Semi-Automatic Leaf Disease Detection and Classification System for Soybean Culture

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Abstract - *In Our project, a rule based semi-automatic system using concepts of k-means is designed and implemented to distinguish healthy leaves from diseased leaves. In addition, a diseased leaf is classified into one of the three categories (downy mildew, frog eye, and leaf blight). Experiments are performed by separately utilizing color features, texture features, and their combinations to train three models based on support vector machine classifier. Results are generated using thousands of images collected from Plant Village dataset. Acceptable average accuracy values are reported for all the considered combinations which are also found to be better than existing ones.*

Key Words: *Leaf dieseASE, K mean, Machine Learning*

1. INTRODUCTION

The affect agricultural production and food security cause severe losses by epidemics of plant diseases. The facility agriculture has been developing rapidly. It could provide conditions for many pathogens. Protected environment could be increase .It could provide a large amount of inoculums for the field crops. In order to control plant diseases timely and effectively, improve the quality and the yield of agricultural products and ensure the safety of agricultural production and food security, fast and accurate diagnosis of plant diseases should be conducted, the prevalence of plant disease should be well known, and disease prediction should be carried out. Traditional methods to identify and diagnose plant diseases mainly rely on naked-eye observation by the professional and technical personnel in field or pathogen identification in laboratory. These methods are not only time-consuming and tedious, but also inaccurate if relevant personnel are lack of experience. Moreover, some expert systems for plant diseases could be used for disease diagnosis. Most of them need disease-related information and data as inputs, but the information and data input by the users could not meet the needs because the users are lack of disease knowledge. So the systems could not give correct and effective outputs. Thus it often results in misuse of pesticides or excessive use of pesticides and poses a great threat to food safety.

Related work

Cieluvcolor area for identification and identification and segmentantation of malady affected leaves victimization fuzzy based mostly approach year (2017) Economy of developing countries primarily depends on the agriculture production. The identification and management of disease plays a signification role in rising the standard and amount of agriculture production. Laptop based mostly machine-driven techniques for the identification of disease is advantageous because it detects terribly early stage of symptoms of plant disease and conjointly it lessens the burden of staff in observation the massive fields.

Image process techniques may be applied to resolve the matter of identification and extraction of the affected elements of plans in economical manner. During this work, fuzzy based mostly technique for the first and segmentation of malady affected plant leaves is planned. Identification of plant disease victimization image process techniques 2017 image process may be a oblique space wherever researches and advancements square measure taking a geometrical progress within the agricultural filed. Numerous researches square measure happening smartly in disease detection. Identification of plants diseases can't solely maximize the yield production however can also be appurtenant for diverse kinds of agriculture practices. This paper proposes a malady detection and classification techniques with the assistance of machine learning mechanism   and image process tools.

Initially, distinctive and capturing the infected region is finished and latter image preprocessing is performed. Further, the segments square measure obtained and therefore the space of interest is recognized and therefore the feature extraction is finished on constant. Finally they obtained results square measure sent through SVM Classifiers to induce the results.

The support vector machines outperformance the task of classification of malady's; results show that the methodology hints during this paper provides significantly higher results than the antecedently used disease detection techniques.

An application of image process techniques for detection of disease on plumbing fixture leaves victimization k-means bunch techniques diseases. The goal of planned work is to diagnose the malady of plumbing year 2016 this work presents a technique for distinctive plant disease associate degreed an approach for careful detection of fixture leaf victimization image process and artificial natural techniques. The disease on

the plumbing fixture square measure vital issues that makes the sharp decrease within the production of plumbing fixture.The study of interest is that the leaf instead of whole plumbing fixture plant as a result of of concerning 85-95 you looks after disease occurred on the plumbing fixture leaf like, microorganism Wilt, genus Cercospora leaf Cercospora Leaf Spot, mosaic virus (TMV). The methodology to sight selenium melongena plant disease during this work includes K-means bunch algorithmic rule for segmentation and Neural-network for classification.

