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LDA Based Tea Leaf Classification on the Basis of Shape, Color and Texture

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Abstract :- **Background/Objectives**: The present paper shows a model of leaf segmentation for tea leaf, it seems to be a promising and feasible approach to perform the task of detecting arbitrary shapes in a tea leaf image with a minimum prior. The performance for given image samples is satisfying. **Methods/Statistical analysis**: Traditional models were very easy to use in but they did not detect boundaries very accurately. On the other hand proposed algorithm is able to detect boundaries well and will be enhanced with image blending to prove the effectiveness of the technique in real applications. **Findings**: The results have been displayed in the result section with comparison to previous system in terms of area, time and efficiency. **Improvements/Applications**: In the proposed LDA system accuracy has been improved.

Keywords: Segmentation, LDA, GA, SVM, RGB

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1. Introduction

Natural images consist of an overwhelming number of visual patterns generated by very diverse stochastic processes in nature. The objective of image understanding is to parse an input image into its constituent patterns. This can be done by image segmentation. Image segmentation mainly deals with distinguishing objects from its background. It is one of the most important elements in automated image analysis because objects or other entities of interest are extracted from an image for subsequent processing, such as description and recognition. Basically the segmentation is also a process of pixel classification: the picture is segmented into subsets by assigning the individual pixel values to classes. The result may be going into a classification process which assigns some further properties to the previously defined segments.

Segmentation subdivides [1] an image into its constituent regions or objects. Segmentation is a process of grouping together pixels that have similar attributes. Image Segmentation is the process of partitioning an image into non-intersecting regions such that each region is homogeneous and the union of no two adjacent regions is homogeneous. Segmentation is typically associated with pattern recognition problems. It is considered the first phase of a pattern recognition process and is sometimes also referred to as object isolation. Segmentation of images is a difficult task in image processing and is still under research.

Digitized pictures more often than not experience the ill effects of poor picture quality, especially absence of contrast and vicinity of shading and artifacts, because of the lacks in focusing, lighting, specimen staining and different components. Since a few components are not really perceptible by eye in a picture, we frequently transform pictures before display. Image enhancement is a digital processing system which does its best to enhance picture vision and makes the picture adjust to be prepared by PC. As well, the requirement for contrast enhancement additionally emerges from the way that current softcopy display gadgets, are unequipped for showing the greatest number of distinctive detectable levels of luminance as can be recorded in a computerized picture [2]. It truly enhances some data inside the picture specifically and limits alternate ones. Thusly, it is anything but difficult to identify and perceive helpful data. It generally yields acceptable results if the best possible procedure is chosen for a given application alongside the correct handling parameters.

Image enhancement procedure comprises of a gathering of strategies that look to enhance the visual appearance of a picture or to change over the picture to a structure more qualified for investigation by a human or machine [3]. The central goal of image enhancement is to alter credits of a picture to make it more suitable for a given undertaking and a particular spectator. Amid this procedure, one or more characteristics of the picture are adjusted.

2. Literature Review

Er. Sachin Bharti[1] proposed watershed technique for Image segmentation. There are a number of techniques for doing the image segmentation, but the watershed image segmentation technique is the latest one. It is easy to use, but there is a major drawback of over- segmentation. This problem may or may not appear in the case of simple images, which are not high definition, but mostly it appears in the case of high definition images. The goal of this paper is to resolve the problem of over-segmentation. This can be done by reducing the size of the image first and then reducing the noise of the reduced size image. This can be verified by comparing the PSNR (Peak Signal to Noise Ratio) value of the traditional watershed algorithm to the improved watershed algorithm.

Jyotismita Chaki et.al[2] proposed an approach for the recognition of plants from their digital leaf images using multiple visual features to handle heterogeneous plant types. Recognizing the fact that plant leaves can have a variety of recognizable features like color (green and non-green) and shape (simple and compound) and texture (vein structure patterns), a single set of features may not be efficient enough for complete recognition of heterogeneous plant types. Accordingly a layered architecture is proposed where each layer handles a specific type of visual characteristics using its own set of features to create a customized data model. Features from various layers are subsequently fed to an array of custom classifiers for a more robust recognition. In this work enumerate is done on the color and shape layers only. A dataset involving 600 leaf images divided over 30 classes and including green, non-green, and simple and compound leaves, is used to test the performance and effectiveness of the approach.

