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Article

Recognition of Leaf Ailments and Categorization using Image Processing

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A B S T R A C T

Recognizing the plant illnesses is significant in directive to avert the wounded in the field and quantity of the agricultural product. The education of the plant diseases is the education of visually noticeable designs seen on the plant. Health monitoring and disease discovery on plant is very dangerous for agriculture field. It is problematic to monitor the plant diseases physically. There is obligation of huge quantity of work, expertise in the plant diseases, and also need the extreme processing time. Without accurate disease, good control actions cannot be used at the appropriate time. The impartial of this system is to contrivance image analysis and classification methods for detection of leaf diseases and classification. The planned system contains of four parts. They are (1) Image pre-processing (2) Segmentation of the leaf using K-means clustering to determine the diseased areas (3) feature extraction and (4) Classification of diseases. Texture structures are extracted using statistical Gray-Level Co-occurrence Matrix (GLCM) features and classification is done using Support Vector Machine (SVM).

Keywords: K-means clustering, Support Vector Machine, Leaf Disease, Image Processing, Segmentation, Feature Extraction

Introduction

India is a cultivated country and about 80 percent of the population depends upon on agriculture. Farmers have large range of difference for selecting various acceptable crops and finding the suitable pesticides for plant. Disease on plant leads to the convincing reduction in both the quality and productivity of agricultural products. Identification of the plant diseases is the key to preventing the losses in the yield and quantity of the agricultural product. Health monitoring and disease detection on plant is critical for sustainable agriculture. It is very difficult to monitor the plant diseases manually. It requires huge amount of work, expertise in the plant diseases. And farmers are not in a position to classify the actual disease deficiency. Henceforth, in planned system various image processing techniques can be used to detect the plant disease. The image is first captured by mobile camera and the image is converted from RGB to HSV color space conversion. The segmentation can be done using K-means algorithm that is defined in.[4] Then, feature extraction is done using Gray-Level Co-occurrence Matrix[5], finally the cataloguing of leaf disease in done using Support Vector Machine.[3]

I This paper is organized as follows: In Section 2, Literature review. In Section 3, Proposed system architecture. In Section 4, Advantages and Applications. In section 5, the conclusion of this research is presented. In section 6,contains references.

Literature Review

In this section, various method for leaf disease detection is discussed.

Ramakrishnan. M, Sahaya Anselin, [1] have used back

propagation for disease detection. They have industrialized two databases, one which stored disease images for training and another for implementation of the query images. For weight adjustment of training database, Back propagation is considered. There are three different features considered namely, color, textures and morphology. From above three features morphological feature gives more accurate results as compared to remaining two features.

Sachin D. Khirade, A. B. Patil, [2] have been proposed in the literature for this processing of plant photos in visible, infrared, light etc. The recognition of disease can often be based on symptoms like spots in various parts of plant. The describes image dispensation method can be used either as a standalone application or it could be combined with cloud/remote database. This application easily be extended for different plant disease and different smart phone platforms.

Pranjali B. Padol, Prof. Anjali A. Yadav [3] discussed a system for automatic plant disease detection, which comprised of four stages. In the first stage, a color conversion space is created for the RGB image and then using specific threshold value green pixels are masked, removed, and monitored by segmentation process. Using co-occurrence matrix texture features are calculated for useful segments. Finally, the useful features are handed over to SVM classifier where classifier where classifier gain is obtained by minimum distance criterion. The author improving the disease identification rate along with color and texture features for any given input conditions. The given system gives 88.89% average accuracy for both Downy and Powderly grape leaf disease.

Aanand R. Veni, S, Aravinth [4] have proposed technique to identify the health status of brinjal plant by capturing brinjal leaf image and processing them. Image is captured by digital camera. Only for diseased chilly plant chemical should be applied. Feature extraction and image recognition is done by MATLAB. In this paper, Fourier filtering, edge detection and morphological operations are used for pre-processing. GUI is developed using LABVIEW software tool. The subdivision is important while extracting feature form the image. As compared to other methods k-means gives more accurate clarity.

A. K. Singh, A. Rubbia, B. Raja, [5] proposed a technique to detect disease in okra leaf with combination of K-means and Naïve Bayes[9] classifiers. Initially twenty-three features are evaluated using gray image and converted into size of invariant features. Using gray level co-occurrence, matrix texture features are extracted in the second phase. Then features values analogous to dominant feature set are designated to create a feature set are designated to create a feature metric and clustered using K-means algorithm. The final classification done using Naïve Bayes classifier.

