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Improved Content based Texture Image Classification using Cascade RBF

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Abstract: Content-based image retrieval (CBIR) systems aim to return the most relevant images in a database, according to the user's opinion for a given query. Due to the dynamic nature of feature content of image of image user query are frequently changed and result of retrieval image are suffered. For the improvement of the capacity of image query retrieval used image classification technique, image classification is well known technique of supervised learning. The improved method of image classification increases the working efficiency of image query retrieval. For the improvements of classification technique we used RBF neural network function for better prediction of feature used in image retrieval. Our proposed method optimized the feature selection process and finally sends data to multiclass classifier for classification of data. Here we used support vector machine for multi-class classification. As a classifier SVM suffering two problems (1) how to choose optimal feature sub set input and (2) how to set best kernel parameters. These problems influence the performance and accuracy of support vector machine. Now the pre-sampling of feature reduced the feature selection process of support vector machine for image classification.

Keywords— CBIR, Classification, SVM, RBF

I. INTRODUCTION

The content based image classification reduces semantic gap between retrieval image and query image. The lower content of query image such as colour, texture and dimension play important role for feature selection process. The flow of feature selection process generates a negative result of query processing [13]. The feature selection, proper parameters adjustment can modify the SVM classification performance. The parameters that should be optimal include define parameter C and the kernel function parameters such as the gamma (γ) for the radial basis function (RBF) kernel [16]. To use a SVM, one must choose a kernel function, set the kernel parameters and determine a soft margin constant C (penalty parameter). The classification algorithm is an alternative to finding the best C and gamma when using the RBF kernel function. RBF algorithms have the potential to generate both the optimal feature subset and SVM parameters at the same time. Our dissertation aim is to optimize the parameters and feature subset selection process, without losing the SVM classification performance [17]. The modified method performs feature selection and parameters setting in a new way. Based on whether or not feature selection is performed independently of the classification algorithm that constructs the classifier, feature subset selection algorithms can be classified into two section for provide feature vector of support vector machine [19]. Now a day the use of digital technologies produces a lot of digital images. Normally Images are automatically recorded in meaningless alphanumeric filenames. A huge variety of images are becoming available to the public, from photo collection to web pages, or even video databases. Since visual media needs large amounts of memory and computing power for processing and storage, there is a requirement for efficiently index and retrieve visual information from image database. In recent years, image classification has become an interesting research field in application [12]. Efficient indexing and retrieval of large number of colour images, classification plays an important and challenging role. The main motive of this research work is to find suitable representation for images and Classification generally requires comparison of images classification capability depending on the certain useful methods [13]. Image classification is defined as the task of classifying the number of images into (semantic) categories based on the available training data. The main objective of digital image classification procedure is to categorize the pixels in an image into land over cover classes [14]. The output is thematic image with a limited number of feature classes as opposed to a continuous image with varying shades of gray or varying colors representing a continuous range of spectral reflectance [15,16]. The wide range of digital numbers in different bands for particular features is known as a spectral pattern or spectral signature. A spectral pattern can be composed of adjacent pixels or widely separated pixels. Traditionally the digital image classification technique can be classified into two types: Unsupervised classification Techniques and Supervised classification Techniques [17]. On the other hand an image classification can also be classified in to two types: Linear Classification and Non-Linear Classification [19]. In Section II related work. The Section III discusses proposed method IV experimental result followed by a conclusion in Section V.

II. RELATED WORK

Wei-jiu Zhang, Li Mao and Wen-bo Xu et al [11] Automatic Image Classification Using the Classification Ant-Colony Algorithm To enhance the versatility, robustness, and convergence rate of automatic classification of images, an ant-colony-based classification model is proposed in this paper. According to the characteristics of the image classification, this model adopts and improves the traditional Ant-Colony algorithm. It defines two types of ants that have different search strategies and refreshing mechanisms. The stochastic ants identify new

categories, construct the category tables and determine the clustering center of each category.

