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Content Based Image Retrieval Techniques in Identifying Plant Diseases using Android System

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Abstract - Mobile phones are widely used devices around. Android, Windows Mobile, and the iPhone, mobile phones are different brands which have changed the way we look at mobile computing. Many applications like games, social networking, and bank transactions are used on mobile today. Today, everyone is using mobile phones, including the farmers. Introduction to Information and Communication Technologies (ICT) has an important role in day-to-day life of farmers. Agriculture sector contributes in daily needs of population in India and is main backbone of GDP of Indian Economy. Farmers are the main element of Agriculture. Farmers are not able to cope up with complications occurring due to crop diseases. They have to depend on Plant Biologist to resolve these problems. Examining the plant affected by disease through a Plant Biologist manually is a time consuming process. Plant affected by the disease is not diagnosed within time then it can affect the quality of the plant. A System can be provided which can involuntarily obtain significant features of the plant affected by disease and computing the uploaded diseased plant image. It will easily help the Plant Biologist to diagnose the disease of plant and provide the farmers to take initial precautionary measures. Acknowledging the significance and dominance of Agriculture sector, System based on Content Based Image Retrieval techniques and k-means algorithm is proposed for diagnosing the plant disease is proposed.

Keywords **- Feature extraction, Image retrieval, CBIR techniques, K-means, Colour histogram.**

1. Introduction

Plant diseases are turn into dilemma where it reduces the quality and quantity of the agriculture products. This paper focuses on the detection of plant diseases based on colour and feature technique. The plant disease detection implemented in two phases. First phase is training phase. In this phase the images of healthy and disease leaves are taken as input. During the training process, the RGB colour components of healthy and diseased images are separated into Red, Green and Blue components and texture and shape on each component. The components of healthy and diseased leaf image are stored in the database. Second phase is testing.This phase testing the samples that are given as input to the System. The feature of each component is compared with the stored results and identify whether the plants leaf infected by disease or not. Significance of digital images has been expanding tremendously over the last decade. Users from various fields are making full use of chances offered by the capability of retrieving and changing remote images in all types of modern and exhilarating ways.

Process of locating a desired image from huge and varied database can be a bottleneck in system. Progress in identifying the problems in image retrieval is gradually increasing and search of solution is an active field of research. Drawbacks of old methods of image indexing have led to the usage of techniques used for retrieving the features of images on the base of automatic derived properties such as texture, shape and colure. This technology is generally known as CBIR (Content Based Image Retrieval) techniques [1][2]. After years of concentrated research, CBIR techniques are been used out of the laboratory in the market, products (like QBIC and Virage uses CBIR technology) in market. Still this technology has been not developed and used at a major scale. Due to the lack of progress in CBIR techniques, efficiency of it is still unknown in practice, estimation can be known by handling real-life queries in vast and different image collections. The image retrieval field is an area of research and has gathered more attention in

recent years due to sudden increase and usage in the volume of digital images. The progress in the field of internet has not only seen the growth of digital images but also gave people more solutions to retrieve those images. The effective technique used in finding and obtaining images from the vast database cannot be enhanced. One solution for indexing and obtaining image data is by using manual text comments. Comments can provide a way to search the images indirectly. But there are some drawbacks in this approach. First, it is complicated to describe the contents of image using only few keywords or comments Second, the manual annotation process is very abstract, uncertain, and partial. Due to this problem the need for automatic techniques like CBIR (Content Based Image Retrieval) has been increased. The CBIR system mainly uses low-level features such as colour, texture, shape, edge for image indexing and obtaining the information on it. The advantage of low level features is that it can be processed automatically. CBIR has some problems of similar comparison images. Applications of image retrieval are mainly based on shape and colour features. Many CBIR Methods are proposed in last few years. Methods like to use pixels of an image to find out local texture and to find the proportion of major colour in the image fuzzy index is used.

Textual co-occurrence matrix is used for texture information of the image. They also used the relevance and performance cost. Many schemes and techniques of relevance feedback exist with many assumptions and operating criteria. There are less chances to compare the relevance feedback algorithm quantitatively. Clustering algorithm like k-means [3] is used for classification of features obtain from histogram method. Histogram method provides features like colour, texture and shape for Content Based Image Retrieval (CBIR) methods. Global histograms are used for image retrieval because they are insensitive for small changes and can be advantage for CBIR methods. Colour feature plays a potential factor for comparison of colour in images, otherwise it would waste of time and problem would become difficult. First method is to quantize the distribution of colours and represent them in colour histogram. Colour histogram provides an easy way for colour distribution and used in different classes for matching.

2. Content Based Image Retrieval (CBIR) Techniques

CBIR technique works in a different way from the traditional text base system. Images stored in a cluster are extracted and then features of those images are used for comparison. CBIR System mainly use colour, shape and texture as their basic features so they operate on level one which is at low level. Traditional system takes query from user by taking input as image while some systems offer extra options to the user such as palette or sketch input. Next step the system compares the query image with stored image and whose feature values matches closely, those images are shown to the user. Main retrieval types for image retrieval are explained below.

A. Colour Retrieval

Methods for obtaining information from the image on basis of colour have been explained in various ways. ut, most of the methods are variations of the basic idea of colour retrieval [4] [5]. When an image is used for comparison, it is first processed and colour histogram is derived from the image, it shows the proportion of colours in each pixel of the image. Colour histogram [6] derived from image is stored in database. When colour histogram is calculated, user can specify the proportion of colours on input image at search time. Images whose colour histogram matches closely with query image are considered. The commonly used catching technique is histogram intersection matching technique. Development in matching techniques has provided to use CBIR techniques in system that is more complex. Swain and Ballard were introduced CBIR techniques. Improved technique of Swan and Ballard are currently used which includes cumulative colour histograms, region based colour querying. Results of these techniques are better than the previous one.

