Approach to Recognition and Classification of Occluded Leafs Based on Deep Learning Methods

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***Abstract* - Bio Diversity and Eco System are indivisible concepts where researches are profoundly influencing more on these compared to space technologies. Most of the species within biosphere, close to 90 percent, remain undiscovered. The species range from 3.6 million to around 100 million species. India is a large country suitable to living of variety of species and plants. Plants are food for variety of species and useful in treating humans and animals. From plants different type of food supplements can be derived and allopathic medicines can be prepared. Ayurveda is a part of Allopathy. To identify different type of leafs which are hidden and same in feature with other leafs can be identified and extracted based on the classification methods. Classification method can be support vector machine model and neural network classifier with the feature extraction using watershed algorithm. K-means segmentation is the centric identification method based on K-nearest neighbors is to be followed in this work. For feature extraction scanning an image, photograph of leaf, Scan type photograph of the leaf are the three different types of images are the input to the algorithm.**

1.INTRODUCTION:

Human vision is different from computer vision. A human eye can't hold all the things at a time in visionary. But Computer vision is to visualize the world by interpreting and analyzing the images and videos capturing from cameras and by applying deep learning methods, then identify and classifying the objects then it works appropriately ….there are various applications of image processing with deep learning methods such as disease diagnosis and treatment, processingdocument, processing video andrecognition of plant image so on.

Indian system of medicine of kerala is well known for Ayurveda treatment. Ayurvedic medicine is existing from more than 5000 years. The uncured diseases were cured by Ayurvedic medicine in place of surgery.In view of making this medicine available to world at reasonable price is a good and progressive work towards world health and peace. A healthy body is cause of healthy mind is a place of Holy god.

Manual identification of plants information has major problems such as scarcity of experts in treatment and analyzing from the existing plants may lead to disambiguate.

Treatment with medicinal plants is an old and traditional method with mankind. From this culture of Ayurveda, man earned to prepare drugs in barks, leafs, trunks, seeds of the plants. Medicinal plants can be plants, shrubs, and herbs, large or small trees. Medicinal plants' usage is a knowledge gain of the many years of great efforts against diseases

2. LITERATURE SURVEY:

Neohsu gathered more information about leaves in his work Identifying Tree Leaves Using Convolutional Neural Networks. The proposed model was a kind of deep learning model, which made great success in the field of image classification. Work provides a five-layer CNN model for leaf classification using Keras, a high-level neural networks API. The developed model can classify two species of tree leaves with a higher accuracy rate on the proposed test set. Many plant identification studies use CNN to identify different local traits of plants; these are fine-grained characteristics and organ characteristics.

A CNN-based model has been proposed for a fine categorization method in the field of plant identification, by Champ, Lorieul, Servajean, &Joly, 2015.

In addition, a pre-trained CNN system has been suggested for categorization of plants based on the method of classifying fine-grained characteristics; this system has been formed by millions of images of ordinary objects from ImageNet datasets by Sünderhauf, McCool, Upcroft and Perez, 2016.

N. Valliammal and S.N.Geethalakshmi., Proposed a computerized system for recognizing living plants based on information on leaf veins. N. Valliammal and S.N.Geethalakshmi., Used the preferential image. Segmentation methods (PIS) sing about mathematical morphologies for the automatic recognition of leaves and

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flowers. The image is encoded as small blocks of tree shapes representing an inherited tree, with each leaf node corresponding to a part of the image. Matching shape and curve is adopted for comparison and recognition of features.

Abdul kadir etc. All of them proposed a method using combined features such as polar Fourier transform, color moments and venous features to recover leaf images. The method is very useful for the recognition of leafy plants. The system has been tested on the Flavia and Folia leaf datasets. The extraction precision of 93.13% and 90.13% is observed for the Flavia and Folia datasets respectively.

Mahmood R. Golzarian and Ross A. Frick developed a method of classifying images of three grasses, namely wheat, ryegrass and bromine in the early stages of growth. A combination of color, texture and shape characteristics are used.

Minggang Du and Xianfeng Wang presented a method of recognizing plants based on images of leaves using linear discriminant analysis (LDA) and principal component analysis (PCA).

Xiaosong Wang et. al., have developed a method of tree image segmentation from a complex background. Based on the differences in visual characteristics of the tree and the surrounding objects, the trees of different backgrounds are separated into a single set of tree image pixels

3.METHODOLOGY

This study established a watershed algorithm implemented using the K-means segmentation of the mining tool. The model was formed by images taken from two different types of plants. This part presents the details of this proposed model and datasets for training and testing.

4. PROPOSED MODEL

Segmentation

The leaf images are taken into account after the plants are picked and under bright light, i.e. a cloudless day is chosen to capture images. Recognizing plants for the purpose of medicines, leaves play ankey role in plant identification. Any data acquisition, proper preprocessing tools are needed to avoid the noise when extracting the necessary information. Leaf images are captured from many directions as images from different perspectives will have many levels of noise, variations in light intensity levels and background area. Images are captured from a camera will cause noise due to movement of leafs and lens adjustment. The various parameters that affect the picture quality are low lighting, inappropriate background, low contrast, uncovered features, weather conditions and shadows, shadows.These problems can be rectified by applying preprocessing and post processing of images isrequired. Here the background chosen is black because shadows can be dimmed and not highlighted.hue is a best choice to select as background. Only the required image is highlighted.