Soo Beom Park, Jae Won Lee, Sang Kyo Kim et al [10] Content-based image classification using a neural network A method of content-based image classification using a neural network. The images for classification are object images that can be divided into foreground and background. To deal with the object images efficiently, in the preprocessing step we extract the object region using a region segmentation technique. Features for the classification are shape-based texture features extracted from wavelet-transformed images. The neural network classifier is constructed for the features using the back-propagation learning algorithm. Among the various texture features, the diagonal moment was the most effective.

Hong Bao Cao, Hong-Wen Deng, and Yu-Ping Wang et al [13] Segmentation of M-FISH Images for Improved Classification of Chromosomes With an Adaptive Fuzzy C-means Clustering Algorithm An adaptive fuzzy c-means algorithm was developed and applied to the segmentation and classification of multicolour fluorescence in situ hybridization (M-FISH) images, which can be used to detect chromosomal abnormalities for cancer and genetic disease diagnosis. The algorithm improves the classical fuzzy c-means algorithm (FCM) by the use of a gain field, which models and corrects intensity in homogeneities caused by a microscope imaging system, flairs of targets (chromosomes), and uneven hybridization of DNA. Other than directly simulating the inhomogeneously distributed intensities over the image, the gain field regulates centres of each intensity cluster.

Sai Yang and Chunxia Zhao et al [14] A Fusing Algorithm of Bag-Of-Features Model and Fisher Linear Discriminative Analysis in Image Classification A fusing image classification algorithm is presented, which uses Bag-Of-Features model (BOF) as images' initial semantic features, and subsequently employs Fisher linear discriminative analysis (FLDA) algorithm to get its distribution in a linear optimal subspace as images' final features. Lastly images are classified by K nearest neighbour algorithm. The experimental results indicate that the image classification algorithm combining BOW and FLDA has more powerful classification performances. In order to further improve the middle-level semantic describing performance, we propose compressing the BOF distribution of images distributing loosely in high-dimensional space to a low-dimensional space by using FLDA, the images are classified in this space by KNN algorithm.

Ajay Kumar Singh, Shamik Tiwari & V.P. Shukla et al [15] Wavelet based Multi Class image classification using Neural Network, A feature extraction and classification of multiclass images by using Haar wavelet transform and back propagation neural network. The wavelet features are extracted from original texture images and corresponding complementary images. The features are made up of different combinations of sub-band images, which offer better discriminating strategy for image classification and enhance the classification rate.

Liping Jing Chao Zhang Michael K. Ng et al [12] SNMFCA: Supervised NMF-based Image Classification and Annotation A novel supervised nonnegative matrix factorization based framework for both image classification and annotation (SNMFCA). The framework consists of two phrases: training and prediction. In the training phrase, two supervised nonnegative matrix factorizations for image descriptors and annotation terms are combined together to identify the latent image bases, and represent the training images in the bases space. These latent bases can capture the representation of the images in terms of both descriptors and annotation terms. Based on the new representation of training images, classifiers can be learnt and built.

Sancho McCann David G. Lowe et al [16] Local Naive Bayes Nearest Neighbour for Image Classification An improvement to the NBNN image classification algorithm that increases classification accuracy and improves its ability to scale to large numbers of object classes. The key observation is that only the classes represented in the local neighbourhood of a descriptor contribute significantly and reliably to their posterior probability estimates.

Lexiao Tian, Dequan Zheng, Conghui Zhu et al [17] Research on Image Classification Based on a Combination of Text and Visual Features A text-image co-occurrence data become available on the web, mining on those data is playing an increasingly important role in web applications. Utilizing description information to help image classification and propose a novel image classification method focusing on text-image co-occurrence data. In general, there are three main steps in our system: feature extraction, training classifiers and classifier fusion.

