ISSN(Online): 2320-9801
ISSN (Print): 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Website: www.ijircce.com

Vol. 5, Issue 5, May 2017

Plant leaf Classification using Artificial Neural Network Classifier

Suman S. G, B. K. Deshpande,

Student, Department of CSE, Cambridge Institution of Technology, Bangalore, India

Asst. Professor, Department of CSE, Cambridge Institution of Technology, Bangalore, India

ABSTRACT: Today has a lot of categories of plants can be edge of an extinction. In daily life herbal is acting very important role on individual physic maintenance. Plant classification has been broad application perception in farming medicine and also especially important to research of biology diversity. Nowadays, computer vision has been effectively useful to automatic schemes of plant classification. This paper introduces a leaf identification method used to extract the features and more efficient identification. All features can be extracted as of digital leaf plant image. With one exception, all features are extracted automatically. Once captured image can be pre-processed, extract the feature by color coherence vector and haralick features then sent to ANN classifier for classification. Our major enhancement is on the feature extraction also classifier.

KEYWORDS: Median filter, Color Coherence Vector, Haralick feature and ANN classifier.

I. INTRODUCTION

Plants are plays a vital role in environment. Without plants there will be no existence of the earth's ecology. But in current days, various categories of plants can be at the risk extinction. To defend plants also to catalogue different categories of the flora diversities, the plant database is more significant step towards maintenance of the earth's biosphere. There are large numbers of plant classes worldwide. To handle the volumes of data, enlargement of a rapid and well-organized classification process has become a region of active examine. In addition to a maintenance aspect, identification of plants also essential to make use of their medical properties and by using them sources of another energy sources is bio-fuel. There are some habits to identify the plant such as root, flower, fruit, leaf, etc. In current times computer visualization of methodologies as well as pattern detection techniques has been applied to automated events of plant detection.

In this paper, an ANN is used to computerize the leaf detection for plant classification. The rest of this paper is organized as follows: in Section II, reviews some of the related work available in literature, Section III details the materials and methods used in this investigation, Section IV results and Section V concludes the paper.

II. LITERATURE SURVEY

Jyotismita Chaki et.al [1] introduces an automated scheme for identifying plant classes on leaf images. The plant leaf pictures matching to the three plant categories can be analyzed by using two various shape modelling methods, the first one is on Moments-Invariant (M-I) and then second one is on the model of Centroid-Radii (C-R). The first 4 standardized central moments has been measured for M-I model and calculated in different combination viz. independently, within 2-D joint and 3-D element spaces for creating optimum outcomes. The edge detector have been utilized to recognize the boundary of leaf shape as well as 36 radii at the 10 degree of angular departure has been used to construct the characteristic vector for C-R model. Later improves the accuracy, where set of features of hybrid relating both the C-R and M-I models have been produced and discovered to find out whether the mixture of characteristic vector can show the way to improved performance. Neural networks can be utilized the classifier for discrimination. The data set contains a 180 images separated into 3 species among 60 images. The accuracy ranges as of 90% to 100% are acquired which can be similar to the finest images descript in present fiction.

ISSN(Online): 2320-9801
ISSN (Print): 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Website: www.ijircce.com

Vol. 5, Issue 5, May 2017

Aamod Chemburkar et.al [02] proposes the system can try to convey atomization in process of the plant leaf classification such that with no any valuable information of leaf classes, to identify the leaf. This can be helped botanists in their revise and rapid up the method of identify the classes of plant. Our design is to expand an automatic tool which can be identify and also classify the plant leaf classes after evaluating with trained sets. This trained set can be used by the Artificial Neural Network (ANN) after an image processing. The Neural Network can be trained for discovery of plant Classes. They propose the automatic tool for recognition of plant leaf to its digital picture. Manual recognition necessitates prior information of species with a lengthy procedure; therefore the atomization method helps to rapid up the conventional scheme of plant classification. Also compares various methods can be used in classification of plant leaf.

Shrikant Vyas et.al [03] demonstrates the method of developing the Artificial Neural network on the basis of classifier which can classifies an iris database. The difficulty concerns the recognition of iris plant classes based on plant attribute measurements. They have used of feed forward neural networks to the recognition of iris plants on the subsequent measurements: petal length, sepal length, petal width, and sepal width. By this information set a Neural Network (NN) can be used for categorization of iris data set. The EBPA can be used for training of ANN. The result of simulations exhibits the efficiency of a neural system in iris recognition.

