Improved the Classification Ratio of Traffic Vehicle based on Cascaded Support Vector Machine

BHUSHAN PAWAR
M.Tech Scholar
PCST, Bhopal, India
pawarbhushany2987@gmail.com

RAJENDRA PATEL
Assistant Professor
PCST, Bhopal, India
sahilsinghmanit@gmail.com

ABSTRACT

Traffic vehicle classification is important role in transportation and security surveillance in current scenario of huge traffic in roadways transportation. Due to rapid change of feature content of traffic motor are major issues in classification. The traffic image classification is improved by various authors using different model of classifier. The efficiency of classifier model depends on feature extraction process of traffic image. For the feature extraction process various authors used a different technique such as Gabor feature extraction, histogram and many more method on extraction process for classification. In this paper we used Gabor feature extraction. Cascading technique improved the efficiency of classifier in multiple stages. In this proposed cascaded classifier for traffic image classification. Experimental result shows better result in compression of support vector machine technique.

Keywords:- Traffic classification, feature extraction and cascaded.

INTRODUCTION

Traffic vehicle image classification technique provide the traffic control and security surveillance. The lower content of traffic image are play important role for feature selection process. The feature selection process impact the result of traffic image classification, the variation of results depends on selection technique [4]. 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 (g) for the radial basis function (RBF) kernel [7]. In the direction of apply a SVM, one must decide a hyper plan role, put the hyper plan parameter and decide a soft margin constant C. The classification algorithm is an alternative to finding the best C and gamma when using the RBF Gaussian kernel. RBF algorithms have the potential to generate both the optimal feature subset and SVM parameters at the same time. 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 classifiermodel, optimal feature subset Selection is performed independently of the classification algorithm that constructs the model, feature selection algorithms can be classified into two section for provide feature vector of support vector machine [10]. The main motive of this research work is to find suitable representation for traffic images Classification generally requires comparison of images classification capability depending on the certain useful methods [4] image classification is defined as the task of classifying the number of images into categories based on the available training data. Traditionally the traffic image classification technique can be classified into two types: unsupervised classification technique and supervisedclassification [10]. In Section II related work. The Section III discusses Feature extarction. in section IV. the proposed method V experimental result followed by a conclusion in section VI.

II RELATED WORK

In this section describe some related work in respective to image classification and traffic image classification. In traffic image classification, the vehicle colour intensity is very high due to this reason extraction of feature form traffic image is very difficult task. But in current researcher paradigram various technique are used for feature extraction. Some feature extraction technique and classification technique discuss here.

[2]In this paper author proposed a classification model using clustering and ant colony optimisation, the classification technique work in two variable ant one value of ant define condition of deterministic and another value of ant select the centre point for generation of cluster.

[1] In this paper author discuss content based image classification on the principle of feature extraction. The feature extraction process performs the value of lower feature and classification task perform using neural network.

[4] In this paper authors describe a method of image segmentation for classification purpose. The proposed algorithm improves the classical fuzzy c-means algorithm (FCM) by the use of a gain field, which models and corrects intensity in similarity cause by a microscope imaging scheme.

[5] In this paper authors proposed an image fusion technique for image classification. The fusion process of feature data is performing by Bag-of-Feature model. The process of feature extraction performed by fisher linear discriminative analysis, the proposed technique find better ratio of image classification.

[6] In this paper authors used wavelet transform function for feature extraction process. The extracted feature divided into different segment of band image. After the band image apply multi-class classification technique using back propagation neural network.

[7] In this paper authors used hybrid method of image classification. The mechanism of hybrid classification is a combination of two data mining classification algorithm one is Naive Bays and another one is KNN. The hybrid algorithm is called NBNN, and applied for image classification process. the process of experimental result shows better classification ratio in compression of single algorithm.

[8] In this paper author used Image classification process using text with visual feature of image. The main idea about this process is that the occurrence of text message hit the visual feature of image on give web retrieval. The retrieval process increase the value of visual features and improved the ratio of classification technique.