Shaohua Wan et al [18] Image Annotation Using the Simple Decision Tree Automatic image annotation is an important but highly challenging problem in semantic-based image retrieval. In this paper, they formulate image annotation as a supervised learning image classification problem under region-based image annotation framework. In region-based image annotation, keywords are usually associated with individual regions in the training data set.

III. MODIFIED ALGORITHM

In this paper we proposed model of image classification based on support vector machine and feature optimization using radial bias network. Image feature selection process decides the performance of image classifier. We put the optimized feature sub set selection using radial bias network. The output of RBF network proceeds input for support vector machine classifier. The basic idea of the proposed technique is to carry out the training process of the hidden layer of RBF neural classifiers by taking into account the class-memberships of the training samples. In particular, clusters are generated by

grouping training samples belonging to the same class in order to avoid the creation of mixed clusters. Moreover, the widths of the kernel functions are selected by using a supervised procedure aimed at limiting the widths of kernels located in boundary regions between classes while maintaining, at the same time, a certain overlapping inside the internal regions of each class. In the following, a detailed description of the proposed technique is provided. The complete description of model shown in figure.

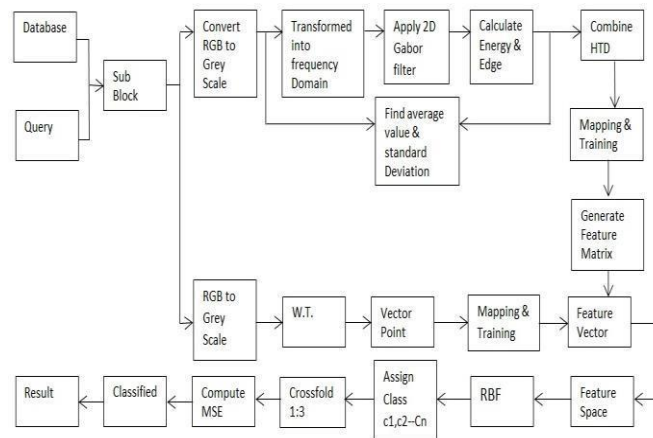


Fig 1: Process block diagram of proposed model

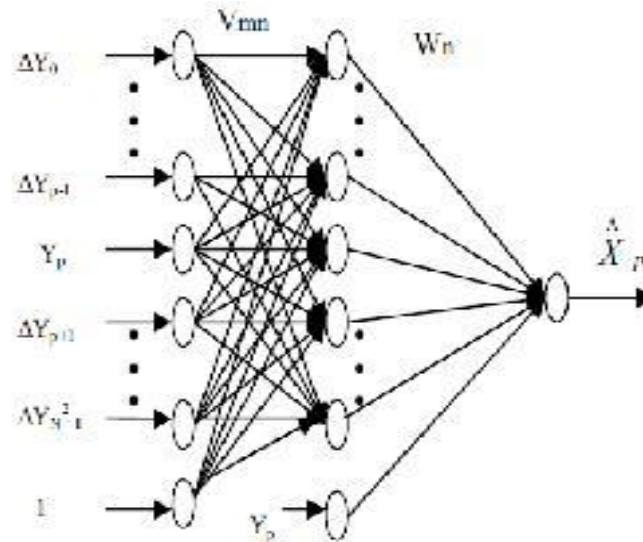


Fig 2: Neural network structure

Initially the discrete wavelet transform function is applied into input image. Now input image decomposed in to layer structure form. After that we calculate horizontal, vertical and diagonal coefficient of input image, after that we apply soft transform technique and generate trained pattern using cascaded algorithm. In RBF network we used Gaussian based kernel function. The cascaded algorithm generates a trained pattern for the removal of redundant feature. In that process the variance factor of feature is increase and the target class is achieved. As known, the high-order statistical relationship does play an important part in image classification area. So in order to take advantage of the high-order statistical relationship among variables, so we used cascaded algorithm for training the network. Proposed feature optimization is a three-layer neural network with inputs derived from an $N \times N$ neighbourhood of the transformed image and appropriately selected neuron activation functions. As shown in Figure 2 the network takes Y_p and Y_k as the inputs, where Y_p is the wavelet transform coefficient under consideration, which is the center of a $N \times N$ processing window, and $Y_k = Y_k - Y_p$ is the difference value between Y_p and the coefficient Y_k ($k=0,1,\dots,N^2-1$) of the other points in the $N \times N$ window. Figure 3 shows an example of a processing window with a size of 3×3 pixels. In this example, Y_9 is the center of the window, and Y_k ($k=0,1,\dots,9$). so we used cascaded algorithm for training the network.