D.B Andore et.al [04] employs Multilayer Perceptron with picture and information processing methods and neural network is to execute general purpose automatic leaf detection. Photoing and sampling leaf can be low cost moreover convenient. One can simply transmit the image to a PC and a computer is extracting the characteristics repeatedly in an image processing methods. They implement a leaf detection technique by using simple to extract the features and higher capable of detection method. The main enhancements can be on feature extraction as well as the classifier. All characteristics can be extracted as of the digital leaves image. With the one exemption, all characteristics are extracted repeatedly.

C. S. Sumathi et.al [05] presents the feed forward neural network can be used to computerize the leaf detection for plant categorization. The accuracy classification of planned neural network can be compared by RBF, MLP and CART. Correlation of feature selection can be used for select the features. The extracted feature are trained by using 10 fold the cross corroboration then tested with CART, MLP, RBF classifiers and proposed the neural network. The output acquired by the feed-forward neural network used for the nine set difficulty is acceptable attaining enhanced recall and accuracy.

III. METODOLOGY

The proposed block diagram of plant classification is shows in Figure 1. This system consists mainly two phases are training and testing phases. In training phase, input plant leaves are pre-processed by resizing an image into 256x256 and apply the median filter to remove the noise. This pre-processed image is passed to feature extraction for extract the features by using haralick feature and clor coherence vector technique. Then these features are trained with ANN classifier and stored it in knowledge base. Similarly in testing phase also after extracting the features it will classifies based on the knowledge base and shows that which class is present.

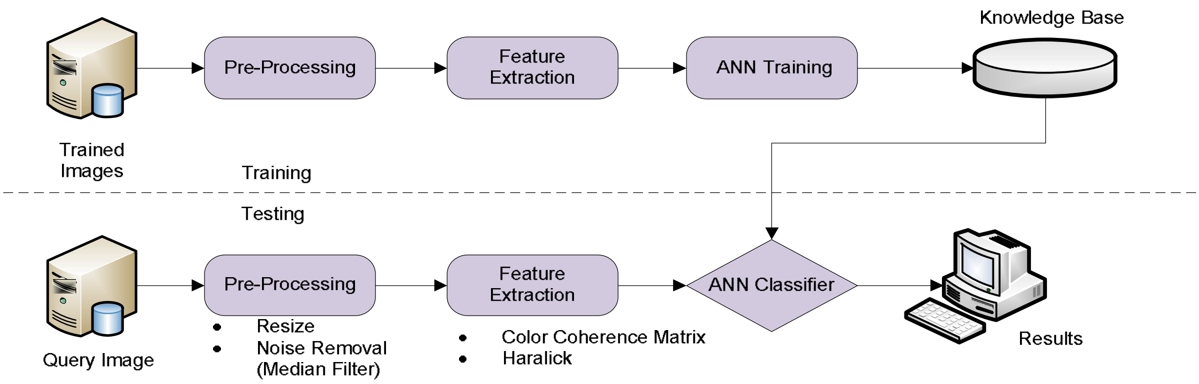


Figure 1: Block Diagram of Proposed System

ISSN(Online): 2320-9801
ISSN (Print): 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Website: www.ijircce.com

Vol. 5, Issue 5, May 2017

A. Image pre-processing

Image processing is the enhancement of image i.e., processing an image so that the results are more suitable for a particular application [9]. Processing an image involves following phases:

- Resize the captured image into 256x256.
- Remove the unwanted noise by using median filter.

B. Color Coherence Matrix

Instinctively, can be defined color coherence as the amount to which pixels of that color are members of large equally colored regions. These important regions like coherent regions, and examine that there are of major importance in differentiating an images.