III FEATURE EXTRACTION

Feature extraction process plays an important role in traffic image classification [5]. In traffic image basically three types of features are color, texture and dimensions. Feature extraction can be defined as the act of mapping the image from image space to the feature space. in current researcher, decision a superior features that efficiently correspond to an image are still a hard job [9]. In this section a wide variety of features are used for traffic image classification from the database. Features basically represent the visual perception of image content. Visual content can be further divided into general or area precise. For example the features that can use for searching would be representing the general visual content like color, shape and texture. Instead of that, the features that are used for searching traffic image are domain-specific and may include domain knowledge. Process of semantic feature extraction process are very difficult, Histogram is important method for color features extraction [11]. Color Histogram Considering a three-dimensional color-space (x, y, z) quantized on each component to a finite set of colors which correspond to the number of bins Nx, Ny, Nz, color of the image I is the joint probability of the intensities of the three color channels. Let i 2 [1,Nx], j 2 [1,Ny] and k 2 [1,Nz]. Then, h(i, j, k) = Card{p 2 I | color(p) = (i, j, k)}. The color histogram H of image I is then defined as the vector H(I) = (..., h(i, j, k), ...). Another method of feature extraction is texture based feature extraction used Gabor filters for extraction process. Texture analyzers implemented using 2-D Gabor functions produce a strong correlation with texture data in traffic image [3]. Gabor functions are Gaussian modulated by complex sinusoids. In the two dimensions they take the form:

$$g(x,y) = \frac{1}{2\pi\sigma_x\sigma_y}\exp\left(-\frac{1}{2}\left(\frac{x^2}{\sigma_x^2}+\frac{y^2}{\sigma_y^2}\right)+2\pi jWx\right) \ldots (1)$$

A dictionary of filters can obtained by appropriate dilatations and invariant of g(x,y) initial function:

$$g_{mn}(x,y) = a^{-m}g(x',y') \text{ where } m=0,1,\ldots,S-1$$

$$x'=a^{-m}(x\cos\theta + y\sin\theta),\ y'=(-x\sin\theta + y\cos\theta) \ \ldots(2)$$

where μ = n¼/K, K the number of orientations, S the number scales in the multi resolution, and a = (Uh/Ul)−1/S−1 with Ul and Uh the lower and upper center frequencies of interest. Compact representation needs to be derived for learning and classification purposes. Given an image I(x, y), its Gabor wavelet transform is then defined as:

$W_{mn}(x,y) = \int I(x,y)\, g_{mn} * (x - x_1, y - y_1)\, dx_1 dy_1$
..(3)

where* represents the complex conjugate. Mean $\mu_{mn}$and the standard deviation ¾mn of the magnitude of the transform coefficients are used to represent the image.

$$\mu_{mn} = \iint |W_{mn}(x,y)|dxdy$$

and$\sigma_{mn} = \sqrt{\iint (|W_{mn}(x,y)| - \mu_{mn})^2 dxdy}$..(4)

After that a feature vector is created with μ_{mn} and σ_{mn}as feature variables:

f=[$\mu_{00}\ \sigma_{00}\ \mu_{01}\ \sigma_{01}\ \ldots\ \mu_{mn}\sigma_{mn}$] ... (5)

As result, we obtain a numerical vector of 30 dimensions for 6 orientations and 5 scales changes. Also note the texture feature is computed only for rectangular grid as it is difficult to compute the texture vector for one arbitrary region. The extracted feature color and texture combined and generate a feature matrix for classification purpose.

IV PROPOSED METHODOLOGY

Traffic image classification and classification is challenging task in the field of traffic security. Traffic image induced multiple content of image data in processing. Now classification processes of traffic image need a classification of traffic image data. Now in current scenario various methodology are available for traffic image classification such as artificial neural network, decision tree and many more machine learning algorithm for classification. We proposed a new method for traffic image classification based on parallel support vector machine based on distant feature set of image features. All of the features are ranked based on their KullbackLeibler (K-L) distances[23], which is an alternative way to measure the importance of a feature in discriminating two classes. The features discriminating based on the equiliden distance formula for finding a similarity of features based oncolor and texture. After calculation of discriminate we apply parallel support vector machine. SVM implements the principle of Structural Risk Minimization by constructing an optimal separating hyper plane in the hidden feature space, using quadratic programming to find a unique solution. In parallel SVM machine first we reduced non-classified features data by distance matrix of binary pattern. From this concept, the cascade structure is developed by initializing the problem with a number of independent smaller optimizations and the partial results are combined in later stages in a hierarchical way, as shown in figure 1, supposing the training data subsets and are independent among each other.

