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Smart Farming: Pomegranate Disease Detection Using Image Processing

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Abstract

Crops are being affected by uneven climatic conditions leading to decreased agricultural yield. This affects global agricultural economy. Moreover, condition becomes even worst when the crops are infected by any disease. Also, increasing population burdens farmers to increase yield. This is where modern agricultural techniques and systems are needed to detect and prevent the crops from being effected by different diseases. In this paper, we propose a web based tool that helps farmers for identifying fruit disease by uploading fruit image to the system. The system has an already trained dataset of images for the pomegranate fruit. Input image given by the user undergoes several processing steps to detect the severity of disease by comparing with the trained dataset images. First the image is resized and then its features are extracted on parameters such as color, morphology, and CCV and clustering is done by using k-means algorithm. Next, SVM is used for classification to classify the image as infected or non-infected. An intent search technique is also provided which is very useful to find the user intension. Out of three features extracted we got best results using morphology. Experimental evaluation of the proposed approach is effective and 82% accurate to identify pomegranate disease.

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Keywords: color; morphology; color coherence vector; support vector machine; k-means algorithm; intent search

1. Introduction

Farmers normally observe visual symptoms of disease on fruit. Experts may easily diagnose the disease or may rely on lab diagnostic test. Most of the currently followed practices for fruit disease detection system in India are naked eye observation by domain expert. The consultation charges of professional experts are high and it is also not possible to get it on time at remote location. Hence, there is a need of automatic fruit disease detection system in the early stage of the disease.

We have selected pomegranate fruit for disease detection. This fruit is mainly affected now days by the attack of Bacterial blight (also called as “Telya”) causes the major loss for the farmers. The fig. 1 shows the pomegranate fruit

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Fig. 1. Pomegranate fruit and leaf affected by bacterial blight disease

and leaf affected by Bacterial blight. Bacterial blight has wide occurrence in Maharashtra, Karnataka, Tamil Nadu, Rajasthan, Andhra Pradesh and Himachal Pradesh states of India. It is also globally reported in Pakistan and South Africa. The production of this fruit is taken in the low rain region and which gives more profit to the farmers. The severity of disease is mainly in rainy season. The range of temperature between 25 to 35°C with humidity greater than 50%, rains and wind are favourable for rapid disease development. This disease affects stem, leaf and fruits, but major distractive part is on fruits. The leaf disease in the form of dark brown surrounded by dark yellow, infected leaves turn in yellow color. For fruit disease, with water soaked lesions on surface, this turns dark brown to black. Small cracks on spots and in severe cases entire fruit split. There is urgent need to identify this disease at the primary stage. But due to lack of domain knowledge, farmers are not able to do it.

The aim of this paper is to find out bacterial blight on pomegranate fruit. This system take input as image of fruit and identify it as infected or non-infected. The intent search technique which helps the farmers to identify disease properly by recommending relevant images to query image from database.

2. Related Work

The author Monica Jhuria¹ provided an approach for fruit disease detection based on image processing. The purpose of research work is to detect disease on fruit. Grapes, Apple and mangoes are selected for conducting experiments. Morphology, color and texture feature vectors are chosen for feature extraction. Morphology feature gives 90% accurate results than other feature vectors. For disease detection and weight calculation of fruit image processing techniques are used. Back propagation is used for weight adjustment of images that are stored in learning database. On the basis of disease spreading, the grading of fruit has been decided.

The author Shiv Ram Dubey² suggested an image processing based way for detection and identification of fruit disease. The fruit selected is apple and diseases considered are namely apple rot, apple blotch for conducting the experiments. For image segmentation, K-means clustering is used. Color coherence vector, Histogram, Local Binary patterns, complete local binary patterns are used for extracting the features. For fruit disease detection, multiclass support vector machine is used.

The author Ilaria Pertot³ suggested multilingual web based tool. The web based tool provided for plant disease detection. Strawberry fruit is considered as case study. The farmer in the farm will observe symptoms and these symptoms will compare with images provided in the system. The outcome will be identification of fruit disease. The web based system consist user and super user. Super user has authority to add /modify / delete images and diseases. And user can use disease detection method /tool for disease detection.

The Indian government following the e-pest surveillance approach to control pests and disease through meticulous field observations for major fruits like mango, banana, and pomegranate but still this process is time consuming⁷.

The proposed systems^{1,2,3} provide different approaches for fruit disease detection like mango, apple, strawberry. But proposed approaches may not give good results if input image quality is low. This problem motivates to implement

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