International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 06 Issue: 04 | Apr 2019 www.irjet.net p-ISSN: 2395-0072

Recognition Of Plants Using Leaf Image With Neural Network and Computer Vision

Shivam Upadhyay[1], Aakash Yadav[2], Kaushik Yadav[3], Sonal Chaudhari[4]

[1],[2],[3]Student, Department of Computer Engineering, [4]Associate Professor Datta Meghe College Of Engineering, Mumbai University, Airoli, India

---

Abstract *– The most common method people used to differentiate and identify any given plant is though the leaf of the plant. Although there are many more parameters which help to distinguish one plant to another leaves are more common. The leaves have many different parameters which can be used to recognize plants, these parameters include shape of the leaf, size of the leaf, type of venation, area, color and many more. That is why the leaf of the plant plays a very important role in plant recognition. This system is a computer based automatic plant identification system. Vein feature as a derived feature is extracted based on leaf structure. At the first stage leaf images are obtained using digital scanner. Then morphological features are extracted which act as input to the classification stage.*

Keywords— *Plant Recognition Computer Vision, Neural Network, Edge Detection, Feature Extraction, Pre-processing.*

I. INTRODUCTION

Plants form and integral part of human life and many people often find it challenging and difficult to differentiate between different plants from their leaves. Also due to the increased awareness for environment protection in the past few decades it becomes very important to know about the plants we are surrounded with to better understand the different ways in which plants affect our day to day life and how to benefit us. Due to the recent reports on global warming, there is a new curiosity and awareness among people regarding plants and that involves knowing the plants. But the process of identifying plans using the leaf is rather difficult. Since the leaves of plants are two dimensional rather than three dimensional like actual plants it is slightly easier to extract feature from these leaves like this shape, size, color, texture, area and to classify the plant based on these features. It involves training a neural network model on a Number of image of a particular class to process and extract the features which would then be used to classify the species of the plant. The leaf detection applications works by scanning the leaf where the leaf image is analyzed and compared with the available dataset and then showing the plant name depending on the match found.

II. LITERATURE SURVEY

In recent times there have been a number of studies on the subject of plant recognition or classification or recognition by using the leaf image. Leaf is most commonly used to identify the plants by using the leaf color, leaf shape, leaf area and very complex parameters. This paper work uses a simple approach of using the neural network models to extract features from implies i.e. edge detection to obtain the leaf shape and the vein structure.

A huge amount of research is done on the process of classifying plants using the leaf image. Arunpriya [1] this proposed approach involves three phases which include the pre-processing of the image to obtain a grayscale image from the RGB image it is followed by the enhancement of boundary for the proper extraction of the five fundamental image features which are them used for the classification of the plant using the support vector machine classification for leaf identification

.Leaf snap [2] Leaf snap is a series of electronic field guides being developed by researchers from Columbia University, the University of Maryland, and the Smithsonian Institution. The free mobile apps use visual recognition software to help identify tree species from photographs of their leaves. The high-resolution images in the original app were created by the conservation organization.

The Leaf snap UK app includes trees from the United Kingdom with species information and imagery provided by the Natural History Museum in London. More information can be found on the Natural History Museum website. Some researchers have proposed to calculate the input images area using another object as a reference [3]. Some researchers [4][5] proposed the use of faster artificial neural networks in order to improve the performance of the system . Others [7] employed k-nearest neighbor classifier for the classification of the plants.

III. METHODOLOGY

The given project consist of two main components

1) Training the model
2) Predicting Label

*In the training process Dataset of images is created to train the neural network model. On this training images dataset image augmentation is performed in order to increase the number of training images. Image augmentation also improves the Quality of data as multiple point of view of image is available. After image augmentation is performed then the images are pre-processed to convert each image in a standard format of 100*100 pixels and the image is converted into grey scale image and then the filters are applied to detect the edge from the image. The following is shown the figure below:*