Segmentation of the leaf image uses a self-adaptive tree-keeping technique to fix the region of interest. Since the leaves are predominantly green in color, color-based segmentation approaches are not suitable for leaves. Contour information thus chosen to identify the images of leaves of medicinal plants. Gray scale images are used instead of color images; they are not influenced by changes in lighting. Therefore, segmentation based on the fixed cut-off has resulted in over-segmentation due to changing ecological conditions. Inevitable changes in orientation and lighting are possible and therefore segmentation based on a single fixed threshold value is not appropriate. Therefore, a self-adapting threshold technique is engaged based on the intensity histogram.

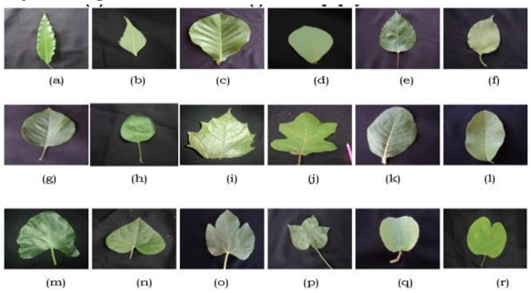

Fig: Images of sample sheets with different base and apex angles (a) Acute elliptical (b) Acute - Serrate (c) Obtuse - Obovale (d) Obtusetip - Obovale (e) Obtuse-Serrate (f) Obtuse - Acuminate (g) Obtuse - Circular (h) Circular-Whole (i) Obtuse-Tight (j) Obtuse-lobed (k) Obtuse Oblong (l) Obtuse-Whole (m) Large Obtuse-Cordate Wide Obtuse Whole (o) Large Obtuse -Lobed (p) Large Obtuse-Lobed (q) Large Obtuse Obcordate (r) Wide Obtuse

Procedure to find the threshold

Input: gray scale leaf images

Output: self-adaptive threshold value

From the gray scale indices of the pixels construct an intensity histogram.Identify the two or three major peaks corresponding to the object and the background.Obtain the pixel range between the two major peaks identified in step 2 and calculate the median of this range as the adaptive threshold continues for the next one so on and will stop.

Tilt correction and vertical position

Input: leaf image

Output: leaf image positioned vertically

Get the image of the leaf and convert it to a grayscale image.Select and apply the sobel operator and acquire the edges of the sheet image.Based on the connectivity, find the statistical properties of the binary image. Find the largest connected component. Draw the marquee and crop it. Find its major and minor axes. Draw the vertical line in the center of the image as a reference. Relative to the vertical axis Estimate the slope of the major axis. Estimate the tilt angle between the major axis and the vertical axis.Through the tilt angle in anti-clock, rotate the leaf image.

Color segmentation works fine only for primary colors and black background or any other recommended color on green. The stem and the soil are almost the same color in some plants. Therefore, trunk segmentation is not always able to identify with a color-based approach. Since the part of the stem in the herbs is green in color, so we used a scan line based algorithm to solve this problem. From Figure 3.4, it is identified that due to the irregular nature of the shrubs, a large number of .blobs will collect disconnected regions which are introduced during segmentation. In general, the segmentation accuracy will be affected when segmenting the trunk, stem, and canopy.

Segmentation depended on the transformation of watersheds

Watershed is a transformation on grayscale images. This technique consists of segmenting the image, generally when two regions of interest are close to each other, that is to say their edges touch. The watershed algorithm is applied to images of medicinal plants. By applying a Sobel operator, the magnitude of the gradient of the primary segmentation is obtained. We found false watershed ridge lines along the plant boundary. In order to reduce the number of false edges due to the irregular nature of the plant border [6], a threshold is imposed on the magnitude image of the gradient. Threshold obtained as a function of the variation in intensity of the pixels in the different regions.

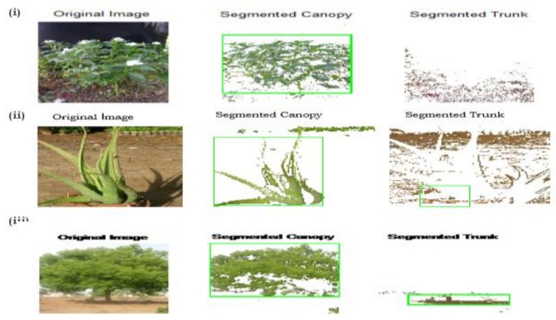

Fig: Segmentation based on color (i) Cathranthusroseus (Herb) (ii) Aloe barbadensis (Shrub) (iii) Azadirachitaindica (Tree) (Top to bottom) (a) Plant image (b) Segmented canopy
(c) Segmented rod

Given the small holes in the plant images, the segmentation of the watersheds has given way to the segmentation. In order to avoid over-segmentation and to control unnecessary false edges, a segmentation of the watersheds controlled by markers is applied. We observe that the transformation of the watershed of the plant image produces more false water ridges, which leads to over-segmentation. After seeing the results and a visual inspection, it is revealed that satisfactory results are obtained for the tree images. In the case of grass and shrub images, it produced many internal markers and faulty segmentations, which are not important for the segmentation of the work undertaken. These are avoided by providing an optimal threshold value for each class. Here we have adopted threshold values, namely 25, 40 and 55 respectively for trees, grasses and shrubs.

