ISSN (Print) : 2320 – 3765
ISSN (Online): 2278 – 8875

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 5, Issue 4, April 2016

Identification of Leaf by using Canny Edge Detection and SVM Classifier

Sneha,. Pankaja K

M.Tech Student, Dept. of Computer Science and Engineering, Cambridge Institute of Technology, Bangalore, India

Assistant Professor, Dept. of Computer Science and Engineering, Cambridge Institute of Technology, Bangalore, India

ABSTRACT: Plants are the important species on the earth. Plant identification is very important in the field ayurvedic, agricultural and biology. Computerisation of plant species and its management is gaining importance. Plant identification process is carried out by collecting common characteristics of leaves. The information of leaf veins, therefore, plays an important role in identifying living plants. This paper presents canny edge, Gabor feature, and color histogram descriptors that have low-dimension, effective and simple. In this case, a called Support vector Machine (SVM) is used as a classifier. The experimental result Shows that the methods used in proposed system gives better accuracy.

KEYWORDS*:* SVM, Color Histogram, Gabor Feature.

I. INTRODUCTION

Each leaf has its own features and carries significant information that can help people to recognize and classify the plant by looking at it. Leaf shape is a prominent feature that most people use to recognize and classify a plant. Wu et al. in had stated that diameter, physiological length, physiological width, leaf area and perimeter are basic geometry information can be extract from the leaf shape. In addition, leaf color, textures and vein are also considered as features. All these features are useful for recognition and classification of leaf image. Figure 1 illustrates the fundamental of recognition and classification process by computer using a leaf image in order to recognize and classify.

The current electronic devices for capturing images have been developed to a point where there is little or no difference between the target and its digital counterpart. The success of machine learning for image recognition also suggests applications in the area of identification of plant by herbarium specimens. Once the image of a target is captured digitally, a myriad of image processing algorithms can be used to extract features from it. The use of each of these features will depend on the particular patterns to be highlighted in the image.

II. RELATED WORK

Plant classification remains very useful and important task for scientist, field guides and others. Using computer vision this process can be automated.[1] Here the reviews of different systems which are helpful to identify any leaf for automation in farming, gardening and in medicine developing from plants have been carried out. PNN, PCA, SVM-BDT, NN, BPNN, Leaf identification, leaf recognition are used in his paper. Mythili.C et.al [2] proposes a system which consists of five stages: Pre-processing, Segmentation, Feature extraction, Classification and Recognition. In the first stage, Fuzzy filter is used to suppress the additive noise from an input image and improve the image enhancement. In the second Stage the image is segmented using Effective Robust Kernelized Fuzzy C- Means (ERKFCM). In the third stage, Geometric features [2] (Diameter, Leaf Length, Leaf Width) and Tooth features) are extracted from the segmented image. In the fourth stage classification is performed using Support Vector Machine Classifier (SVM) and finally Artificial Neural Network (ANN) used to recognize the characteristics of leaf. Ajit Dant at.al [3] his paper presents the mean and range color features based identification of leafy vegetables. Initially, a total of 18 RGB and HSI color features are chosen. A reverse engineering process is adopted for reduction of features. Finally 12 mean and range features of RGB and HSI color features are selected based on the performance.

A BPNN based classifier is used for identification of vegetables. The identification rate is in the range 92-100% for ten types of vegetables. The work finds applications in automatic vending, packing and grading of vegetables, food

ISSN (Print) : 2320 – 3765
ISSN (Online): 2278 – 8875

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 5, Issue 4, April 2016

preparation and the like. Basavaraj S. Anami [4] The study provides a methodology for retrieving medicinal plants images from a database of medicinal plant images based on shape and texture features. The shape descriptors include Zernike moment, Fourier descriptor (FD), Generic fourier Descriptor(GFD) and for texture descriptors ,gabor filters are used. The similarity measures, Euclidean distance of each medicinal plant image from the database to query image is used. The images are sorted based on similarity of Euclidean distance. The retrieval experiments are carried on different training and test medicinal plant images. The effectiveness of different descriptors is confirmed by the experimental results. We have investigated shape and texture features for medicinal plant retrieval by successively combining the different transforms.

The retrieval efficiency is reported through precision and recall rate. Experimental results by combining Gabor and Zernike transform outperforms the all other methods. D. Wijesingha at.el Digital pictures of leaves were enhanced, segmented, and a set of features were extracted from the image. The most discriminating set of features were selected and then used as inputs to a Probabilistic Neural Network (PNN) which is used in MATLAB classifier and tests were performed to identify the best system. Several classification models were assessed via cross-validation in order to select the leaves in an image and identify the correct one. The results suggested that, leaf width, length, perimeter and area related features can be used as factors for prediction, and that machine vision systems lead to successful prediction of targets when fed with appropriate information. The overall classification accuracy utilizing the proposed technique for the test set was 85%, whereas that feature extraction obtained was 95 %.