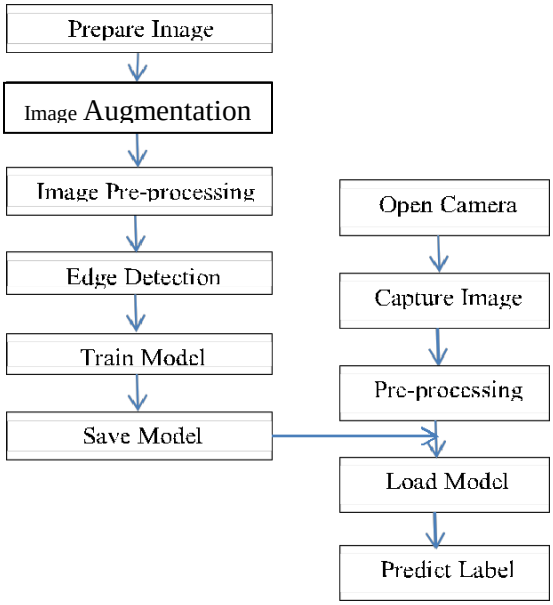

Fig. 1 Training and Testing model

1) Preparing image dataset:

The images can be obtained by taking photos from the camera in the phone or by searching for images on the internet. While preparing the training data all the images have a white background in order to avoid background interference and all the images all taken at a minimum distance of 15cm. The model was trained on leaves of 5 plants namely Mango, Peepal, Grape, Eucalyptus, Guava. The dataset set consists of 200 images of each class and contains a total of 1000 images for 5 classes The samples are as shown in the below figure.

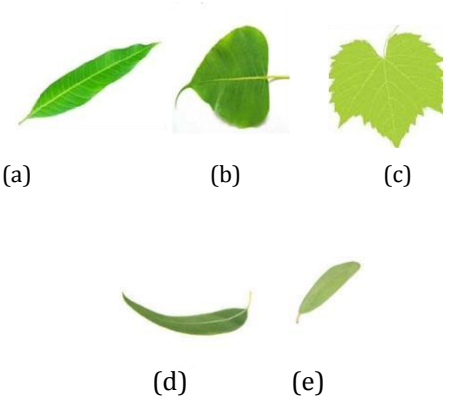

Fig. 2 Leaf Samples : (a) Mangifera indica(Mango) (b) Ficus religiosa(Peepal) (c) Vitis vinifera(Grape) (d) Eucalyptus Globu(Eucalyptus) (e) Psidium guajava(Guava)

2) Image augmentation

The images used to create the dataset are then augmented to increase the size of the training data. This ensures that the model is properly trained on a number of data and improves the accuracy of the model and also ensures that the system is able to recognize the image in different orientations. It involves performing a number of operations on a given image to obtain different mirror images. The Image augmentation is as shown in the below figure.

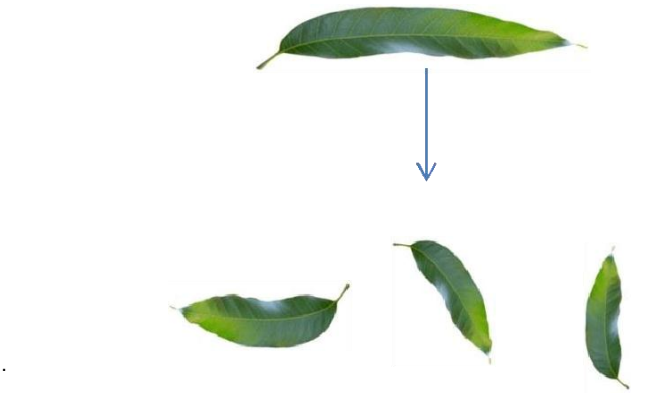

Fig 3. Image Augmentation

3) *Image pre-processing and edge detection:*

*The images are processed to convert each image from original size to required size in this case each image was converted to a size of 100*100 pixels. The images are then converted from RGB to gray scale images and then the image is converted into binary image. Now, we apply a 3*3 filter (kernel) to detect the edges and the veins of the leaf. The main aim to perform edge detection is to separate and identify the image from its background to extract the features of image which is then used to train the classifier.*

