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Segmentation and Feature Extraction of Flowers Intended for Image Retrieval : A survey

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Abstract— **Flower image retrieval is a very important step for computer-aided plant species identification. The paper elaborates the segmentation technique and feature extraction schema proposed by different authors. Firstly the flower area is extracted from the background image using OTSU thresholding, then the Improved Itti Model is used to extract the features like color, texture, shape. Otsu algorithm can obtain satisfactory segmentation results when it is applied to the noisy images. We use the histogram intersection distance to measure the similarity between the different images.To show the degree of similarity between two images extracted features of query image and target image are recorded. Finally, classification contains the database and does the comparison of flowers under the same category.**

Index Terms— **segmentation, OTSU thersholding, feature extraction schema, CBIR, Improved Itti Model.**

I. INTRODUCTION

With the development of computer science, image processing techniques also used to assist botanist in the plant image analysis. In particular, indexing the content of this image should allow the automatic classification and recognition of the plant, according to their visual form [1][2][3]. A region based feature are used to propose a new method [4] Chia-Ling Lee and Shu-Yuan Chen invoke the problem of leaf classification. features are include compactness, aspect ratio, centroid and horizontal/vertical projections.

To build the system, leaf image retrieval consider the shape and venation features [5]. segmentation algorithm is used based on color classification and the domain knowledge[6]. In fact, the flowers are rarely green, black, gray or brown and the background usually occupies the border of the image.Using an iterative algorithm-driven by domain knowledge the segmentation has been developed [7]. In the case of false assumption a relevance feedback schema is used to correct the segmentation. For the flower region extraction, the RGB color space is quantified and then converted to a color name space.

The segmentation algorithm used graph-based method [8] to get the general structure of plants. where the nodes present the pixels of the image and the arcs correspond to the neighborhood relations between pixels. maximum flow / minimum cut technique is applied to separate the plant and the background. It requires a manual selection of seeds presenting the plant and the background.

Flower segmentation algorithm based on the minimization of Markov Random Fields (MRF) using graph-cuts[9]. First, a general color distribution is computed using the ground truth. Then, a specific distribution to each image is attuned iteratively through a learning process.

Some models are explain the petal structure. This model is tolerant to viewpoint changes and petal deformations and it is applicable to many flower classes. Although, cited works give good results, sometimes they have shortcomings. Some works are based on the domain knowledge [1,2]. Other works are based on the interactivity with the user [2,4] or exploit the ground truth to initialize the segmentation process [5].

There are two kinds of technologies: text-based image retrieval and content based image retrieval, CBIR. In the text-based approach, images are usually manually searched by text descriptors. Its greatest advantage is that when images are recorded correctly, good search results can be achieved.

This approach has some limitations. The first is that a considerable amount of human labor for manual annotation is required. The second entry is inaccurate due to the subjectivity of human perception. To overcome the drawbacks of text-based retrieval of images, CBIR was introduced and has become the predominant technology.

The fundamental difference between content-based and text-based retrieval systems is that the human interaction is an indispensable part of the latter system. Humans tend to use high- level features (concepts), such as keywords, text descriptors, to interpret images and measure their similarity. While the features automatically extracted using computer vision techniques are mostly low-level features (color, texture, shape, spatial layout, etc.). In general, there is no direct link between the high-level concepts and the low-level features [18].

Content-based image retrieval has become a research hotspot, but the research on flower image retrieval is less. Some of the main research results come from the VGG group [14][15] of Oxford University. They divided the flower image retrieval tasks into several steps: Image segmentation for flower area extraction, Feature extraction, Feature fusion, Image retrieval

When the segmentation result is unfortunate the information will be lost more. While regarding the flower images with complex background consisting of the weeds ,mud and leaves, even more factors such as the mutual projection between flowers and leaves under illumination, all these will reduce the segmentation accuracy of flower region. So,to enhance the adaptability of algorithm and to avoid the conventional image segmentation for complex images Itti et al. model put forward a classic visual attention model, which

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describes various features (such as color,shape, brightness etc) that are extracted from the image.

Images are grouped as "single flower" images with the other as "many flowers" images. The first group contain images with a single flower whereas the second group represents images with many or bunch of flowers. Grouping is done to understand which features represent best flower image groups, the experiments are conducted selectively with each feature extraction method. Because of conducting experiments with the single features, which gives the most distinguished results for prominent features using the CSS shape descriptor for self-adaptive feature extraction [16].