The planned detection model based mostly artificial neural networks square measure terribly effective in recognizing leaf disease. Image recognition of plant disease supported back propagation networks Year 2013 realize automatic identification of plant disease and improve the image recognition accuracy of plant disease, 2 type of grape diseases (grape false mildew and grape powdery mildew) and types of wheat diseases (wheat stripe rust and wheat leaf rust) were designated as analysis objects, and therefore the image recognition of the diseases was conducted supported image process and pattern recognition. When image preprocessing as well as compression, image cropping and image deposing, K-means bunch algorithmic rule was accustomed phase the malady picture, and so twenty one color option, four from option and twenty five texture options were extracted from the photographs.

Back Propagation(BP) networks were used because the classifiers to spot grape diseases and wheat diseases, Severally ,The results showed that identification of the diseases may well be effectively achieved victimization BP networks whereas the size of the feature knowledge weren't reduced by victimization Principal Element Analysis(PCA),the bees recognition results for grape diseases were obtained because the filling accuracy and therefore the prediction accuracy were each 100 percent, which for wheat disease were obtained because the fitting accuracy and therefore the prediction accuracy were each 100 percent.

Whereas the size of the feature knowledge were reduced by victimization PCA, the best recognition result for grape disease was obtained because the fitting accuracy was 100 percent and therefore the prediction accuracy was ninety seven. 14%, which for wheat diseases was obtained because the fitting accuracy and therefore the prediction accuracy were each 100 percent? Automatic identification of plant diseases and improve the image recognition accuracy of plant diseases,2 sorts of grape diseases (grape false mildew and grape powdery mildew) and types of wheat diseases (wheat stripe rust and wheat leaf rust) were chosen an analysis objects, and also the image recognition of the diseases was conducted supported image process and pattern recognition.

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Proposed system

The process flow of propose system in the preprocessing module of background elimination and color space conversion of testing images. In the segmentation process the leaf get labels for each identifies cluster in colors and textures features are extracted in healthy and unhealthy leaves. The segmentation of each leaves get cluster with maximum grey level value on the phase of leaf infection on the computer severity disease.

The leaf is extract color and texture features for each identified cluster on the number of components on leaf will be healthy and unhealthy.The first stage classifier learns the features of leaf between a healthy and unhealthy image sample with complex background.Second stage classifiers learn the image sample of infected leaf grouped to form the features of infected clusters into one or three disease categories.

The phase's starts at the same initial modules on the process of segmented clusters are grouping with maximum grey level leaf contains single component, then the process will stops and giving an output is healthy leaf.In this phase the second stage classifier are closer to apply proposed rules forming the features of unhealthy clusters given as an output.

In this case the second stage classifiers are referred to select the infecting test image sample shown as an output. The amount of infected leaf image samples can be shown by computer severity disease in the image sample.

Pre-processing:

First, a region of interest (ROI) is selected manually followed by the computation of binary mask and its complements. The addition of the original image to the obtained complement removes the irrelevant background.Finally, cropping eliminates extra white spaces

and completes background elimination process.The color space is converted from a device dependent RGB model into a device independent model. The proposed system uses $L*a*b*$ ($L*$ signifies the lightness, $a*$ and $b*$ are the chromaticity layers) color space.

The segmentation module is executed on '$a*b*$' channel.Using only two channels for color representation decreases the processing time as well. Moreover, $L*a*b*$ has a strong aptness towards good segmentation results as compared to other color models

Segmentation and rule formation:

Segmentation is an important step in the proposed system, A well known k-means clustering algorithm is utilized to separate infected and healthy leaf regions. Grey level values of the resultant three color clusters are then utilized for further processing.The concept of threshold is successfully explored in various studies that deal with the detection of diseases showing a particular color symptom

These rules are framed after closely observing the formed clusters. after closely observing the formed clusters.**Cluster 1** represents the highest, **Cluster 2** represents the intermediate, and **Cluster 3** represents the lowest grey-level value region.