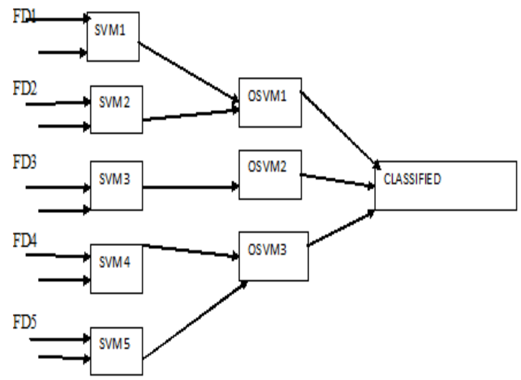

Figure 1: proposed model of traffic image classification based on support vector machine.

this figure shows that cascaded support vector machine, in this machine we passed five stage of features discernment and all these passes to optimized support vector machine for the processing of classification.

1. Assigned the extracted feature matrix of image dataset.

- Transform data to the format of an SVM that is X is original data Ris transform data such that Xi∈ R^d here d is dimension of data.
- Conduct scaling on the data
  α $= \sum_{i=1}^{m}\sum_{j=1}^{n} sim(Xi, xj) \therefore m * k$ here α is scaling factor and m is total data point and k is total number of instant and sim find close point of data.

- Consider the RBF kernel K(x; y)
  H(x)= $\exp\ ((-(\delta - c)2\ /\ (r2)$ this is kernel equation of plane.
- Use cross-validation to 2nd the best parameter C and
- employ the best factor C and to train the complete training set
  Ro=$\alpha\frac{1}{p}\sum_{i=1}^{p} min\ (xi - yi)$ where Ro is learning parameter of kernel function.

- Generate formatted data.

2. Step of traffic image data classification.

1. process the feature vector generated by feature matrix.
2. For all the classes are represented
 Let us consider class of features c1, c2, c3…………………….cn
BEGIN
Find class with no features
C=¢
Find class at Max cross product rate
$C=R*X^d$
Find the class at half cross product
REPEAT
Pointer= False
Find the intervals of hyper plane
If the end condition is met
Pointer = True
If the first period has improved results we should Use this, otherwise the other
Find the class evaluation after cross product class Instances middle times
UNTIL pointer= False
END
3. Multiply all the classes with the best factor obtained;
4. Traffic image classified.

V EXPERIMENTAL RESULT ANALYSIS

For the performance evaluation of our proposed model used MATLAB computational software and traffic image data set of different variant. Used the radial basis function kernel for the SVM classifier, Parameter γ that defines the spread of the radial function was set to be 4 and parameter C that defines the tradeoff between the classifier accuracy and the margin to be 3. For all of the experiments, we randomly split the vehicle image data set into training and testing sets, each time with 20% of each class' images reserved for testing, whereas the rest for training. The performance was from the average of 100 runs, such that each run used a random split of the data to training and testing sets, the first experimentwas designed to provide a comparison of thedifferent classifiers adopted in the stage 2ensembles. Their accuracy values were summarized in Table I. for the measuring performance calculates precision and accuracy of data set.

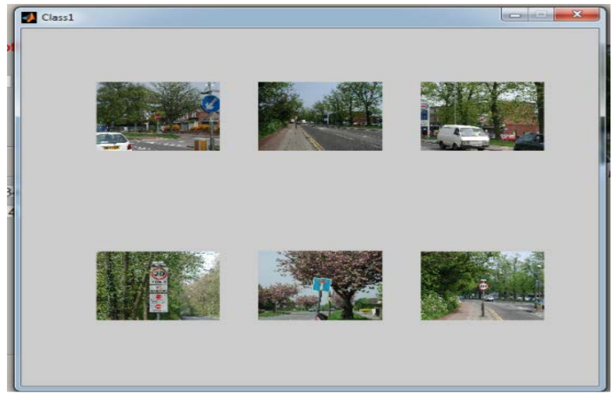

Figure 2: shows that classification result of traffic image in given data set using the method of support vector machine with neural network and the ratio of train and test data is randomly selected in ratio of 20%.