Thus, it is a family of techniques used to retrieving of the flower image by segmentation and feature extraction schema. It achieves good segmentation techniques on a variety of challenging images.

Fig. 1 shows main three parts taken into consideration for flower image retrieval, which include the segmentation, feature extraction & classification.

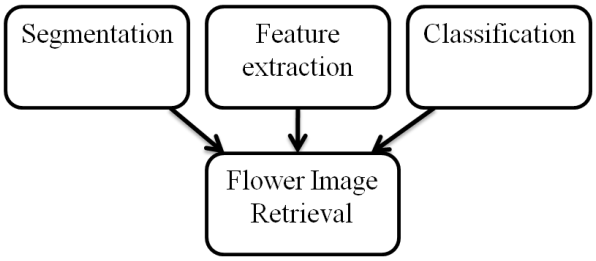

Fig.1. Flower Image Retrieval

The rest of the paper is organized as follows: In next Section II, different techniques used for segmentation are discussed. Section III describes the various methods to be considered for the feature extraction schema and classification of the flower image. Finally, Section IV concludes the paper.

II. SEGMENTATION TECHNIQUES

Segmentation subdivides an image into its constituent region or object. Image segmentation methods are categorized on the basis of two properties discontinuity and similarity [10].

Based on this property image segmentation is categorized as Edged based segmentation and region based segmentation shown in Fig.2. The segmentation methods that are based on a discontinuity property of pixels are considered as boundary or edges based techniques.

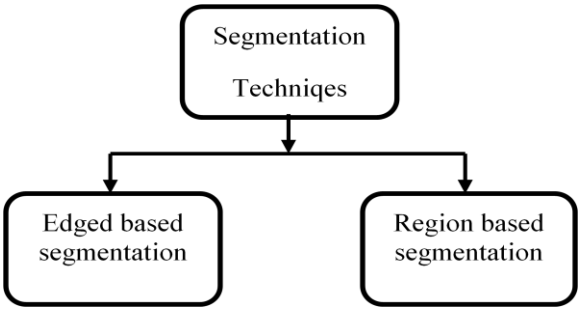

Fig.2. Segmentation Techniques

A. *Edge based segmentation*

The Edge based segmentation method attempts to resolve image segmentation by detecting the edges or pixels between different regions that have rapid transition in intensity and are extracted and linked to form closed object boundaries. The result is a binary image. Based on theory, there are two main edge based segmentation methods, gray histogram based and gradient based method [11].

B. *Region based segmentation*

Region based segmentation partitions an image into regions that are similar according to a set of predefined criteria. The region based segmentation is partitioning of an image into similar areas of connected pixels. Each of the pixels in a region is similar with respect to some characteristic or Computed property such as color, intensity and/or texture [11]. There are different types of the Region based methods specified in Fig.3.

1. Thresholding
2. Region growing
3. Region splitting
4. Merging

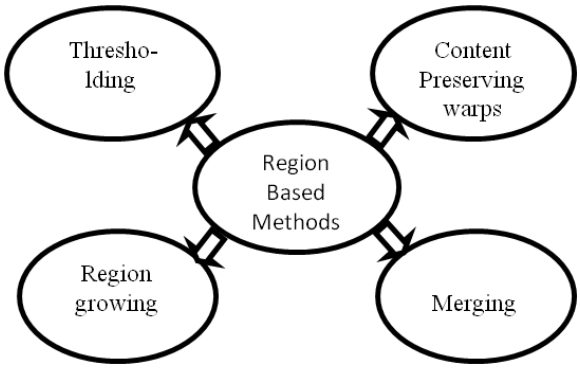

Fig.3. Region based methods

1. Thresholding

Thresholding is an important technique in image segmentation applications. The basic idea of thresholding is to select an optimal gray-level threshold value for separating objects of interest in an image from the background based on their gray-level distribution. Thresholding creates binary images from Gary-level ones by turning all pixels below some threshold to zero and all pixels about that threshold to one. OTSU method is a type of global thresholding in which it depends only gray value of the image. Otsu method was proposed by Scholar Otsu in 1979. Otsu method is a global thresholding selection method, which is widely used because it is simple and effective [12]. The Otsu method requires computing a gray level histogram before running. OTSU gives satisfactory segmentation result applied when applied to noisy image [13].

2. Merging

The result of region merging usually depends on the order in which regions are merged.