Y0	Y1	Y2
Y3	Y4	Y5
Y6	Y7	Y9

Fig 3: Shows that unit input vector pixel

The output of network is linear activation function.that activation function perform the targeted output of optimised value.

Step process for working.

Input image data set

1. Perform wavelet transform and image decomposed in layers.
2. Find horizontal, vertical and diagonal coefficient of wavelet.
3. Apply soft transform of wavelet
4. Check value of coefficient of wavelet
5. Decide the size of vector input 3*3
6. Trained the network.
7. Apply target value of activation function
8. Find feature vector
9. Input feature vector in support vector machine
10. Features are classified
11. Return classified image
12. exit

4. EXPERIMENTAL RESULT ANALYSIS

To evaluate the performance of proposed method of content based image classification.



Fig 4: shows all five classification of Data set2 which includes total 500 images and contains 100 images of Parrots and the Precision rate is 93% and Recall rate is 96.06 %.

Data set	Method	Precision (%)	Recall (%)
Data set 1	SVM	86.66	80.21
	SVM-CRBF	91.33	83.60
Data set 2	SVM	90	91
	SVM-CRBF	93	96.06
Data set 3	SVM	83.33	79.81
	SVM-CRBF	80	79
Data set 4	SVM	83.33	76.83
	SVM-CRBF	93.33	83.33
Data set 5	SVM	86.66	78.66
	SVM-CRBF	90	78.6

Table 1: Shows Classification result of all method used in experimental process

We have use MATLAB software 7.8.0 with a variety of image dataset used for experimental task. The coral image data set is very famous image data set for research purpose for image retrieval. The coral images are relatively easy to annotate. We have used 1000 coral images and grouped them into a set of 500 images. In our

result we have used total 1000 coralimages and they are subdivided into five datasets. Then we have performed an image classification method on each dataset using SVM-RBF. The evaluated result using both the methods is presented in the table shown below:

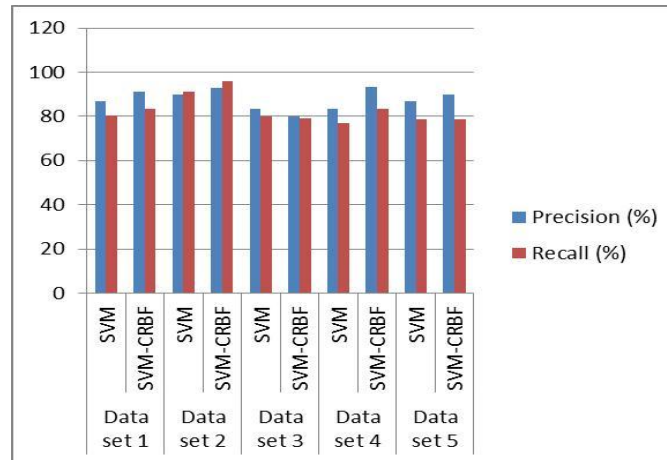


Fig 5: shows the classification result of SVM and SVM RBF method.

5.CONCLUSION AND FUTURE SCOPE

In this paper we discuss content based image retrieval using image classification technique. For the classification of image support vector machine classifier. For the improvement of support vector machine classifier we used RBF neural network. Our empirical result shows better efficiency instead of support vector machine classifier. In future we used POS optimisation technique for classification in place of RBF.