In CCV algorithm pixels of every color can be allocated to either coherence otherwise incoherence collection. Assuming that one pixel which belongs to a big equally colored district, this is known as coherence, and otherwise this is incoherence. Because there is extra data stored in CCV method, the matching results of picture recovery process has been much improved than histogram system. In CCV technique a three dimension vector can be considered for every picture. Consequently, the ensuing vectors can be contrasted to find out the comparable imagery by query ones. Various techniques are examined to the picture comparison and the resemblance measurement. For example, Minkowski-form Distance technique is as well as Manhatan/City Bock, Cosine Distance, Distance (L1) and Euclidean Distance (L2), x^2 Statistic, Quadric Distance, Histogram Intersection and Mahalanobis Distance. L1 and x^2 Statistic are more attractive distance process, with others, for a useful and well-organized retrieval. Furthermore, L1 is used more commonly as this is more rapidly than x^2 statistic. In developing the L1 technique in CCV, the distance amid two images can be computed as,

$$\Delta_{CCV} = |\alpha_j - \alpha'_j| + |\beta_j - \beta'_j| \qquad (01)$$

Where $(\alpha_j, \beta_j$ j and $(\alpha'_j\ \beta'_j)$ descries the first and second image of the jth color for coherence pairs respectively. The amount of j-th colored pixels of the first and second images are same however it is coherence in primary image and second image is incoherencen. There is a parameter of τ that can be used in computing CCV. The τ established whether an associated element can coherence or not, and refers the size of every element.

C. Haralick Feature

There are three categories of visual cues individuals obviously look for an image: spectral which can be an average tonal difference in band varieties of observable wavelengths, contextual which can be macro information surveyed as of the surrounding information, and textural. Textural data, or a spatial distribution of the tonal difference in the band, is much more significant features utilized in recognizing the object or region of interest in the image. The texture can also represent a usual selection for automatic image classification since it avoids require for both context and color. Haralick, Shanmugam, and Dinstein bring in the set of 13 features computed as of image gray level co-occurrence matrix in 1973. These Haralick features, which can be widely used nowadays for a variety of applications, permit quantification of the texture features, defined as: Contrast, Sum of Squares: Variance, Angular Second Moment, Correlation, Inverse Difference Moment, Sum Variance, Sum Average, Entropy, Sum Entropy, Difference Variance, Difference Entropy, Maximal Correlation Coefficient, Information Measures of Correlation and flow chart of it shows in Figure 2. The mathematical formulas of 13 haralick features is shows in below equations,

Angular Second Moment:

$$f_1 = \sum_i \sum_j \{p(i,j)\}^2 \qquad (02)$$

Contrast:

$$f_2 = \sum_{n=0}^{N_g-1} n^2 \left\{ \sum_{i=1}^{N_g} \sum_{j=1}^{N_g} p(i,j) \right\} \qquad (03)$$

Correlation:

$$f_3 = \frac{\sum_i \sum_j (i,j)p(i,j) - \mu_x \mu_y}{\sigma_x \sigma_y} \qquad (04)$$

ISSN(Online): 2320-9801
ISSN (Print): 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Website: www.ijircce.com

Vol. 5, Issue 5, May 2017

Sum of Squares: Variance

$$f_4 = \sum_i \sum_j (i-\mu)^2 \, p(i,j) \qquad (05)$$

Inverse Difference Moment:

$$f_5 = \sum_i \sum_j \frac{1}{1+(i-j)^2} p(i,j) \qquad (06)$$

Sum Average:

$$f_6 = \sum_{i=2}^{2N_g} i p_{x+y}(i) \qquad (07)$$

Sum Variance:

$$f_7 = \sum_{i=2}^{2N_g} (i - f_a)^2 p_{x+y}(i) \qquad (08)$$

Sum entropy:

$$f_8 = -\sum_{i=2}^{2N_g} p_{x+y}(i) \log\{p_{x+y}(i)\} \qquad (09)$$

Entropy:

$$f_9 = \sum_i \sum_j p(i,j) \log p(i,j) \qquad (10)$$

Difference Variance:

$$f_{10} = \text{variance of } p_{x-y} \qquad (11)$$

Difference Entropy:

$$f_{11} = -\sum_{i=0}^{N_g-1} p_{x-y}(i) \log\{p_{x-y}(i)\} \qquad (12)$$

Information Measures of correlation:

$$f_{12} = \frac{HXY - HXY1}{\max\{HX, HY\}} \qquad (13)$$

$$f_{13} = (1 - \exp[-2.0(HXY2 - HXY)])^{1/2} \qquad (14)$$

Maximal correlation Coefficient:

