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Recognition of Ayurvedic Herbal Leaf Properties Using Image Processing and Convnet Algorithm

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ABSTRACT: Ayurveda is one of the oldest systems of Medicinal Science that is even used today. Plant systematics can be classified and recognized based on their reproductive system like Flowers and Leaf morphology. Neural Network is one of the most popular Deep Learning algorithms for plant leaf classification. Currently, there are many methods for classifying herbal plants based on leaf identification. Basically, the method of leaf identification is a visual comparison of images taken by a camera with a reference visual image. The commonly used Neural Networks are Artificial Neural Network (ANN), Probabilistic neural Network (PNN), Convolutional Neural Network (CNN), K–nearest neighbor (KNN), and Support Vector Machine (SVM), even some studies used combined techniques for accuracy improvement. This paper aims to identify herbal leaves using the artificial intelligence method i.e., the convolutional neural network (CNN) applied. The advantage of CNN is that it does not need feature extraction because it contains an automatic feature extraction process. In this project, there are 20 types of leaves from different herbal plants which are divided into two-third training data and one-third testing data. Texture analysis of the leaf images have been done in this using the feature computation. The results of the identification system using CNN will be validated with other data that are not included in training and testing. Furthermore, it will be tested with different types of leaves that are outside ten types of leaves in the experiment. The accuracy using this CNN method is above 90%. These results indicate that the CNN method is more accurate in herbal leaf.

KEYWORDS: Convolutional Neural Network (CNN), Deep Learning, Neural Network.

I. INTRODUCTION

Plants have many uses in industry, medicine, and foodstuff production. Recognizing plant species is an important process to obtain necessary raw materials from correct plants. Plant recognition is also important in environmental protection to correctly observe changes in plant species and population. However, recognizing plants is a difficult task and is generally done by human expert biologists. Designing automatic recognition systems for plants is useful, since it can facilitate fast classification of plants, and have applications in moany scientific and industrial fields. For instance, discovery of new species, plant resource surveys, population studies, and plant database management are demanding applications in biology, foodstuff, medicine, and agriculture. Automatic plant recognition may increase efficiency and speed in these fields, save time of human experts, and decrease cost of production stages. A computer-based plant classification system can use various characteristics of plants such as leaves, flowers, fruits, branching styles, and outlooks. An easier and accurate way is using leaves to identify plants. Since leaves are considered as important features to characterize plant species, many studies on leaf image retrieval based on shape, venation, color, and texture information have been conducted in computer-aided plant identification systems.

Image processing is a method to convert an image into digital form and perform some operations on it, in order to get an enhanced image or to extract some useful information from it. It is a type of signal dispensation in which input is image, like video frame or photograph and output may be image or characteristics associated with that image. Usually **Image Processing** system includes treating images as two dimensional signals while applying already set signal processing methods to them.It is among rapidly growing technologies today, with its applications in various aspects of a business. Image Processing forms core research area within engineering and computer science disciplines

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too.Image processing basically includes the following three steps.

- Importing the image with optical scanner or by digital photography.
- Analyzing and manipulating the image which includes data compression and image enhancement and spotting patterns that are not to human eyes like satellite photographs.
- Output is the last stage in which result can be altered image or report that is based on image analysis.

In this paper, we want to identify the herbal leaves using an deep learning method, the convolutional neural network (CNN). One of the advantages of this method is that there is no need for feature extraction because thereis an automatic feature extraction process. CNN is more efficient in the identification and classification process because CNN assumes input in the form of an image matrix. Leaf images of a plant will be processed in system in which Convolutional Neural Network (CNN) has been installed. The results of the identification process will be validated with other data excluded in training and testing as well as leaf data other than the type of leaf that is identified. This paper is expected to make it easier for people to find out the types of herbal plants and their medicinal uses and botanical name.

III. EXISTING SYSTEM

Leaf identification describes an optimal approach for feature extraction and selection for classification of leaves based on Genetic Algorithm (GA). The selection of the optimal features subset and the classification has become an important methodology in the field of Leaf classification. The deterministic feature sequence is extracted from the leaf images using GA technique, and these extracted features are further used to train the Support Vector Machine (SVM). GA is applied to optimize the features of color and boundary sequences, and to improve the overall generalization performance based on the matching accuracy. SVM is applied to produce the false positive and false negative features. Our experimental results indicate that the application of GA for feature subset selection using SVM as a classifier proves computationally effective and improves the accuracy compared to KNN to classify the leaf patterns.

