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A Review on Flower Classification Using Neural Network Classifier

Archana L. Lakesar

Assistant Professor, E&TC Department, ADCET, Ashta, Maharashtra, India
E-mail: all_etc[at]adcet.in

Abstract: ***Image processing plays an important role in extracting useful information from images. However, the process of translating an image into a statistical distribution of low-level features is not an easy task. These tasks are complicated since the acquired image data often noisy and target objects are influenced by lighting, intensity or illumination. In this paper we have present literature survey of various methods for classification of flowers using Artificial Neural Network (ANN) classifier. The proposed method is based on textural features such as Gray level co-occurrence matrix (GLCM), discrete wavelet transform (DWT) and Color features such as normalized color histogram. A flower image is segmented using a threshold based method. The database has different flower images with similar appearance.***

Keywords: Feature extraction, flower classification, neural network, GLCM, DWT

1. Introduction

Image classification gives a lot of contribution in organizing image databases efficiently. It categorizes images into semantic categories based on the available data. This categorization is useful in most of the applications such as image retrieval [1]-[3], digital library and search engine which queries images based on text or keywords.

In this study, the flower classification was performed using neural network. As neural network (NN) was designed with the goal of building 'intelligent machines' to solve complex problems, such as pattern recognition and classification, NN plays an increasingly significant role in the process of classification. In addition, neural networks can be trained to classify arbitrarily complex and difficult to learn datasets such as flower images. Thus, NNs are valuable tools to find solutions for dataset with an unknown or complex statistical distribution.

Flower classification has various applications, as it can be helpful in flower searching for patent analysis and in floriculture. The floriculture industry consists of flower trade means selling and buying flowers, bulb and seed production, nursery and potted plants and extraction of essential oil from flowers. In above cases, automation of the classification of flower is necessary [4].

2. Literature Review

Here, we have presented the review of flower classification & methods to classify the flower images.

1] Dr. S. M. Mukane et.al [4] proposed Flower Classification Using Neural Network Based Image Processing. In this paper, it is proposed to have a method for classification of flowers using Artificial Neural Network (ANN) classifier. The proposed method is based on textural features such as Gray level co-occurrence matrix (GLCM) and discrete wavelet transform (DWT).The ANN has been trained by 50 samples to classify 5 classes of flowers and achieved classification accuracy more than 85% using GLCM features only. Feature database is created using wavelet decomposed sub bands up to forth level of decomposition. Experimentation has been conducted on databases of 50 images and 5 classes. The classification accuracy under ANN classifier has been investigated. As compared with all classes GLCM features shows highest result while combination of DWT and GLCM shows less success rate. Hence it is found that flower images can be classified easily with the GLCM features only. Only gray level features have been used. The neural network is trained using the back propagation algorithm. Own database of flowers of 5 classes, each containing 10 flower images has been created. It has been found that MLP offers accuracy 87% with GLCM features.

2] Fadzilah Siraj et al [5] proposed the system for classification of Malaysian blooming flower. In this paper they present the application of NN and on image processing particularly for understanding flower image features. For predictive analysis, they have used two techniques namely, Neural Network (NN) and Logistic regression. The study shows that NN obtains the higher percentage of accuracy among two techniques. The Otsu's method was applied in order to compute a global threshold. The image is then converted to RGB color space again. In color extraction, the images were transformed from RGB color space to HSV color space the image texture is calculated based on gray-level co-occurrence matrix (GLCM) to obtain the contrast, correlation, energy and homogeneity of the image. The prediction accuracy of logistic regression is 26.8%. Therefore based on 1800 samples of Malaysian flower images, NN has shown a higher average prediction results vs. logistic regression. However this paper cannot present recognition of flower type, its only recognize flower features so in future studies can be focused on developed flower model system which can recognize Malaysian blooming flower or extending the dataset built and Verities sample of images can be captured for different flowers and recognize their types.

[3] Yuita Arum Sari et al [6] proposed Flower Classification using Combined a* b* Color and Fractal

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based Texture Feature. This research proposes a new method of flower classification system using combination of color and texture features. The first phase is getting the crown of the flower, which is localized from a flower image by using pillbox filtering and OTSU's thresholding. The color features are extracted by removing L channel in L*a*b* color space, and taking only a* and b* channel, because of ignoring different lighting condition in flower image. The texture features are extracted by Segmentation-based Fractal Texture Analysis (SFTA). Classification is done using KNN classifier.KNN classifier is used to assess similarity among image flowers. Cosine measure outperforms to all distance measures under k =9. The combined a*b* features and texture gives the better performance when using cosine measure, than using L* color channel when combined with texture feature. The flower classification achieves the best result with accuracy 73.63%. Comparing the color feature extraction, the accuracy of texture feature is better to stand alone, and help the performance to achieve the accuracy when all features combined with combined a*b*color and texture feature. In this paper, the accuracy will be poor if the color feature extraction independently used for classifying flower. Removing L, give the bad result for color feature performance when the feature classifies in stand-alone.