Proposed System Architecture

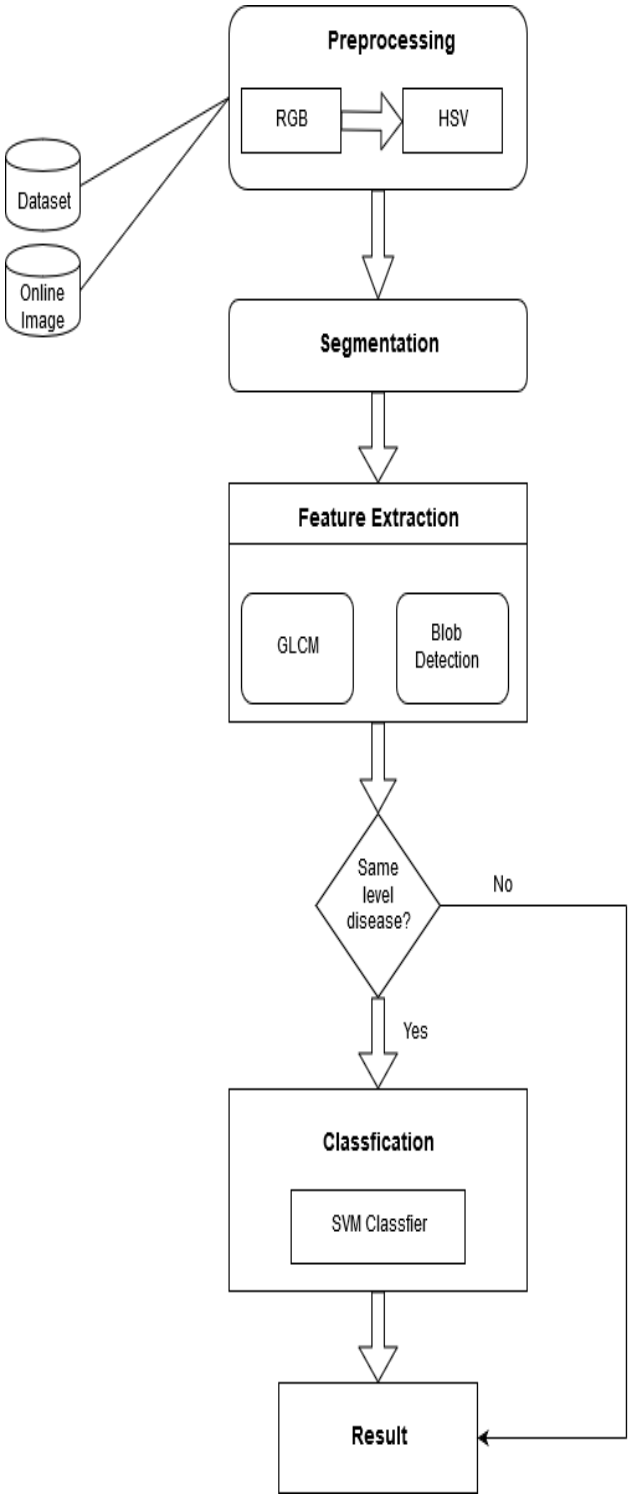

Figure 1.System block diagram

Image Pre-processing

Image pre-processing is used to enhance the quality of the image necessary for further processing. It includes color space conversion and image enhancements. The RGB images of leaf is converted into HSV color space. The

color space conversion is used for the enhancement of visual analysis.

Hue

Hue is the color portion of color model, ranges from 0 to 360 degrees.

Saturation

Saturation is the percentage of gray in the color, ranges from 0 to 100.

Value

The brightness or intensity of the color is described by value, ranges from o to 100.

Image Segmentation

Image segmentation is the procedure used to divider image into meaningful form. It is used to abridge the image of image into meaningful form, such as to highlight object of interest from background.

K-Means Clustering

The K-means clustering algorithm prefers segmentation by minimizing the sum of squares of distances between image intensities and cluster centroids. It is an iterative algorithm that partitions the data and assigns n observations to one of the k clusters defined by centroid.

The algorithm is given below:

- Choose k initial cluster centroids
- Compute point-to-cluster centroid distances of all observations. Assign each point in the cluster with the closest centroid
- Compute the mean of the observations to the cluster with closest centroid
- Repeat steps 2 and 3 until algorithm converges

Feature Extraction

Gray-Level Co-occurrence Matrix (GLCM) is the statistical method of texture investigation which considers the spatial relationship of pixels. The GLCM[11] functions characterize the texture of images by computing the spatial relationship among the pixels in the image. The different features extracted are defined as follows.