Savita N. et al.[3] examined different order strategies for plant leaf sicknesses. Each example of unmistakable classes is grouped in order method in light of their morphological elements. Different strategies, for example, Artificial neural system, Probabilistic Neural Network, Genetic Algorithm, k-Nearest Neighbor, Principal Component Analysis and Fuzzy rationale. It is a troublesome errand to choose an order strategy in light of the fact that each arrangement strategies have its own particular impediment and favorable position. This review work settles which characterization technique is reasonable for a specific application. K-Nearest-Neighbor strategy is one of the least complex calculations to test classes yet it is exceptionally time complex with making expectations. Neural systems have capacity to endure uproarious info however having hard to comprehend calculation structure. For ordering high-dimensional informational index SVM (Support Vector Machine) observed to be the best accessible machine learning calculation.

Subodh Kumar et.al[4] describes about the image segmentation techniques using edge detection based on the sobel edge operator and discusses the edge detection techniques of sobel edge operator and their evaluation. It gives an algorithm which is a combination of detection and evaluation of the edge detectors of the segmentation. The results show that the edge detection in the matlab and the simulation waveform implemented in the model sum .The fpga based architecture is good and stable techniques for the edge detection.

Poonam Dhankhar et.al[5] presents a review of various approaches for image segmentation based on edge detection techniques. The study of different Edge detection techniques and their experimental results shows that canny yield best results. In this work an attempt is made to review the edge detection techniques which based on discontinuity intensity levels. The relative performance of various edge detection techniques is carried out with an image by using MATLAB software. It is observed from the results Log and Canny edge detectors produce almost same edge map. Canny result is superior one when compared to all for a selected image since different edge detections work better under different conditions.

3. Proposed Work

The basic mechanism of the proposed algorithm consists of the user or a higher-level image descriptor based on LDA process initializing any arbitrary shaped closed area to the object boundary features of the image to be detected. The algorithm proceeds and starts deforming trying to minimize its error function at every step. One can interpret the selective area framework that the proposed algorithm represents a top-down, rather than a bottom-up, approach to image segmentation problem. The prior can be interpreted in terms of the initialization of the contour close to the desired boundary, which is used as an input to start the algorithm.

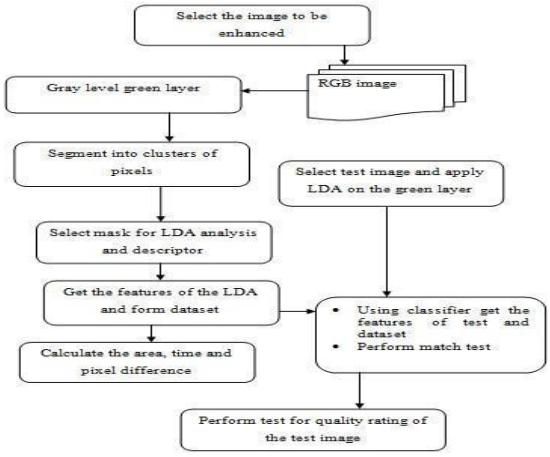

Figure 1. Proposed System

Figure1 shows the flow chart of proposed system which proceeds as follows:

- Select the target image and import to MATLAB.
- Separate the image layers to form three different images after de noising.

- Create gray level copy of the RGB image by separating the green layer.
- For all the layers extract the effective segmented pixels with the gray converted image and map the LDA on the mask of image.
- Merge the segmented image with contour mapping.
- Derive the obtained image into a secondary filtering, based on block processing and find the area of leaf.
- Deduce the Independent LDA features details of the image using descriptor Frequencies.
- Do this for each image of modified RGB image and store coefficients of the image blocks in dataset.

- Select the image for test and match the features with stored features.
- Match the image with previous and find the grade of the tea leaf image.
- Evaluation with efficiency, area and time calculation.