Classification depended on shape descriptor

In object recognition and image processing, Fourier descriptors useful for representing the boundary shape of a segment in an image. Fourier Descriptors (FDs) which are formed using four shape signature functions, namely centroid distance, complex coordinates, and cumulative angular curvature signature function, are the four important functions used to form the anticipatory neural network for the identification and classification of medicinal plants. For training, the back propagation algorithm is used. Shape entities are considered inputs. 0.15 is the value set for the error function. The figure of 0.9 is adopted as the learning rate. There are four numbers of neurons equal to the number of FDs in the input layer, and the output layer has three output nodes corresponding to the type of plant class. Depending on the configuration of each signature, a separate feedback network is assumed. Centroid distance and cumulative angular function are very sensitive to minor changes in the contours. This can be represented in the results, the results show that the classification using the FDs derived from the centroid distance and the signature of the cumulative angular function is significantly better than that using the FDs derived from the other two signatures. These characteristics are highly discriminated so that the classification of herbs, shrubs and trees is derived. Since the spectral model of grasses and tree species changes significantly, the accuracy of tree-based classification is better than grasses
and shrubs.

Fig: Accuracy depended on Fourier Descriptors

Classification depended on a texture descriptor

Every plant image is extracted with three views namely the texture descriptor, the Gabor descriptor and the plant class and frequencies and the resulting values are used as a feature vector. The classification accuracy of tree images using the gabor descriptor is better than that of shape descriptors. An improved classification rate of 84% is observed for the sample shrub images. It clearly follows that the Gabor texture characteristics are suitable for texture analysis of species of plant images.

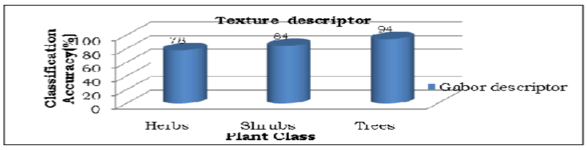

Fig: Accuracy depended on texture Descriptors

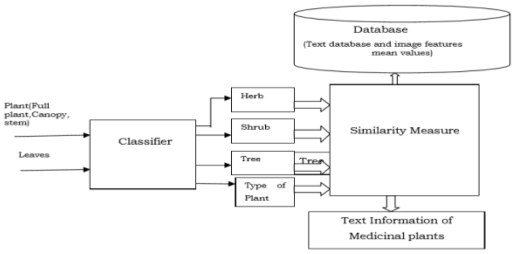

Fig: Block diagram

Classification depending on combined functionality of shape and texture

The results are also compared to the classification obtained using texture descriptors, shape descriptors and combined characteristics. The highest classification rate is considered in the case of the combined characteristics compared to the rest. An improvement on average of classification, accuracy is 4% observed in comparison to individual characteristics.

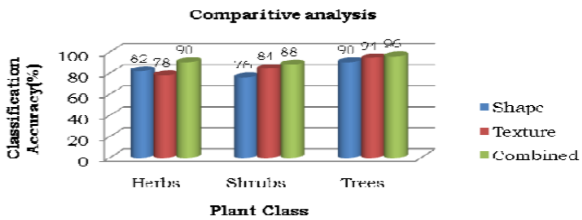

Fig: Benchmarking classification accuracy using combined functionality

1. RESULTS

Different types of Occluded plants are identified and recognized using watershed algorithm. Occluded leaves identified are also classified using texture and shape which yields 97.06% accuracy.

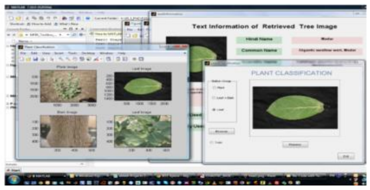

Fig:Sample interface for plant image retrieval

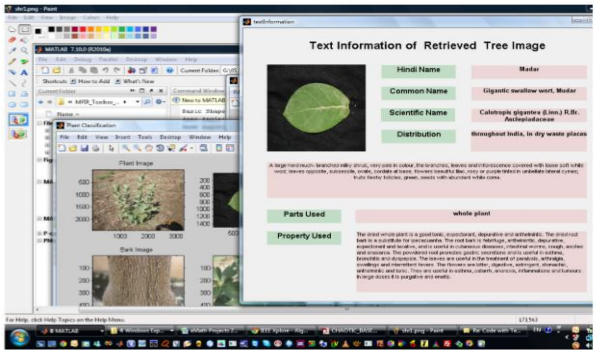

Fig : Sample interface for plant information retrieval

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