A. Drawback

- It doesn't perform well when we have large data set because the required training time is higher.

IV. PROPOSED SYSTEM

In deep learning, a **convolutional neural network (CNN/ConvNet)** is a class of deep neural networks, most commonly applied to analyze visual imagery. Now when we think of a neural network, we think about matrix multiplications but that is not the case with ConvNet. It uses a special technique called Convolution. Now in mathematics **convolution** is a mathematical operation on two functions that produces a third function that expresses how the shape of one is modified by the other.

Deep Learning has proved to be a very powerful tool because of its ability to handle large amounts of data. The interest to use hidden layers has surpassed traditional techniques, especially in pattern recognition. One of the most popular deep neural networks is Convolutional Neural Networks. The proposed system is used to improve the accuracy.

Herbal leaf recognition using CNN algorithm. The features of leaf like correct shape, size, edges, etc. are extracted and trained. Herbal leaf is classified and its uses are predicted. This project proposes a recognition of ayurvedic herbal leaf properties using image processing and CNN algorithm.

V. SYSTEM REQUIREMENTS

A. Hardware Requirements

- CPU type : Intel Pentium 4
- Clock speed : 3.0 GHz
- Ram size : 512 MB
- Hard disk capacity : 40 GB
- Monitor type : 15 Inch color monitor
- Keyboard type : internet keyboard

B. Software Requirements

- Operating System : Windows OS

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- Language : Python 3.8
- Installation Software's : Python 3.8, Tensorflow,Page (for GUI)
- Platform : Spyder IDE

VI. SYSTEM IMPLEMENTATION

Module Split Up

- Image Acquisition
- Image Pre-Processing
- Feature Extraction
- Training data
- Herbal leaf classification

B. Modules Description

Image Acquisition: Image acquisition is the action of retrieving an image from a source, usually hardware systems like cameras, sensors, etc. It is the first and the most important step in the workflow sequence because, without an image, no actual processing is possible by the system. The image that is acquired by the system is usually completely unprocessed.

Image Pre-Processing: In this module, we can implement preprocessing techniques to convert RGB image to gray image and remove the noises from images. The goal of preprocessing is

- Enhance the visual appearance of images.
- Improve the manipulation of datasets.

Using image resampling to reduce or increase the number of pixels of the dataset and improve the visualization by brightening the dataset. The first step in this process is to convert the acquired color image to a grayscale image. Following this, image segmentation is performed to identify leaf pixels and background pixels. After holes have been closed and small regions removed, the segmented image is converted to binary and the interior of the leaf is subtracted, leaving an image of the leaf's outline contour.

Feature Extraction: The LBP (Local Binary Patterns) approach is used to extract features. LBP is used to store information on the shape and texture of the leaf. Feature extraction is the process of determining the brightness of a leaf image using grayscale, the illuminance of a leaf image using the leaf color, contour, texture, and shape were used to classify plants. Leaf texture analysis consists of the application of common image texture analysis techniques to leaf images in plant classification systems.

Training data: For the database, we need to collect the herbal leaf images .We need to store the data in the form of separate folders as training , testing , single prediction . In each folder we need to store the data in the form of separate folders distinguishing each leaves from others. Next, we need at least 20 to 30 image of each leaves , for getting higher percentage of accuracy we need to collect more than 1000 images of each leaf and meet the purpose we are doing in this project.

Herbal leaf classification: In a CNN, the convolution and pooling layers replicate the LGN to V3 paths in the visual system structure, and extract feature points from the image. The fully connected layer acts in the same way as the LOC in a human visual system to recognize the image. As shown in Figure 6.5.1 , the CNN structure extracts features by performing the convolution operation on the input image, extracts the maximum or average feature values on the pooling layer, and then classifies them in the fully connected layer.

VII. CONCLUSION

Twenty types of herbal leaves will be identified using the convolutional neural network (CNN) model. By using CNN, there is no need to do feature extraction because there is already an automatic feature extraction process. From the results of tests carried out, the level of accuracy using this CNN model is above 90%. The accuracy is influenced by the amount of data as well as epochs in training. Hence, the CNN method is more accurate in herbal leaf identification. In the result we provided the medicinal uses of the leaves and their botanical name and important note whether the

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pregnant ladies can use it or not. Our system is very fast , it gives the result instantly.

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