3. Proposed Work

The proposed method has training and classification phases. In the training phase, from a given set of training images (segmented) the texture features (DWT and GLCM) is extracted. This extracted texture features are used to train the system using a Multilayer Perceptron Neural Network. In the classification phase first all the flowers is segmented from test image set and then texture features are extracted. These features are queried to the Multilayer Perceptron neural network to know the flower class. The block diagram of the proposed method is given in Figure 1. The first step in flower classification is to segment the flower image. In this step from flower image remove the unwanted background region. Flowers in images are generally surrounded by greenery in the background.

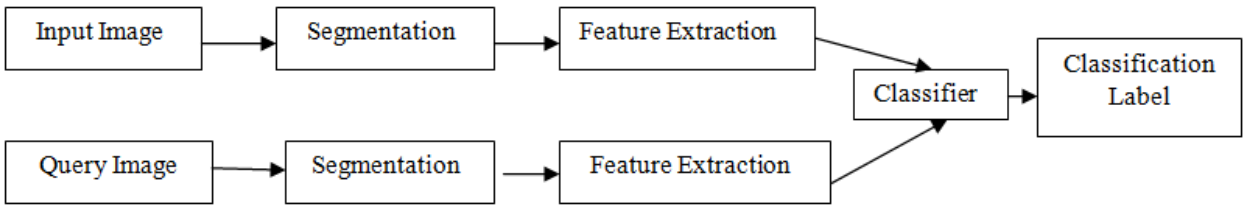

Figure 1: Block diagram of the proposed work

Figure 2: Segmentation result (a) Input images and (b) segmented images.

In order to avoid matching the green background region, rather than the desired foreground region, the image has to be segmented. To segment the flower image, we use a semi-automated threshold-based segmentation algorithm. Figure 2 shows the results of flower segmentation using the threshold-based method on a few sets of images with a cluttered background.

A] Feature extraction techniques:

1] DWT: Traditionally, Fourier transforms have been utilized for signal analysis & reconstruction. However, Fourier transform does not include any local information about the original signal. Therefore, Short Time Fourier Transform (STFT or Gabor transform) has been introduced, which uniformly samples the time-frequency plane. Unlike the STFT which has a constant resolution at d times and frequencies, the wavelet transform has a good time and poor frequency resolution at high frequencies, and good frequency and poor time resolution at low frequencies. In JPEG2000, Discrete Wavelet Transform is used as a core technology to compress still images. The DWT has been introduced as a highly efficient and flexible method for sub band decomposition of signals. The two dimensional DWT (2D-DWT) is nowadays established as a key operation in image processing.

2] GLCM: Texture feature calculations use the contents of the GLCM to give a measure of the variation in intensity at a pixel of interest. Co-occurrence texture features are extracted from an image in two steps. First, the pair wise spatial co-occurrences of pixels separated by a particular angle and distance are tabulated using a gray level co-occurrence matrix (GLCM). Second, the GLCM is used to

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compute a set of scalar quantities that characterize different aspects of the underlying texture. The GLCM is a tabulation of how often different combinations of gray levels co-occur in an image or image section.

B] Flower Classification: Artificial neural network (ANN) as a classifier has been used. An Artificial Neural Network (ANN) is an information-processing paradigm that is inspired by the way biological nervous systems, such as the brain, process information. The MLP and many other neural networks learn using an algorithm called back propagation. With back propagation, the input data is repeatedly presented to the neural network. With each presentation the output of the neural network is compared to the desired output and an error is computed. This error is then fed back (back propagated) to the neural network and used to adjust the weights such that the error decreases with each iteration and the neural model gets closer and closer to producing the desired output. Performance of the above feature sets is tested with the help of a MLP classifier in terms of Success rate. Let PT be the no. of samples to be tested and out of that the system correctly classifies is PC then percentage is given as: Pr=PC/PT*100.

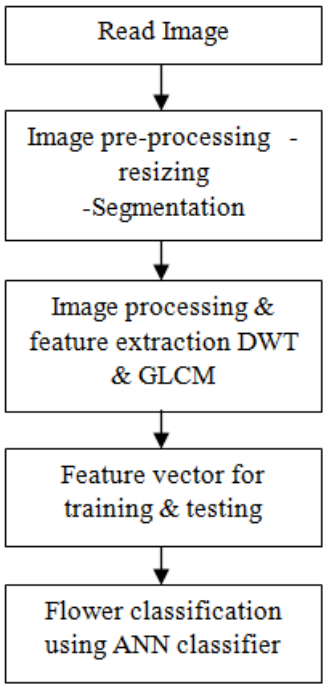

Figure 3: Flowchart for Flower Classification

4. Conclusion

Image processing technique plays an important role in the flower classification. The use of a neural network classifier for flower classification using DWT and GLCM has been demonstrated. Only gray level features have been used. The neural network is trained using the back propagation algorithm. Classifiers plays important role to test the data and check the accuracy of classification algorithm. To identify different flower images based on its surface parameter is challenging and most expensive task. Flower image surface parameters are color and texture. The combined feature extracted from each of its parameter is used to identify flower type and gives better result as compare to using single parameter.

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