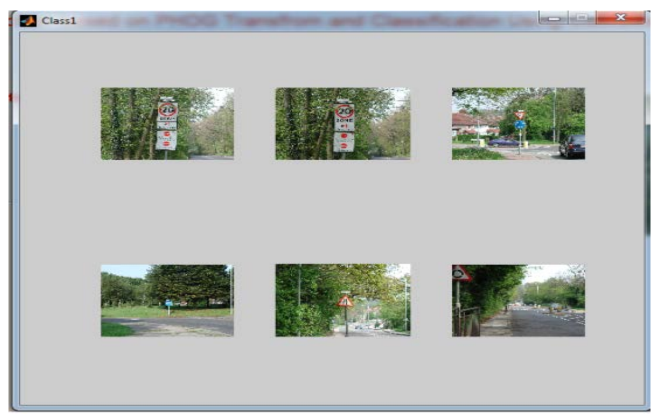

Figure 3: shows that classification result of traffic image in given data set using the method of support vector machine with cascading technique and the ratio of train and test data is randomly selected in ratio of 20%.

The comparative result analysis of traffic image classification based on number ofclass of image based on two methods. The totalnumber ofimage in classification window is 500 and count the number of actual recall image in result windows.

Table 1: shows the comparative Precision and Recall of traffic image classification.

Data set	Method	Precision (%)	Recall (%)
Data set 1	SVM-NN	92.68	94.21
	CAS-SVM	91.33	96.6
Data set 2	SVM-NN	96	96.77
	CAS-SVM	98	98.06
Data set 3	SVM-NN	93.33	79.81
	CAS-SVM	96	96.43
Data set 4	SVM-NN	95.33	96.83
	CAS-SVM	97.33	98.33
Data set 5	SVM-NN	97.66	97.66
	CAS-SVM	98	98.60

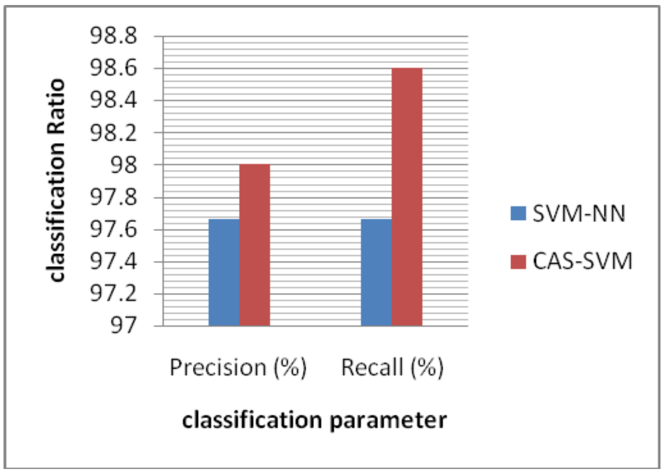

Figure 4: shows that comparative result of support vector machine and cascaded support vector machine classification technique. The ratio of train and test data is randomly selected 10% and cascading is single stage.

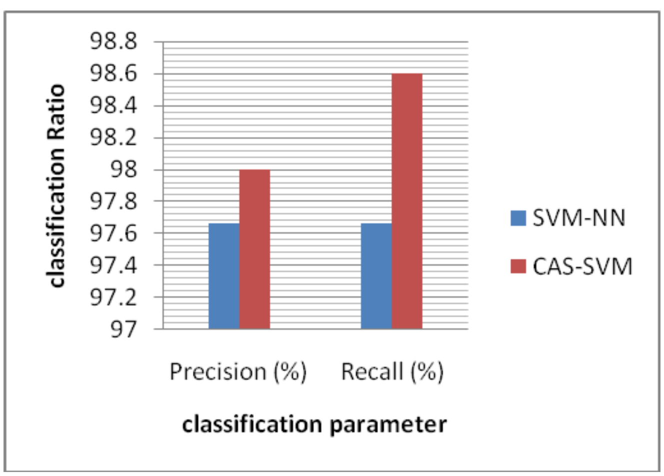

Figure 5: shows that comparative result of support vector machine and cascaded support vector machine classification technique. The ratio of train and test data is randomly selected 20% and cascading is single stage.

