

Prediction of Plant Disease from Weather Forecasting using Data Mining

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Abstract— Plant disease determination is an art and also science. Plant disease is essential problem that lower the quantity and also reduced the quality of agricultural production. Recent, pesticide is applied on plant without learned what the essential requirement of plant. Disease is the main cause to death the plant and also influences the human health. Data mining is a comparatively novel research in agricultural. In this paper, our aim to develop the system to evaluate high accuracy and also detects the disease of the orange plant. The proposed system use segmentation techniques such as k-means clustering and deep neural network learning to predict the disease based on weather feature of the orange plant. This system helps the farmer to understand the disease of orange plant and also increase the yield of orange plant.

Keywords-Plant disease, k-means clustering, SGLDM, Deep neural network learning

I. INTRODUCTION

India is the agricultural land, wherein around 70% of the population relies upon agriculture and it remains as a second biggest maker of fruits through producing by 44.04 million tons fruit and 10% of world fruit generation is been accounted by India. Fruits and vegetables are the most significant product in agricultural field. The main focus of this research in agriculture is to increment the nourishment quality and efficiency at lower cost and gain benefit because in India the majority of the population based on agriculture. Wide range of fruits is growing up in India such as apple, banana, guava, grape, mango, orange are the main one. Fruit production gives around 20% of the country's development. But due to absence of maintenance, inappropriate development of fruits and manual investigation there has been a reduce in generate the quality of fruits. Agriculture productivity is mostly based on the quality of seed and soil. Plant disease may reduce the quality of agriculture product. Plant disease interferes with its fundamental operation for example fertilization, germination photosynthesis, pollination, transpiration etc. These diseases are produced by pathogen like bacteria, fungi and viruses and because of antagonistic conditions. In plant, disorder can be found in different parts for example fruit, leaves and stem. At present chemicals are enforced to the plants regularly without knowing the necessity of plants. These chemicals enforced in huge amount prompt soil pollution, and could hazard the human health. So as to predict the right time suppression of pathogens numerous parameters must be prepared such as pathogen could affect fruit simply species under specific condition. Those natural details could be particular climate condition like humidity, temperature, leaf wetness and rainfall.

Sometimes experience is insufficient. For specific prediction of potentially fruit plant disease, and right time for protection the fruit plant using data mining technique. Data mining is used to extract the meaningful relationship from huge database. Data mining is rising exploration field in agriculture plant protection too. Examine the available data from some point back the past, which comparing the comparing pathogen disease has been recorded.

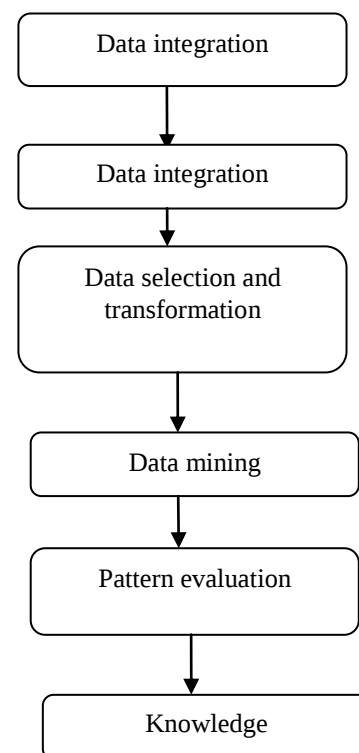


Figure 1: Knowledge discovery of data mining

The main aim of this paper is to develop the model to predict the disease of orange plant. This paper is use the segmentation techniques such as k-means clustering, SGLDM and deep neural network to detect the disease of the orange plant based on available data.

II. Different disease of Orange

A. Black Spot: Citrus black spot is caused by fungus named *Guignardia citricarpa*. Its symptoms are hard spot, virulent spot, cracked spot and false melanoses. Leaves are also affected by this disease. The development of black spot disease is enhanced by rainfall and by soil having excess amount of moisture.

B. Greening: It is a severe plant disease. It is otherwise called Huanglongbing (HLB) or yellow dragon. There is no cure to this disease once it is invaded. It can destroy all types of citrus trees including orange. The growth of affected trees gets stunted. Its symptoms can be often mistaken with that of the nutrient deficiency diseases.

C. Melanosa: It is saprophyte that finishes its lifecycle on dead twigs. The severity of the disease is identified by the measure of inoculum on dead wood in the tree overhang and the span of wetting periods. 18-24 hours of wetting are needed for contamination to happen and extreme disease is supported by long stretches of persistent wetting. Spores cause issues when there are critical measures of dead wood on trees, on the ground or in heaps of brush left in the forest.