3. Region Growing and Region Splitting

Region-growing approaches exploit the important fact that pixels which are close together have similar gray values**.** Region growing approach is the opposite of the split and

merge approach. This method may not distinguish the shading of the real images.

In a Region Splitting, the technique is a recursive approach of automatic multi-threshold Since the splitting technique depends upon homogeneity factor, some of the split regions may or may not split properly. It should be reduced through merging technique between the two adjacent regions to overcome the drawback of the splitting technique.

III.Feature Extraction Schema

Many techniques have also exploited the use of regions during retrieval. A region based CBIR system called WINDSURF [17]. It uses discrete Wavelet transforms to extract a set of features representing each image in the color-texture space. These features are subsequently used to partition the image into a set of homogeneous regions.

CBIR is basically a two step process which is Feature Extraction and Image Matching (also known as feature matching). Feature Extraction is the process to extract image features to a distinguishable extent. Information extracted from images such as color, texture and shape are known as feature vectors shown in Fig.4.

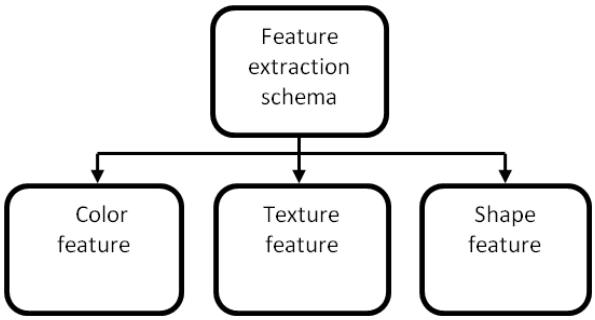

Fig.4. Different features of the image

The extraction process is done on both query images and images in the database. Image matching involves using the features of both images and comparing them to search for similar features of the images in the database. Using multiple feature vectors to describe an image during the retrieval process increases the accuracy when compared to the retrieval using single feature vector.

The saliency map to flower-based image retrieval method can avoid conventional image segmentation, and it enhances the adaptability of algorithm for complex images. Itti et al. Put forward a classic visual attention model, in which various features (such as color, brightness, direction, etc.) are extracted from the image [3].

These features are formed to various feature maps through the Gaussian pyramid and center-surround operators, then they are normalized and merged to get saliency maps. But sometimes, the phenomenon of region inversion occurs on extracting color feature map in this model [4]. Hou extracted the saliency map by using inverse Fourier transform of frequency domain spectral residual of the image [5]. But this method ignores the thought of multi-scale analysis, which will lead to get incomplete target. Based on the thoughts of Itti and Hou, improved Itti model algorithm to get the saliency map is use and to extract flower features.

Histogram intersection distance use to measure the similarity between different images.

IV.COMPARATIVE ANALYSIS

In this section, a comparison of describing techniques is discussed to verify the effectiveness of each technique of Image segmentation and feature extraction in the domain of flower image retrieval. Focusing on Image segmentation, In Region based segmentation, we segment the objects from a background. A simple way to segment the image from the background is to choose a threshold based histogram of gray values[11].Unfortunately, thresholding this image gives a binary image that either misses significant parts of the image or merges parts of the background with the image. The OTSU's algorithm maybe an effective technique among all the techniques [19].It is widely used in image processing because it gives a good segmentation results and it is easy to implement. Otsu method is a global thresholding selection method [12].

Feature plays a very important role in the area of image processing. Before getting features, various images preprocessing techniques like binarization, thresholding, resizing, normalization etc. are applied to the sampled image.

Reviewing through Feature Extraction schema to avoid conventional image segmentation saliency map flower image retrieval is used which is the most efficient method[20]. Feature extraction techniques are applied to get features that will be useful in classifying and recognition of images.

For visual recognition and discrimination color feature is utilized by humans. It is relatively robust to background complication and independent of image size and orientation.

Feature extraction techniques are helpful in various image processing applications. As features define the behavior of an image, they show its place in terms of storage taken, efficiency in classification and obviously in time consuming also.

V.CONCLUSION

Regarding a study on existing flower image retrieval methods, including image segmentation and feature extraction and comparing their strengths and weaknesses, we think that maybe combining the segmentation technique and feature extraction schema gives good result together, which benefits from the strength points of existing methods and improves the quality of the segmentation result. Which gives the better classification results at the output. Where the test image may contain a single flower or ten or more instances.

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