III. PROPOSED SYSTEM

The proposed system for leaf classification consists of two stages testing phase and training phase. In training phase, image segmentation is carried out using K-mean method. Segmented image is resized and gray conversion is done which is suitable for further processing. Gabor feature, shape feature, color feature are stored in feature vector and trained using SVM training .Trained features are stored in knowledge base.

In Testing Phase same steps like color conversion, resize, and feature extraction is done. The features obtained from the testing phase and the features stored in knowledge base are given to SVM classifier to recognize the leaf.

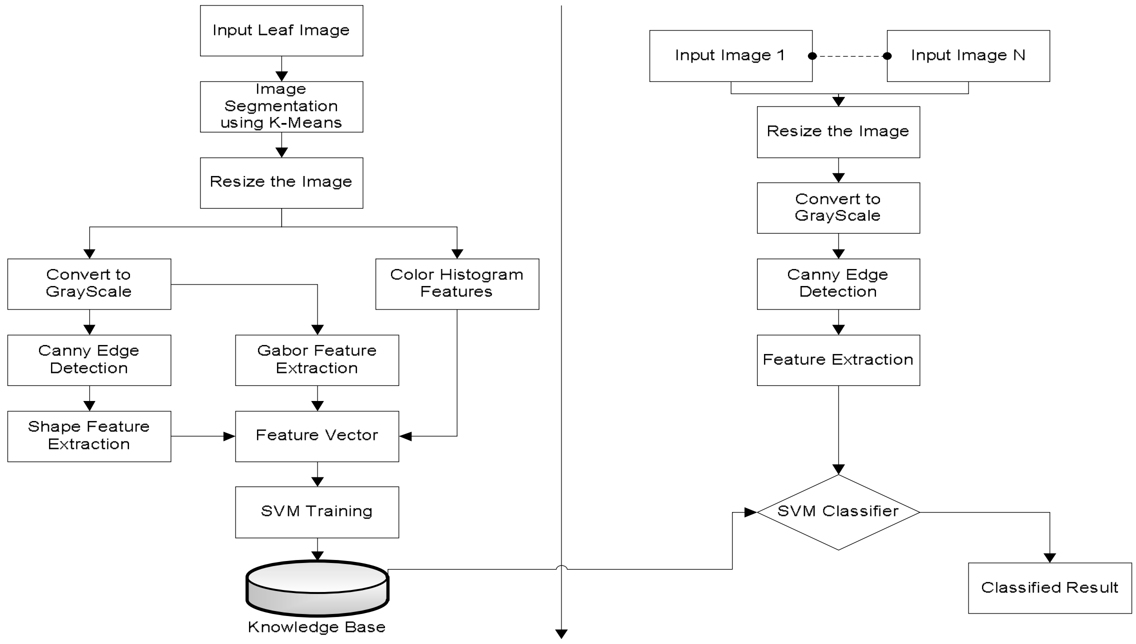

Figure 1: Flowchart of Proposed System

ISSN (Print) : 2320 – 3765
ISSN (Online): 2278 – 8875

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 5, Issue 4, April 2016

A. K-Mean Segmentation

The main thought is to characterize k centroids, one for every cluster. These centroids ought to be set cunningly as a result of various area causes diverse result. In this way, the better decision is to place them however much as could be expected far from one another. The following step is to take every point having a place with a given data set and partner it to the closest centroid.

At the point when no point is pending, the initial step is finished and an early gathering age is finished. As of right now we have to recalculate k new centroids as bary centers of the bunches coming about because of the past step. After we have these k new centroids, another tying must be done between the same information set focuses and the closest new centroid. A circle has been created. As an aftereffect of this circle we might see that the k centroids change their area orderly until no more changes are finished.

The algorithm iterates over two steps:
1. Compute the intensity distribution (also called the histogram) of the intensities.
2. Initialize the centroids with k random intensities.
3. Repeat the following steps until the cluster a label of the image does not change anymore.

4. Cluster the points based on distance of their intensities from the centroid intensities. Equation (1)

$$c(i) = \arg\min_j \|x^{(i)} - \mu_j\|^2 \quad (1)$$

5. Compute the new centroid for each of the clusters.

Where k is a parameter of the algorithm (the number of clusters to be found), i iterates over the all the intensities, j iterates over all the centroids.

B. Gabor Feature

The Gabor filter is generally utilized as a part of the image features. The Gabor filter wavelet is the type of sine wave adjusted by the Gaussian coefficient. The Gabor filter is helpful for extracting local and global data. The Gabor filter are tunable band pass channel, multiscale and multi resolution filter [5].

