Pattern Recognition Of Medicinal Leaves Using Image Processing Techniques

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Abstract: Medicinal leaves have been widely used in medicine, Pharastastic and Cosmetic industry. Knowing of the medicinal leaves are very critical in the futures. Nevertheless, the current way of identification and determination of the type of medicinal leaves is still being done manually and prone to human error. Leaves species is essential since this will improve medicinal species classification efficiency. In this paper the recognition approach identifies the shape and texture features of the medicinal leaves. In this paper MATLAB is used. First, we extract certain features from the inputted leaf images, later using different methods like thresholding, segmentation. After preprocessing the image data are applied to Neural Network. And compared with several trained databases. Thus this paper analysis the medicinal leaves with a successfully using image processing.

Keywords: Medicinal leaves, MATLAB, Thresolding, Segmentation, Preprocessing, Neural Network and Trained databases.

Introduction

India is an agriculture developing country with people working in this agriculture area. Number of persons work for Siddha, Ayurvedha and herbal based industry in food, medicine and cosmetics. They are required to detect and identify different kind of agriculture plants and herbs. Medicinal leaves are one of the most important part in the human life. Leaves recognition is very demanding in biology and agriculture as leads to new plant discovery. This paper aim’s to identify the leaf recognition using MATLAB. The different medicinal leaves are collected and capture using 16.0 Megapixels resolution digital camera and it is stored with JPEG format. The analyses of the medicinal leaves are done by using the image processing technique in MATLAB.

This project focus on recognition approach to the shape features of the different types of leaves.

The analysis of different leaves data’s using SPSS software. Because it is easy to analyze trained of the target output and then automatically created the Neural Network . The efficiency and effectiveness of the proposed method in recognizing and identifying the different leaves is demonstrated.

Methodology

Step1: Leaf preparation: The required medicinal leaves are collected [1], and capture using 16.0 Megapixels digital camera.

Step2: The obtained input images are stored in MATLAB in the form of JPEG format.

Step3: A programme is written and loaded in the MATLAB. The conversion process for the input images.

Step4: After executing the programme its images were obtained.

Step 5: The image data’s were coped and pasted in SPS software (Statistical Package for the Social Sciences).

Fig.1. The medicinal leaves image recognition process
Preprocessing

The image acquisition is done using a digital camera and it is loaded and saved using JPEG format in the current directory. Fig.1. MATH works to the images captured from any type of color or monochrome source. It supports file formats such as TIF (TIFF), JPG (JPEG), BMP (bitmap), as well as raw format

RGB Convert to Grayscale image

RGB is one of the formats of color images. Its our input images Fig.a. The image is basically green this is affected the color due to various changes in Water, Nutrients and Climate. So that color characteristic has low reliability. The image color information may be removed

Grayscale images Fig.b are distinct from one-bit bi-tonal black-and-white images, which in the context of computer imaging are images with only the two colors, black, and white (also called bi-level or binary images). Grayscale images have many shades of gray in between. Grayscale images are also called monochromatic, denoting the presence of only one (mono) color (chrome).

Grayscale images are often the result of measuring the intensity of light at each pixel in a single band of the electromagnetic spectrum (e.g. infrared, visible light, ultraviolet, etc.), and in such cases they are monochromatic proper when only a given frequency is captured. But also they can be synthesized from a full color image; about converting to grayscale.

Grayscale image Convert to Binary image

A Binary Image is a digital image that has only two possible values for each pixel. Fig.c Typically the two colors used for a binary image are black and white though two colors can be used. The color used for the object(s) in the image is the foreground color while the rest of the image is the background color. In the document scanning industry this is often referred to as bi-tonal. Binary images are also called bi-level or two-level. This means that each pixel is stored as a single bit (0 or 1). The names black-and-white, monochrome or monochromatic are often used for this concept, but may also designate any images that have only one sample per pixel, such as grayscale images. In Photoshop parlance, a binary image is the same as an image in "Bitmap" mode.