$$f_{14} = (\text{Second Lagest eigenvalue of } Q)^{1/2} \qquad (15)$$

Where, $Q(i,j) = \sum_k \frac{p(i,k)p(j,k)}{p_x(i)p_y(k)}$

Haralick textures can be a familiar method for calculating textures and offers data about an image area like boundaries, homogeneity, complexity and contrast as explained about. This method has yet enjoyed a few achievements in biology. One cluster recently established by Haralick feature to forecast malaria on the image study of erythrocytes. One more group can be used that PCA based method in mixture with Haralick textures to categorize the synthetic opening radar images. Thus, exposed a patent subjected to two years ago used for computing global nuclear examples as marker of branch cell separation by, amongst other methods, Haralick textures.

ISSN(Online): 2320-9801
ISSN (Print): 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Website: www.ijircce.com

Vol. 5, Issue 5, May 2017

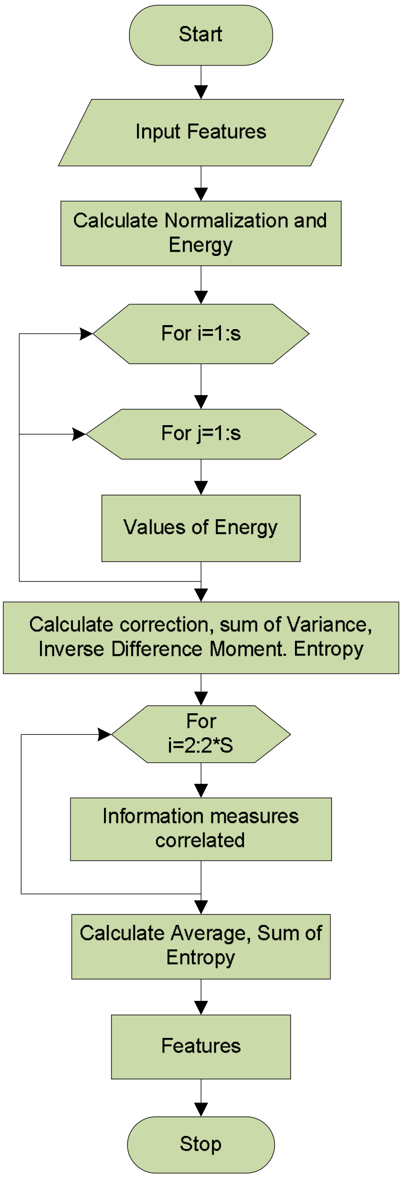


Figure 2: Flowchart of Haralick Feature

D. ANN Classifier

An ANN is the informative processing scheme that can be on the reproduction the individual recognition process. ANNs contains a lot of computational neural units attached into each other. The compensation of Neural Network for categorization is:

- Neural Networks can be more robust as of the weights.
- The Neural Networks get better its presentation by knowledge. This can continue still after training set has been related.
- The utilize of Neural Networks are parallelized as particular for improve the performance.
- There is minimum error rate thus a more amount of accuracy one time the suitable training has been executed.
- Neural Networks can be high robust in the noisy surroundings.

ISSN(Online): 2320-9801
ISSN (Print): 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Website: www.ijircce.com

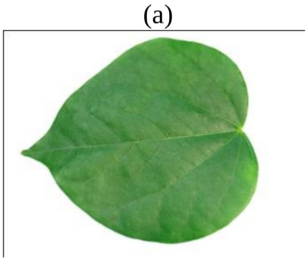
Vol. 5, Issue 5, May 2017

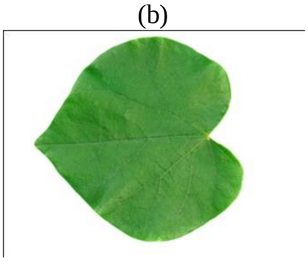
In ANN, information on the difficulty which can be distributed in to neuron and correlation weights of links among neurons. The neural networks have to be organized to regulate the correlation weights and also biases in civilization to generate the required mapping. ANNs can be mainly valuable for complex pattern detection and classification. The ability of knowledge from example, the capability to replicate random non-linear function of inputs and the extremely parallel as well as usual structure of the ANN build them particularly appropriate for the pattern classification troubles. This method is on the adjustment of connection weights of the network to minimize the problem. The problem can be computed by comparing acquired outputs by expected outcomes of recognized inputs. This problem is then backward broadcasted until the primary layer and then weights can be adjusted. This method takes places over and weights can be persistently adjusted. The position of information which permits the training is known as training set. Throughout the training of network, the similar position of information is developed several times until the attainment an acceptable problem, or attainment the highest amount of iterations.