B. Texture Retrieval

Image comparison can be done based on texture also, though it may not be seem to be useful. Texture quality can be used for differentiation between colours and area of images. Texture similarity is done by calculating values from query and image stored in database. Parameter of adaptive brightness from the pair of pixel of two images is considered for comparison. Values are calculated based on scale, degree of contrast, directionality, periodicity for texture analysis. Gabor filter and fractals is another method for texture analysis of image. Texture comparison is done by submitting query image or by selecting texture from palette. System then considers those image whose texture measures match closely with query image.

C. Shape Retrieval

Third technique is to obtain the information on the image using shape retrieval. Basic requirement to retrieve the property of image is by their shape, which is at the basic level of shape retrieval technique. Contrary to texture, shape is a quite well defined approach. There is remarkable their shape mainly identifies proof of many objects in nature. Many characteristics of an object shape

(independent of size) are processed for every image stored in the database. The queries are answered by processing the equivalent features for the query image and obtaining those images whose features nearly match with query image. Two important types of shape feature are usually used like global features as aspect ratio, circularity and moment invariants and local features as sets of successive boundary segments.

3. Fuzzy C-Means Clustering Algorithm

This algorithm works by assigning membership to each data point corresponding to each cluster center based on distance between the cluster center and the data point. More the data is near to the cluster center more is its membership towards the particular cluster center. Clearly, summation of membership of each data point should be equal to one.

Advantages

1) Gives best result for overlapped data set and comparatively better then k-means algorithm.
2) Unlike k-means where data point must exclusively belong to one cluster center here data point is assigned membership to each cluster center because of which data point may belong to more than one cluster center.

Successively divided into small clusters. Partitioned clustering algorithms are different from hierarchical clustering algorithms where it finds all the clusters as partition and do not form hierarchical form. Single link and complete link are examples of the hierarchical clustering
algorithms. K-means is a type of unsupervised learning algorithm used for solving the

Fuzzy c-means clustering algorithm

1) Randomly select c cluster centers.
2) Calculate the fuzzy membership 'μij' using:
3) Compute the fuzzy centers 'vj' using:

$v_{j=} (\sum_{i=1}^{n} (\mu ij)^{\pi} x_i / = (\sum_{i=1}^{n} (\mu ij)^{m}) , \forall j = 1,2, c \ldots$

4) Repeat step 2) and 3) until the minimum 'J' value is achieved or ||U(k+1) - U(k)|| < β. where, k is the iteration step. β is the termination criterion between [0, 1]. „U = (μij)n*

Clustering algorithm K-means follows a very simple procedure where it classifies the given dataset into fixed number of clusters (k clusters). The first step is set k center. Centers should be formed in such a way that different location of cluster can change the result. Best option is to keep them far away from each other. Next step is to assign the data points to its nearest centre. When data points are finished, formation of clusters is completed. At this stage we need to re-assign k centroids as center point from the clusters formed by the previous step. After obtaining k centroids, same data points are assigned to their nearest new data centers. Loop is formed. Result of loop causes the k centers to change their current location after every step until no more changes are done or centers cannot be moved.

c is the fuzzy membership matrix. „
J is the objective function.

Disadvantages

1) A priori specification of the number of clusters.
2) With lower value of β we get the better result but at the expense of more number of iteration.
3) Euclidean distance measures can unequally weight underlying factors.

4. Proposed System

The architecture of proposed system is shown in Figure 1. As shown in the Architecture, Basic principles of CBIR and k-means are used to provide user with accurate result. Describing the system architecture, all the images of crops affected by the disease and those crops not affected by diseases are stored in the database. In this case CBIR is used, CBIR uses three steps to extract the properties from image on the basis of colour, texture, shape and properties or features are stored in the Database. Average RGB is calculated for colour comparison, Co-occurrence matrix is used for texture comparison.

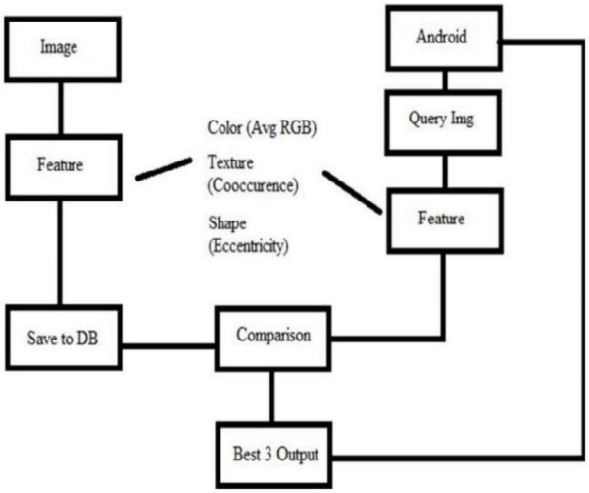

Fig.1. Proposed System Architecture

5. Conclusion

Low level features (colour, shape, texture) of the image are extracted accurately using CBIR techniques and k -mean clustering method will increase accuracy of the system by classifying the images with similar features together. This system can be incorporated with android mobile phones. Thus, accurate results can be provided to user using android smart phone.

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