Binary images often arise in digital image processing as masks or as the result of certain operations such as segmentation, thresholding, and dithering. Some input/output devices, such as laser printers, fax machines, and bi-level computer displays, can only handle bi-level images.
The purpose of smoothing is to reduce noise and improve the visual quality of the image. Often, smoothing is referred to as filtering. There are different types of filtering in image processing.

**Filtering**

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**Segmentation**

The purpose of image segmentation is to partition an image into meaningful regions with respect to a particular application. The segmentation is based on measurements taken from the image and might be grey level, colour, texture, depth or motion. Here the suitable segmentation method used for my project is Edge based segmentation. An edge based segmentation approach can be used to avoid a bias in the size of the segmented object without using a complex thresholding scheme. Edge-based segmentation is based on the fact that the position of an edge is given by an extreme of the first-order derivative or a zero crossing in the second-order derivative. As edge detection is a fundamental step in image processing, it is necessary to point out the true edges to get the best results from the matching process. That is why it is important to choose edge detectors that fit best to the application. In this way I have chose canny edge detector. Canny edge detection algorithm is also known as the optimal edge detector. Cranny’s intentions were to enhance the many edge detectors in the image [4]. Based on these criteria, the canny edge detector first smooths the image to eliminate noise. It then finds the image gradient to highlight regions with high spatial derivatives Fig.e. The algorithm then tracks along these regions and suppresses any pixel that is not at the maximum using non-maximum suppression. The gradient array is now further reduced by hysteresis to remove streaking and thinning the edges.
The pixel gradient direction is computed from the pixel gradient \( G_x \) and \( G_y \) using the following equation:

\[
\varphi = \tan^{-1}(G_y / G_x)
\]

Morphological Processing

The word morphology commonly denotes a branch of Biology that deals with the form and structure of animals and plants. This Morphological process is very useful for representation and region shapes description such as boundaries, skeletons and convex hull [1].

Here using the Morphological Algorithm for Skeletonization operation. The skeleton of A can be expressed in terms of erosions and openings.

\[
S(A) = \bigcup_{K=0}^{\infty} S_k(A)
\]

![Skeleton images](image)

**Fig. (f).** Skeleton images

Neural Network

The neural network is widely used in pattern recognition kingdom as an effective classifier. Since the development of the back-propagation method, many algorithms have been proposed and used to train neural networks. From the menus choose in SPSS software. Analyze \( \rightarrow \) Neural Networks \( \rightarrow \)

![Multilayer Perceptions](image)

**Fig. (g).** Automatically created the Neural Network.

Some example of leaf matching percentages.

Result and discussions

An individual leaf extraction computer program was developed based on grayscale, canny detector and Neural Network algorithm. After morphological processing the image data are applied to Neural Network. That should be compared with several leaf data trained in the neural network. The pattern recognition for different kinds of medicinal leaves data's was realized and the recognition rate shown in Tables. This paper innovatively uses the medicinal leaf image database as a textural. Here shown the table 1 The recognition rates using Neural Network.

Hibiscus Leaf data’s are compared match with the Hibiscus, Betel, Castor and manathakali.

<table>
<thead>
<tr>
<th>TABLE 1. The recognition rates</th>
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<tbody>
<tr>
<td>Betel</td>
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<tr>
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<tr>
<td>66.8%</td>
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<td>70.6%</td>
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<td>69.4%</td>
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<td>65.3%</td>
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<td>71.5%</td>
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<tr>
<td>74.3%</td>
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<tr>
<td>69.1%</td>
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<tr>
<td>Total%</td>
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Conclusions
This paper capable of recognize medicinal leaf identification. A novel individual leaf extraction computer program was developed based on grayscale, canny edge detector, morphological and neural network algorithm. With the use of computer, medicinal leaves plant becomes more convenient, and efficient. By using the rapid recognition for different medicinal leaves was realized and the recognition rate reached as shown in Tables. The training set.

References