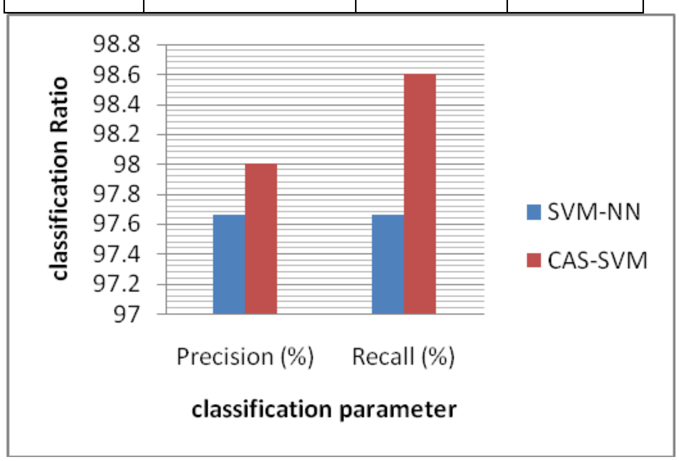

Figure 5: shows that comparative result of support vector machine and cascaded support vector machine classification technique. The ratio of train and test data is randomly selected 30% and cascading is two stages.

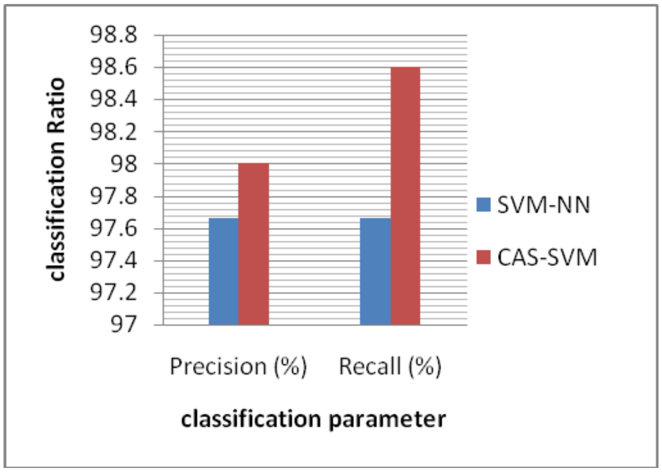

Figure 7: shows that comparative result of support vector machine and cascaded support vector machine classification technique. The ratio of train and test data is randomly selected 40% and cascading is three stages.

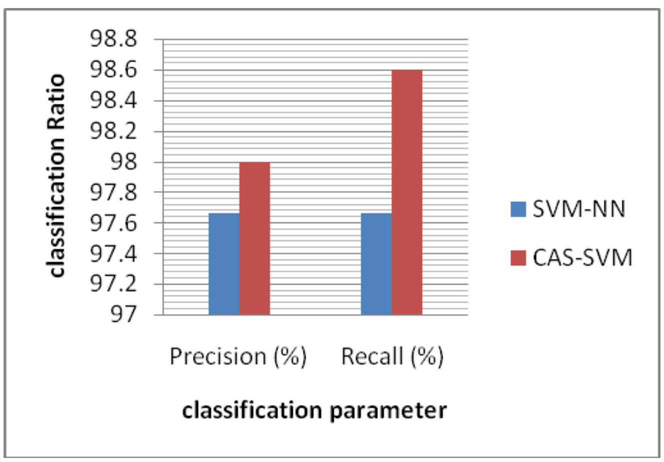

Figure 8: shows that comparative result of support vector machine and cascaded support vector machine classification technique. The ratio of train and test data is randomly selected 50% and cascading is four stages.

VI CONCLUSION AND FUTURE SCOPE

In this paper proposed a traffic image classification technique based on parallel support vector machine. For the improvement of security surveillance and transportation system, feature extraction of traffic image applied two different techniques one is histogram and another is Gabor filter. The extracted feature from traffic image is combined in single matrix called feature matrix. The feature matrix finally converted into feature vector and passes through cascaded support vector machine for classification process. The classification process of support vector machine choose different kind of constant parameter C. the changes value of constant C varies the classification result. Our experiment result shows better classification ratio in terms of precision and recall instead of conventional support vector machine. The cascading stage of support vector machine increases the computational complexity of proposed method. But the performance of classification is reached is 98%.