The Gabor filter eq. (2) is utilized as a part of texture segmentation, image representation. It offers ideal resolution in space and time domain. It gives better visual representation in the involved composition pictures. Be that as it may, the current Gabor parameter requires additional time utilization for feature extraction. The Gabor filter works on the frequency, orientation and Gaussian kernel.

$$\text{Gabor}(x, y, \theta, \varphi) = X.Y \quad (2)$$

$$X = \exp(-(x^2 + y^2) \div \sigma^2) \quad (3)$$

$$Y = \exp\big(2\pi\theta(x\cos\theta + y\sin\theta)\big) \quad (4)$$

The terms x and y (eq. 3 and eq. 4) is the position of the filter relative to the input signal [5]. The angular representation of the filter is represented as 'θ'. The angular orientation of the filter is represented as '∅'.

C. Color Histogram Feature

A histogram is the distribution of the number of pixels for an image. The number of elements in a histogram depends on the number of bits in each pixel of an image.[6] For example, if we consider a pixel depth of n bit, the pixel value will be in between 0 and $2^n - 1$.Equation (5) and (6) is used to find variance and Mean.

$$Var = \frac{\sum_{i=0}^{255} h(i) * (i - mean)^2}{\sum_{i=0}^{255} h(i)} \quad (5)$$

$$Mean = \sqrt{\sum_{i=0}^{255} i * \frac{h(i)}{\sum_{i=0}^{255} h(i)}} \quad (6)$$

D. SVM Classifier

SVM is built up as one of standard instruments for machine learning and information mining. Uses of an extensive variety of example acknowledgment issues, picture grouping, money related time arrangement expectation, face recognition, biomedical sign investigation, restorative diagnostics, and information mining utilizes SVM now a days. Standard SVM orders objects into two classes by figuring the most extreme edge hyper-plane between the preparation objects of both given classes. Auxiliary danger minimization is connected with such a plan to demonstrate a decent exchange off between low observational danger and little limit.

ISSN (Print) : 2320 – 3765
ISSN (Online): 2278 – 8875

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

(An ISO 3297: 2007 Certified Organization)

Vol. 5, Issue 4, April 2016

The utilization of delicate edges by indicating a cost component and piece capacities (e.g. Outspread Basis Kernel or Polynomial)which empowers to order any sort of information. The SVM algorithm provides a choice of four kernel types: (i) Linear, (ii) Polynomial, (iii) Radial Basis Function, and (iv) Sigmoid.

IV. RESULT & DISCUSSION

Figure 2 represents the overall experimental results of proposed system. We considered input image as leaf as shown in Figure 2(a), this image is pre-processed to get gray scale image as shown in Figure 2(b), next after applying segmentation techniques we are going to get color image as shown in Figure 2(c), by applying edge detection algorithms will map the edge map as shown in Figure 2(d). Finally SVM classifier will classify the leaf according to the database in knowledge base and output is displayed as shown in Figure 2(e).

(a) (b) (c) (d) (e)

Figure.2: (A)Input Image; (B) Gray Scale Image; (C) Color Image; (D) Edge Map; (E) Output

CONCLUSION

The process of leaf identification is time manually consuming and it has been mainly carried out by botanists. In our proposed system Computer-aided plant recognition system is proposed in which k-mean is used for image segmentation. The good results are obtained by the combination of colour, edge and texture feature (edge) features. It is found that classification accuracy is better with SVM classifier. The work assists human beings in classification of medicinal plants in the real world and considered an essential task in pharmaceutical industry, Ayurved practitioners and botanists.

IV. REFERENCES

[1] Anuja Vaidya, Divyesh Pujari, Harsh Desai, Krunal Borse and Sagar Patel.” Leaf Recognition – A Technical Review”, International journal for research in emerging science and technology, volume-2, issue-1, january-2015.
[2] Mythili.C, Dr.V.Kavitha,” Recognition of Plant Leaf in Medicine”.2012
[3] Ajit Danti, Manohar Madgi and Basavaraj S. Anami. “ Mean and Range Color Features Based Identification of Common Indian Leafy Vegetables”.International Journal of Signal Processing, Image Processing and Pattern Recognition Vol. 5, No. 3, September, 2012.
[4] Basavaraj S. Anami, Suvarna S. Nandyal, and A. Govardhan,“Suitability of Shape and Texture Features in Retrieval of Medicinal Plants” Images in Indian Context”. International Journal of Machine Learning and Computing, Vol. 2, No. 6, December 2012.
[5] D. wijesingha and f.m.m.t. marikar, **“**Automatic detection system for the identification of plants using herbarium specimen images”. tropical agricultural research vol. 23 (1): 42 – 50 (2011).
[6] Abdul Kadir, Lukito Edi Nugroho, Adhi Susanto, Paulus Insap Santosa” Leaf Classification Using Shape, Color, and Texture Features” ,International Journal of Computer Trends and Technology- July to Aug Issue 2011.