4. Results and Implementation

For the proposed system segmentation is applied**.** Total 11 images are taken from the internet database and stored as the back end dataset in laptop. The entire testing is done on the Matlab R2013b platform and the laptop of 2.40 Ghz Processor and 4 GB RAM is used to run the prototype model.

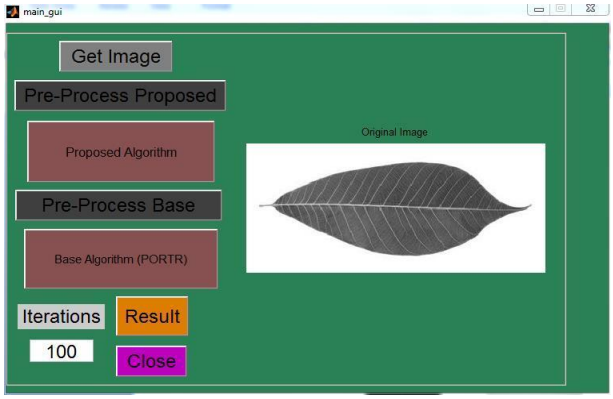

Figure 2. Main GUI of the Software

Figure 2 shows the main GUI window of the matlab view, it displays the button interface and output window with variable options to tune the filter and display the results.

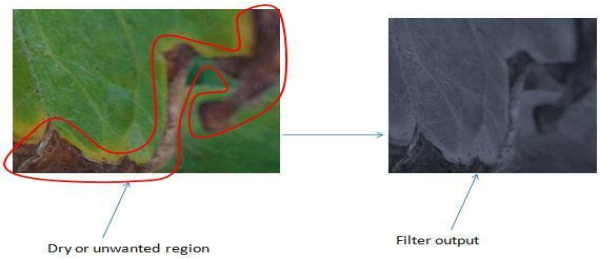

Figure 3. The main region bounding of the selected leaf part

Figure 3 displays the output of the region bounding and segmentation filter, it also shows the actual gray level mask of the green layer.

Figure 4. Output of the Pre-processing and Initial Segmentation of Green Layer Using GA

Figure 4 displays the output of the pre-processing and initial segmentation of green layer.

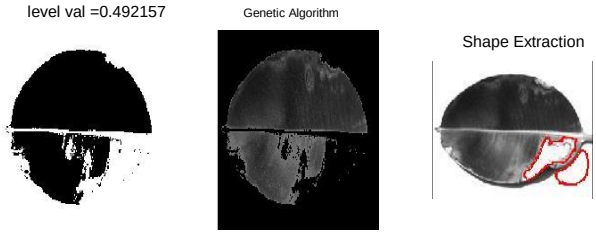

Figure 5. Output of the Clustered Region and Final Segmented Region of the Leaf Green Layer**.**

Figure 5 shows the output of the clustered region and final segmented region of the leaf green layer.

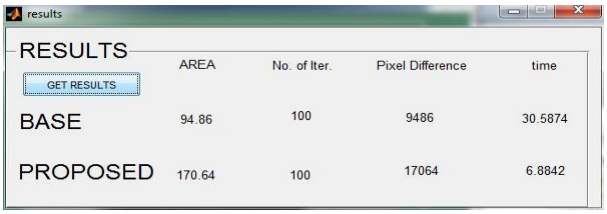

Figure 6. Comparison of the base and proposed system in terms of area, iterations, pixel difference and the total time consumption

Figure 6 displays the comparison of the base system and the proposed system.

5. Conclusion

The proposed model seems to be a promising and feasible approach to perform the task of detecting arbitrary shapes in an image with a minimum prior. The performance for given image samples is satisfying. Traditional models were very easy to use in but they did not detect boundaries very accurately. On the other hand proposed algorithm is able to detect boundaries well and will be enhanced with image blending to prove the effectiveness of the technique in real applications.

The LDA based shape, color and texture detection in image gave results as expected; indicates its high quality after the segmentation and classification process is performed. In the formal way, the final step classifies the image with the area, pixel difference and the accuracy of the system. In conclusion, the prototype segmentation and classification procedure

and the novel segmentation and classification procedure indicates that proceeding with other frequency filters like the Haar or DFT in future may provide high segmentation and classification resolution and will improve the effective boundary of segmentation

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