Contrast

The intensity of a pixel or its neighbor pixel is measured by contrast over the entire image.

Energy

Energy is a summation of squared elements that ranges between 0 and 1.

Homogeneity

Similarity among the pixels is measured and it ranges between o and 1.

Correlation

Correlation measures how a pixel is correlated to its neighborhood and it ranges between -1 and 1.

Classification

Support Vector Machine is kernel-based managed learning algorithm used as a classification tool. Support vector machine mostly used for organization and reversion purpose. It uses method called the kernel trick to transform your data. SVM attempts to find a linear separator(hyperplane) between the data samples belonging to classes in multidimensional area. The hyper plane is also called as optimal hyper plane. It is used to find connection between features and redundant features. It is used to identify the category of the unknown disease leaf image.

Advantages and Applications

Advantages

Farmers can use the mobile application to identify the type of disease on leaf. The use of application is user-friendly. It reduces effort and time of farmers. Shopkeepers can recommend pesticides and fertilizers for the particular disease. Manual work is labour demanding and error-prone. Automatic leaf disease detection technique gives accurate, fast, efficient and effective solution to the problem.

Applications

Farmers can use this app or system to detect the diseases of plant at early stage. They do not need to call the expert for the disease. So, it is time and money saving. Shopkeepers can use this system to suggest pesticides on identified diseases. Agricultural students can use for study purpose and learn new leaf diseases.

Conclusion

The division of the diseased part will be done using K-Means subdivision. Texture features will be extracted and classification will be performed using SVM. With a very less computational efforts the optimum results will be generated. This simple system will allow people with very little technological knowledge especially rural people to use and get effective help out of it. The barrier between the rural people and the technology will exist no more if we try to utilize the benefits of technology.

References

1. Ramakrishnan M, Anselin S, Nisha A. Groundnut Leaf Disease Detection and Classification by using Back Propogation Algorithm. IEEE ICCSP, 2015.
2. Khirade SD, Patil AB. Plant Disease Detection Using Image Processing. IEEE ICOCCOCA, 2015.
3. Padol PB, adav AA. SVM Classifier Based Grape Leaf Disease Detection. IEEE, 2017.
4. Veni AR, Aravinth S. An application of image processing

technique for detection of diseases on brinjal leaves using K-means clustering.
5. Singh AK, Rubbia A, Raja B. Classification of rice disease using digital image processing and naïve bayes classifier. *International Journal of Electrical and Electronics Engineers* 2015; 7: 294-299.
6. Shije J, Jia Peiyi Liu Haibo. Automatic Detection of Tomato Diseases and Pests Based on Leaf Images. IEEE CASP, 2016.
7. Gavhale KR, Gawande U, Hajari KO. Unhealthy region of citrus leaf detection using image processing techniques. *International Conference for Convergence for Technology*.
8. Al-Tarawneh MS. An empirical investigation of olive leaf spot disease using auto-cropping segmentation and fuzzy c-means classification 2013 23(9): 1207-1211.
9. Anthonys G, Wickramarachchi N. An image recognition system for crop disease identification" of paddy fields in Sri Lanka. In: Fourth IEEE international conference on industrial and information systems(ICIIS 2009), Sri Lanka, 2009; 403-407.
10. Arivazhagan S, Shebiah RN, Ananthi S, Varthini SV. Detection of unhealthy region of plant leafs and classification of plant leaf diseases using texture features. *Agric Eng Int CIGR J* 2013; 15(1):211–217
11. Asraf HM, Nooritawati MT, Rizam MS. A comparative study in kernel-based support vector machine of oil palm leafs nutrient disease. *Procedia Engineering* 2012; 41: 1353–1359
12. Barbedo JGA. Digital image processing techniques for detecting, quantifying and classifying plant Diseases. *SpringerPlus* 2013; 2(1):660
13. Camargo A, Smith JS. An image-processing based algorithm to automatically identify plant disease visual symptoms. Biosyst Eng 2009; 102(1): 9-21.
14. Es-saady Y, El Massi I, El Yassa M et al. Automatic recognition of plant leaf diseases based on serial combination of two SVM classifiers. *International Conference on Electrical and Information Technologies*, 2016; 561-566.
15. Sannakki SS, Rajpurohit VS, Patil VB et al. Diagnosis and classification of Grape Leaf Diseases using Neural Networks. IEEE 4th ICCCNT, 2013.