Feature extraction:

The literature for plants disease detection conveys that color and Texture plays an important role in disease lesion classification.Thus, several color features, texture features, and their

Combinations are explored in this study to design a valuable system and to validate its performance.

Classifier:

The dataset used is imbalanced thus for improved classification accuracy the proposed system uses three classifiers. One is to identify a healthy or infected cluster.**CLFRHD** learns healthy and infected clusters, **CLFRFE_SLB** differentiates *frog eye* from *sartorial leaf blight*, and **CLFRDM_SLB** classifies between *downy mildew* and *sartorial leaf blight*. **CLFRHD** uses features offal the clusters, **CLFRFE_SLB** and **CLFRDM_SLB** are trained from the features of infected clusters only.

SVM is used due to their numerous advantages in high-dimensional space.SVM learns an optimal hyper plane $g(x)$, as given in (1),to properly split data points of the classes. Here, an is a non-zero valued Lagrange multiplier, $z(n)$ is its corresponding support vector, t is the size of input data, c is the threshold, and xn represents an input data point

$$g(x) = \Sigma 1 \le n \le t \; z \; nan \; (xn + x + c) \qquad (1)$$

Disease severity computation:

The severity of a disease depends upon the region being covered by an infection. After identifying the test leaf image sample, percentage of leaf infection can easily be computed as a ratio of the number of infected pixels is to the number of healthy pixels in the leaf image.

In this paper, the complete leaf ROI is segmented into three clusters, thus disease severity is calculated using an expression given in (2). Here, Ai is the number of infected image pixels in **Cluster i** (where i = 1, 2, 3) and AL represents the total number of pixels lying in the extracted ROI of a leaf image

$$A = \Sigma i = 13 \; Ai / AL \times 100 \qquad (2)$$
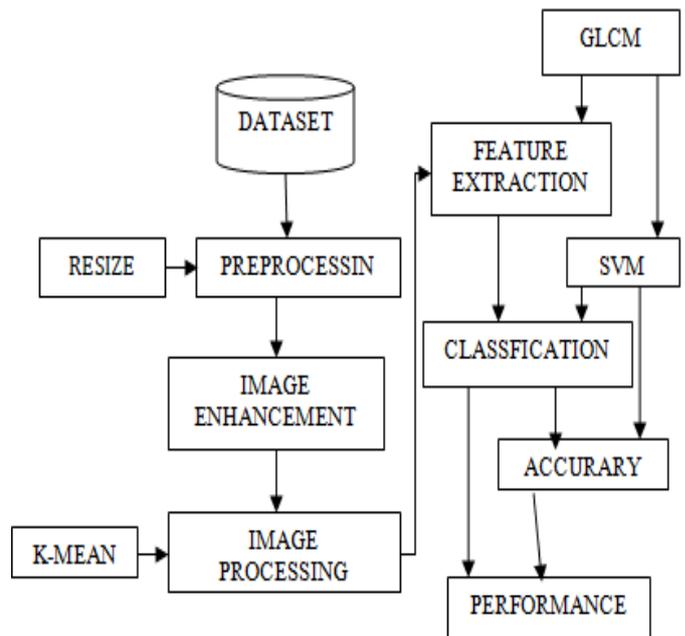
ARCHITECTURE

Figure 1

CONCLUSION

It is important to detect whether a leaf is healthy or diseased. Once detected, the disease needs to be identified. The proposed system utilizes SVM classifier, although it is flexible to work with different classifiers as well. Based on several combinations of color and texture features, classification is performed using the proposed rules.The proposed method is found to be better on many criteria as compared to existing studies. Moreover, the proposed system is designed and tested using a sufficiently large dataset collected from Plant Village which contains images with complex backgrounds. The maximum average classification

accuracy reported is 90%. However, the system is trained using leaf images with the complex.

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