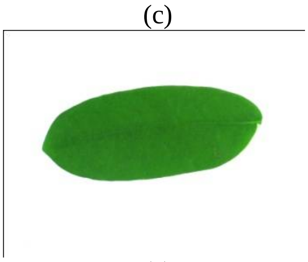
IV. EXPERIMENTAL RESULT

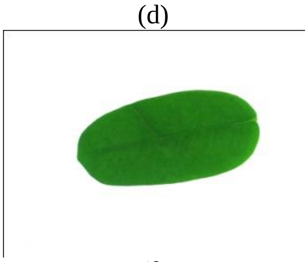

(a)

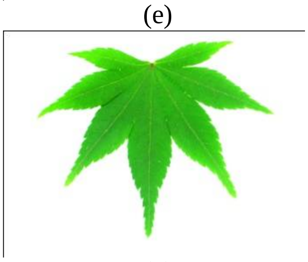

(b)

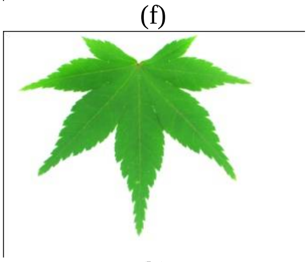

(c)


(d)


(e)


(f)


(g)


(h)

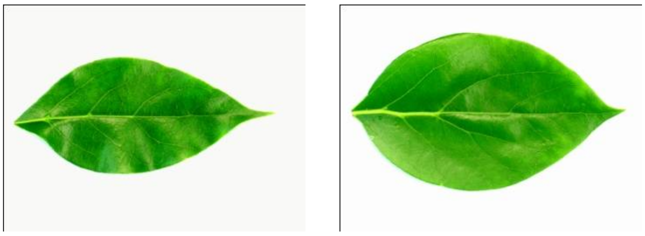
ISSN(Online): 2320-9801
ISSN (Print): 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Website: www.ijircce.com

Vol. 5, Issue 5, May 2017



(i) (j)

Figure 3: Different types of classification (a) & (b) Chinese horse chestnut (49); (c) & (d) Chinese redbud plant leaf; (e) & (f) trueindigo plant leaf; (g) & (h) Japanesemaple plant leaf; (i) & (j) camphortree plant leaf

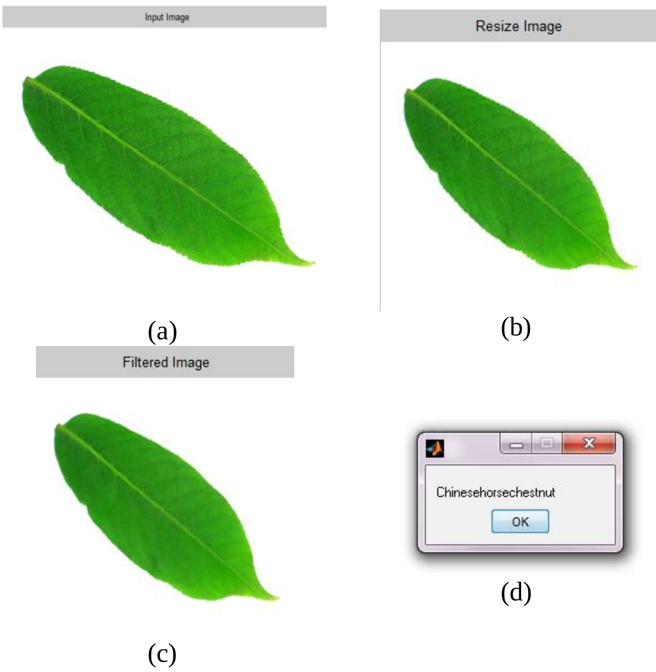


Figure 4 : Classifying Bean Plant; (a) Input Image; (b) Resize Image; (c) Filtered Image; (d) Recognize the Beans Plant

In our database consists five classes of plant leaf are selected with 10 images for each plant classes. Figure 3 shows five classes such as Chinese horse chestnut, Chinese redbud, trueindigo, Japanesemaple and camphortree Plant. Figure 4 represents the one test classification. Figure 4 (a) depicts the input plant image, (b) gives the resizes Image, (c) represents the Filtered Image and finally (d) gives which class is classified.

