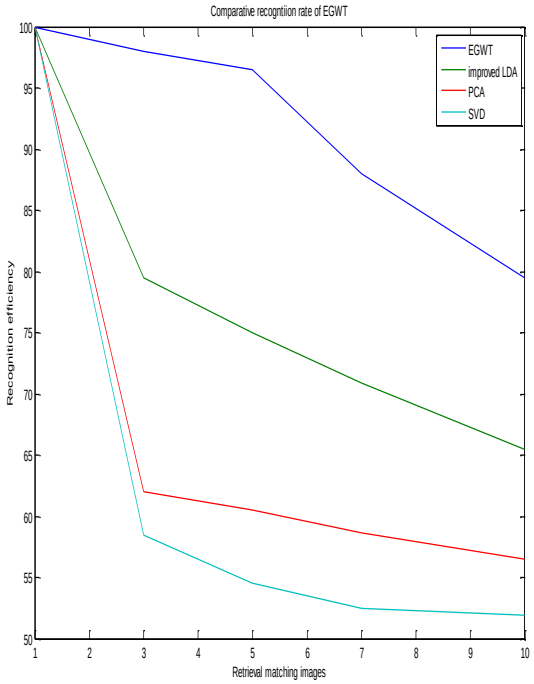

Figure5: comparative recognition rates

Conclusions

Many research scholars have been implemented so many feature extraction techniques for CBIR to retrieve the images from the training database. In this paper, we proposed a new enhancement technique for CBIR using hybrid Gabor wavelet transform. The proposed experimental result of the Gabor wavelet transform gives excellent results in terms of recognition efficiency and computational rates as compared to existing techniques

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