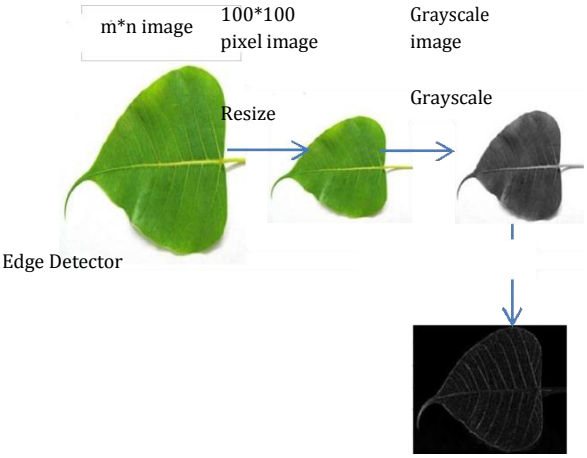

Fig. 4 Pre-processing

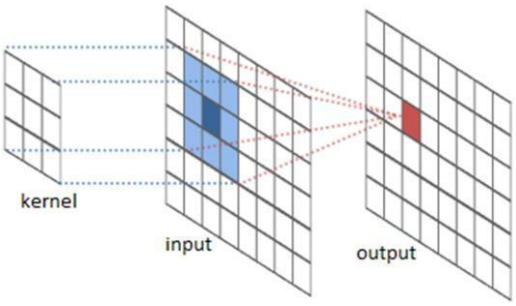

Fig. 5 Edge Detection

The input image is mapped by adjusting the weights iteratively. While training the model the weight optimization is done by back propagation of error. The training is started by initializing the weight and biases and it progresses in a number of rounds or epochs so as to minimize the errors unit the desired amount of accuracy is not obtained. Initially random weights and biases are used to initialize the neural network once it is over, training can be started. Once the training of the model is initialized, the Initial weights and biases change as the training progresses and it tries to minimize the loss and improve the accuracy of the system. Before training the data is divided into two categories i.e. training data and testing data. The training is performed using the training data and the testing data is used the test to accuracy of the trained model. Depending on this observation Training and testing data is changed until the desired Accuracy and performance is reached. Once the cycles or epochs are completed training is stopped and the model is saved for classification.

IV. RESULT

The system is designed using tensorflow and python. The system is executed on a laptop with following configurations: 2.30 GHZ core i5 processor, 8 GB of RAM, run under Microsoft Windows 10-64 bits. The result is as follows:

V. CONCLUSION

In the above paper, we investigated the use of neural networks and computer vision for classifying plants using their leaf image and benefits of such a system to Botanists and other users who use the system for classifying plants. Our system depends upon the ability of the neural networks to extract the required characteristics from the leaves and store it. This model is then used to predict the label of any input image depending upon the features extracted from the images of the training data.

The above analysis shows that the system is capable of identifying multiple input images. However the precision and accuracy of the system can be improved. Our future research will work towards training a model to classify the plants from images in a busy or noisy background having background interference

VI. Reference

[1] ArunPriya C., Balasaravanan T., Antony Selvadoss Thanamani, "An Efficient Leaf Recognition Algorithm for Plant Classification Using Support Vector Machine", Proceedings of the International Conference on Pattern Recognition, Informatics and Medical Engineering, 2012, pp. 428-432.

[2] Neeraj, K., et al., Leafsnap: A Computer Vision System for Automatic Plant Species Identification, in ECCV 2012. 2012, Springer. p. 502-516.

[3] Sanjay B patil and Dr. Shrikant K Bodhe, " Betel Leaf Measurement Using Image Processing", International Journal on Computer Science and engineering(IJSCE), Vol. 3 No. 7 july 2011.

[4] H. Fu, Z. Chi, D. Feng, and J. Song, "Machine learning techniques for ontology-based leaf classification," IEEE 2004 8th International Conference on Control, Automation, Robotics and Vision, Kunming, China, 2004.

[5] J. Du, D. Huang, X. Wang, and X. Gu, "Shape recognition based on radial basis probabilistic neural network and application to plant species identification,"inProceedingsof2005 International Symposium of Neural Networks, ser. LNCS 3497. Springer, 2005.

[6] X. Gu, J. Du, and X. Wang, "Leaf recognition based on the combination of wavelet transform and gaussian interpolation," in Proceedings of International Conference on Intelligent Computing 2005, ser. LNCS 3644. Springer, 2005.