REFERENCES:-

[1] Bailing Zhang" reliable classification of vehicle types based on cascade classifier ensembles" in IEEE transactions on intelligent transportation systems, vol. 14, no. 1, march 2013.

[2] S. Sivaraman and M. Trivedi, "General active-learning framework for on road vehicle recognition and tracking," IEEE Trans. Intell. Transp. Syst.,vol. 11, no. 2, pp. 267–276, Jun. 2010.

[3] Z. Chen, T. Ellis, and S. A. Velastin, "Vehicle type categorization: A comparison of classification schemes," in Proc. 14th Int. IEEE ITSC, Washington, DC, 2011, pp. 74–79.

[4] B. Zhang and C. Zhao, "Classification of vehicle make by combined features and random subspace ensemble," in Proc. 6th ICIG, Hefei, China, 2011, pp. 920–925.

[5] Y. Fu, L. Cao, G. Guo, and T. S. Huang, "Multiple feature fusion by subspace learning," in Proc. ACM Int. CIVR, Niagara Falls, Canada, 2008, pp. 127–134.

[6] Soo Beom Park, Jae Won Lee, Sang Kyoon Kim "Content-based image classification using a neural network" in 2003 Elsevier.

[7] 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.

[8] 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.

[9] 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.

[10] Ajay Kumar Singh, Shamik Tiwari and V.P. Shukla " Wavelet based Multi Class image classification using Neural Network" in International Journal of Computer Applications Volume 37– No.4, January 2012.

[11] Sancho McCann and David G. Lowe "Local Naive Bayes nearest Neighbor for Image Classification" in IEEE 2012.

[12] 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.

[13] Shaohua Wan"Image Annotation Using the SimpleDecisionTree" in International Conference on Management of e-Commerce and e-Government 2011.

[14] 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," Photogram. Eng. Remote Sens., vol. 75, no. 7, pp. 819–829, Jul. 2009.

[15]Y. O. Ouma, J. Tetuko, and R. Tateishi, "Analysis of co-occurrence and discrete wavelet transform textures for differentiation of forest and nonforest vegetation in very-high-resolution optical-sensor imagery," Int. J. Remote Sens., vol. 29, no. 12, pp. 3417–3456, Jun. 2008.

[16] M. Simard, S. S. Saatchi, and G. De Grandi, "The use of decision tree and multiscale texture for classification of JERS-1 SAR data over tropical forest," IEEE Trans. Geosci. Remote Sens., vol. 38, no. 5, pp. 2310–2321, Sep. 2000.

[17] M. Pesaresiand and J. A. Benediktsonn, "A new approach for the morphological segmentation of high-resolution satellite imagery," IEEE Trans. Geosci. Remote Sens., vol. 39, no. 2, pp. 309–320, Feb. 2001.

[18] J. A. Benedktsonn, J. A. Palmason, and J. R. Sveinsson, "Classification of hyperspectral data from urban areas based on extended morphological profiles," IEEE Trans. Geosci. Sens., vol. 43, no. 3, pp. 480–491, Mar. 2005.

[19] M. Dalla Mura, A. Villa, J. A. Benediktsson, J. Chanussot, and L. Bruzzone,"Classification of hyperspectral images by using extended morphological attribute profiles and independent component analysis," IEEE Geosci. Remote Sens. Lett., vol. 8, no. 3, pp. 542–546, May 2011.

[20] M. Dalla Mura, J. AtliBenediktsson, B. Waske, and L. Bruzzone, "Morphological attribute profiles for the analysis of very high resolution images," IEEE Trans. Geosci. Remote Sens., vol. 48, no.10, pp. 3747–3762, Oct. 2010.

[21] D. Tao, X. Tang, X. Li, and X.Wu, "Asymmetric bagging and random subspace for support vector machines-based relevance feedback in image retrieval," IEEE Trans. Pattern Anal. Mach. Intell., vol. 28, no. 7, pp. 1088–1099, Jul. 2007.

[22] G. Guo, A. K. Jain, W. Ma, and H. Zhang, "Learning similarity measure for natural image retrieval with relevance feedback," IEEE Trans. Neural Netw., vol. 13, no. 4, pp. 811–820

[23]V. Vapnik, The Nature of Statistical Learning Theory. NewYork: Springer-Verlag, 1995.