REFERENCES

- [1] Swapnalini Pattanaik, Prof.D.G.Bhalke, "Beginners to Content Based Image Retrieval", International Journal of Scientific Research Engineering & Technology (IJSRET) Volume 1 Issue2, pp. 040-044 May 2012.
- [2] Nishchal K Verma, Saurabh Agrawal, Pradip Sircar "Content Based Color Image Classification using SVM", Eighth International Conference on Information Technology: New Generations 2011.
- [3] R. M. Haralick, K. Shanmugam, and I. Dinstein, Texture features for image classification, IEEE Trans. On Sys.Man. and Cyb.SMC-3(6), 1973.
- [4] H. Tamura, S. Mori, and T. Yamawaki, "Texture features corresponding to visual perception," IEEE Trans.On Systems, Man, and Cybernetics, vol. Smc-8, No. 6, June 1978.
- [5] W.Y. Ma, B. S. Manjunath, "Comparison of wavelet transform features for texture Image Annotation", IEEE Trans 1995.
- [6] Yi-Min Wen1, 2 and Bao-Liang Lu1, "A Cascade Method for Reducing Training Time and the Number of Support Vectors", 2004.
- [7] Dr. Fuhui Long, Dr. Hongjiang Zhang and Prof. David Dagan Feng, "Fundamentals of Content Based Image Retrieval".
- [8] "SVMs and Kernel Functions", Algorithms in Bioinformatics II, SoSe'07, ABIT, D. Huson, June 27, 2007.
- [9] Yong Rui and Thomas S. Huang, and Shih-Fu Chan, "Image Retrieval: Current Techniques, Promising Directions, and Open Issues", Journal of Visual Communication and Image Representation 10, 39–62 (1999).
- [10] Soo Beom Park, Jae Won Lee, Sang Kyoong Kim "Content-based image classification using a neural network" in 2003 Elsevier.
- [11] Wei-jiu Zhang, Li Mao, Wen-bo Xu "Automatic Image Classification Using the Classification Ant-Colony Algorithm" in International Conference on Environmental Science and Information Application Technology 2009.
- [12] Liping Jing, Chao Zhang and Michael K. Ng "SNMFCA: Supervised NMF-based Image Classification and Annotation" in IEEE 2011.
- [13] Hongbao Cao, Hong-Wen Deng, and Yu-Ping Wang "Segmentation of M-FISH Images for Improved Classification of Chromosomes With an Adaptive Fuzzy C-means Clustering Algorithm" in IEEE TRANSACTIONS ON FUZZY SYSTEMS, VOL. 20, NO. 1, FEBRUARY 2012.
- [14] Sai Yang and Chunxia Zhao "A Fusing Algorithm of Bag-Of- Features Model and Fisher Linear Discriminative Analysis in Image Classification" in IEEE International Conference on Information Science and Technology 2012.
- [15] Ajay Kumar Singh, Shamik Tiwari and V.P. Shukla "Wavelet based Multi Class image classification using Neural Network" in International Journal of Computer Applications (0975 – 8887) Volume 37– No.4, January 2012.
- [16] Sancho McCann and David G. Lowe "Local Naive Bayes Nearest Neighbor for Image Classification" in IEEE 2012.
- [17] Lexiao Tian, Dequan Zheng and Conghui Zhu "Research on Image Classification Based on a Combination of Text and Visual Features" in Eighth International Conference on Fuzzy Systems and Knowledge Discovery 2011.
- [18] Shaohua Wan "Image Annotation Using the Simple Decision Tree" in International Conference on Management of e-Commerce and e-Government 2011.
- [19] M. Kim, M. Madden, and T. A. Warner, "Forest type mapping using object-specific texture measures from multispectral IKONOS imagery: Segmentation quality and image classification issues," Photogramm. Eng. Remote Sens., vol. 75, no. 7, pp. 819– 829, Jul. 2009