V. CONCLUSION

In this paper, artificial neural network (ANN) Classifier is used to automate leaf detection for the plant classification. This paper introduces a neural network method for leaf identification. The computer can be automatically detecting leaf in relocating the leaf images to computer. ANN is assumed for its rapid training speed with easy structure. The experimental result specifies that method is effective with accuracy more than the previous methods; this technique is quick in execution, proficient in identification and simple in implementation.

ISSN(Online): 2320-9801
ISSN (Print): 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Website: www.ijircce.com

Vol. 5, Issue 5, May 2017

REFERENCES

[1] Chaki, Jyotismita and Ranjan Parekh, "Plant leaf recognition using shape based features and neural network classifiers", International Journal of Advanced Computer Science and Applications, Vol. 2, No. 10, 2011.
[2] Aamod Chemburkar, Anand Sartape, Ajinkya Gawade, Prasad Somawanshi, “Automated Tool for Plant Leaf Classification Using Morphological Features”, International Journal Of Engineering And Computer Science, Vol. 3, No. 11, pp. 9098 - 9102, 2014.
[3] Shrikant Vyas and Dipti Upadhyay , “Identification of Iris Plant Using Feed Forward Neural Network on the Basis of Floral Dimensions”, International Journal of Innovative Research in Science, Engineering and Technology, Vol. 3, No. 12, 2014.
[4] Sambhaji, Ekshinge Sandip and D. B. Andore, "Leaf Recognition Algorithm Using Neural Network Based Image Processing", Asian Journal of Engineering and Technology Innovation, Vol. 2, No. 02, 2014.
[5] Sumathi C S, and AV Senthil Kumar, "Plant Leaf Classification Using Soft Computing Techniques", International Journal of Future Computer and Communication, Vol. 2, No. 3, pp. 196, 2013.
[6] Swain M, Dash S. K, Dash S and Mohapatra A, “An approach for iris plant classification using neural network”, International Journal on Soft Computing, Vol. 3, No. 1, pp. 79, 2012.
[7] Amlekar M, Manza R. R, Yannawar P and Gaikwad, A. T., “Leaf features based plant classification using artificial neural network”, IBMRD's Journal of Management & Research, Vol. 3, No. 1, pp. 224-232, 2014 .
[8] Sünderhauf N, McCool C, Upcroft, B, and Perez T, “Fine-Grained Plant Classification using Convolutional Neural Networks for Feature Extraction”, In CLEF (Working Notes), pp. 756-762, 2014.
[9] Ramya and Anthuvan Lydia, “Leaf Disease Detection and Classification using Neural Networks”, International Journal of Advanced Research in Computer and Communication Engineering, Vol. 5, No. 11, 2016.
[10] Malvika Ranjan, Manasi Rajiv Weginwar, Neha Joshi and A.B. Ingole, “Detection and Classification of Leaf Disease using Artificial Neural Network”, International Journal of Technical Research and Applications, Vol. 3, No. 3, pp. 331-333, 2015.
[11] Muthukannan K, Latha P, Selvi R. P and Nisha P, “Classification of Diseased Plant Leaves using Neural Network Algorithms”, ARPN Journal of Engineering and Applied Sciences, Vol. 10, No. 4, pp. 1913-1919, 2015.
[12] “Haralick Texture Analysis for Stem Cell Identification “ athan Loewke
[13] Ravani, Reza, Mohamad Reza Mirali and Maryam Baniasadi, "Parallel CBIR system based on color coherence vector", 17th International Conference on Systems, Signals and Image Processing. 2010.
[14] Hati, Shayan, and G. Sajeevan, "Plant Recognition from Leaf Image through Artificial Neural Network" , International Journal of Computer Applications, Vol. 62, No. 17, 2013.
[15] Haralick, Robert M and Karthikeyan Shanmugam, "Textural features for image classification", IEEE Transactions on systems, man, and cybernetics, Vol. 3, No.6, pp. 610-621, 1973.