D. Greasy Spot: It is the most severe disease of orange plant. It is a fungal disease caused by *Mycosphaerella citri*. It is developed through stomata on the underside of leaf. It mainly affects the leaves of plants. The cycle of this disease is around a year in areas with high temperature and high rainfall. The symptoms of greasy spot are pale yellow lesions on the underside of the leaf. High humidity and high moisture favours the disease.

E. Scab Disease: Scab is caused by the fungus *Elsinoe fawcettii*. Fruits, leaves and twigs of the plant are mainly targeted by the pathogen. The disease is spread on the surface of the leaf. The growth of fungus is liberated by the rain and overhead irrigation. Protective copper sprays are used to control the disease.

F. Alternaria brown spot: It is caused on young leaves by the pathogen *A. alternata*. The temperature range for this disease is 25 to 28 degree. The disease is spread on leaf, stem and other parts by air borne spores.

G. Canker: It affects the branches and structurally weaken parts of the plant. It is caused by the bacteria *Xanthomonas axonopodis*. It causes lesions on the leaf, fruit and stem of the plant. The lesions are translucent and of slightly color. The infection agent of the disease is wind driven rain. The disease cycle is around 90 days.



(c)

(d)



(e)

(f)



(g)

Different disease categories of orange plant

III. METHODOLOGY

In this paper, we develop the system using MATLAB Software. It is the programming language implement by Math Works and is simple and easy way to make learning fast and efficient. Data is collected from various resources. Data mining classification techniques and segmentation techniques are used to detect the plant disease. We developed software that tests the seven diseases namely black spot, greening, melanosa, greasy spot, scab disease, alternaria brown spot and canker disease. Then next step is implemented to extract the feature from dataset. In the third step, classifier is applied to train and test the input data. The model then classifies all the weather parameter of particular plant disease and then segmentation techniques are applied to segment the image data. Then the system finds the category name of disease based on input data and shows the result.



(a)

(b)

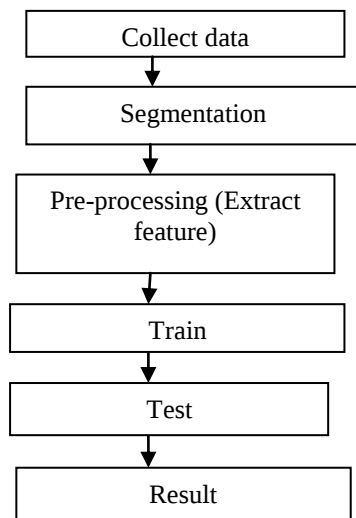


Fig 2. Flow Diagram of different steps of disease predict

A. Data collection:

Rainfall of plant is collected from PAU and another weather feature of plant is collected from online site of Orange plant. Image data is directly captured from disease plant of Orange.

B. Segmentation:

In this phase, segmentation is applied to extract texture feature of specific part of image. This method is used to extract the texture feature from image and divide into different parts. The main purpose of the segmentation is to simplify the image and easy to analyse. They include the factor such as to decrease the noise and enhance the image.

1. *K-means clustering*: k-means clustering is the unsupervised learning technique to solve the well-known problem of clustering. This is the technique of vector quantization, basically from signal processing. It is very significant for cluster analysis in data mining. K-means clustering is use to extract the feature and divide into constitute part.

2. *Deep neural network learning*: this method is used to extract the automatic feature without human conflict. In this method, the systems know to recognize relationship between important features and produce excellent results. They draw association within feature property and what those feature produce. This classifier is used to train and test the available dataset.

3. *Spatial Grey Level Dependence Matrix*: It is a matrix to extract the texture of image. Information like spatial arrangement of colour and image intensity is provided through SGLDM. Manual selection of region is the base of this matrix.

C. Pre-processing

In this phase, extract the feature of plant from input dataset. Feature includes the weather feature of the plant.

D. Feature extract

In this phase, simplify the number of the data that show the large data.

IV. Result

The system is performed on the different data. These dataset include the disease image of orange plant and also include the weather feature such as temperature, rainfall and humidity. The dataset used the seven categories of disease namely black spot, greening, melanosa, greasy spot, scab disease, alternaria brown spot and canker disease. First apply the segmentation technique such as k-means clustering divide the image into specific part and show the disease part of orange plant. Next In pre-processing, features are extracted from input data. Then apply the classify technique such as deep neural network learning to classified the feature of plant. They train and test the input data and predict the name of disease to effects the yield of orange plant.

V. Conclusion

Plant disease is the main problem promoting death of the plant and it effects human health also. This research determines the colour imaging and texture feature analysis of the image could be used for differentiating the plant disease. In this paper, we develop the system to achieve high accuracy and to predict the disease of orange plant. We used the segmentation technique such as k-means clustering and deep neural network learning to detect the disease part and disease name of the orange plant based on image data and weather feature of plant. The proposed gives accurate result and provide 99% accuracy. This system helps the farmer to understand the disease of the orange plant.

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