

Automatic Leaf Disease Identification and Classification using Image Processing and Python

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Abstract

Few years back to develop and maintain a agriculture field is takes more man power. The farmer wants to maintain the crops periodically, whether the crops get affected by the disease or spots in the leaf. This can reduce the crop yields and affects the quality. The main symptoms are the change in colour and the dark spots in the leaf. The yielder can finds by the symptoms the plant gets affected by some disease to find out which kind of disease pathogen detection has been done manually it takes more time and consumes man power. To made this disease identification work simple in this paper they proposes the identification of disease by images. The images undergoes three stages preprocessing, training and identification. By using the python language the identification made simple. In paddy downey mildew can cause major defects.

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1. Introduction

Agriculture is the back bone of our country. Today most of them are doing smart way of framing. The smart way in which it reduces the man power and saves the time. All the work are made automatically. In before we want to water the plant we need to check the field moisture and crops condition then operate the motor. But now we use the some different types of sensor these sensor can sense the moisture level of the soil and pump the water according to the plant need. Likewise to protect the leaf from the disease, want to monitor the crops regularly whether the crops gets affected from the disease. The affected crop is identified by the parts of the plant. Presence of black spots in leaf, stem, root. The affected part is get treated in the laboratory using pathogen identification it consumes more man power and it consumes more human work. The people who have well knowledge can able to predict the kind of disease in the crops or the person who have experience in the farming field and able to find out the kind of disease in the crop. The disease can affect the yield of the crops. For each crop various kind of disease takes place. For example in

paddy downey mildew disease takes place which can affect the paddy crops majorly. The disease affected plant leaf colour get varied and the spots in the leaf, changes in the stem and in the root section. The disease can spread to the neighboring paddy crops and affect the major protection of the field. To detect the disease in the early stages and avoid spreading and make prevention, this system proposes by using the python image processing technique to predict the disease of the plant automatically at the initial stage and to save the crop.

This technique involves three different stages training, preprocessing and identification. The preprocessing stage in which the affected leaf is get captured, the captured leaf of the image is undergoes the preprocessing after the stage of the preprocessing the training stage is undergoes in which the image of the leaf is get compared with data base data. By using the data and the python technique the comparison has been made the comparison can be made at each section of the leaf part majorly in the black spots of the leaf. After the comparison the identification is made from the data. The data contains all the various types of disease of each

plant. Based upon the data the identified result is easily fetched. The disease affected plant leaf colour get varied and the spots in the leaf, changes in the stem and in the root section. The disease can spread to the neighboring paddy crops and affect the major protection of the field. To detect the disease in the early stages and avoid spreading and make prevention, this system proposes by using the python image processing technique to predict the disease of the plant automatically at the initial stage and to save the crop. It makes the work more simple and identification does not required a skilled or experienced person. The leaf major and the minor axis are need to consider for the comparison with the data. These three stages of prediction can make the work more simple and saves the time.

2. Literature Survey

Jayamala K. Patil, Raj Kumar et., al., proposed in agriculture most of the loss is due to the infection of the crop. To prevent the loss the detection of the leaf disease is to be predicted before itself. The major disease are the bacterial, fungus and late blight which are the common disease founds in the crops .In this paper they proposes the identification of the disease in the tomato leaf using CNN algorithm and the learning vector quantum algorithm. These both algorithm can identified the affected plant crops and predict the kind of disease which it is suffer from. The CNN can take the images of the affected leaf and compare the images with the data in the data set. The data set which has nearly 600 images with various angles and various sections of the plant. They can first compare the color of the leaf image with the data for that it uses the RGB channels to predict the result. After the comparison has been made the vectorisation system is get implemented at the output path of the result to provide the accurate disease. The experiment has been in practical to recognize the outcome has same by use of various types of affected tomato leaf disease [1].

Revathi, M.Hemalatha, et., al., proposed the image processing technique is used in this paper to identify the affected leaf disease. For this they can undergoes various sections. The first stage is the preprocessing; they can predict the affected leaf from the normal leaf. The analyze of the affected leaf disease can be made with the preprocessing. Then the next stage is the segmentation of each section of the leaves using the K means algorithm, This can separate each part of the leaves from the normal area and can finds which are is get affected. From the affected leaf section parts the area is get extracted. The extracted result is get into the identification of the disease. The data are get allocated in the separate section of the data base. The section can have different set of images the images are compared with the affected leaf disease. The compared result is accurate then they shows the kind of disease which the crop gets suffered. Some of the features are get extracted from the grade-level occurrence matrix which helps in identification is separate part and the SVM can also plays a major role in the classification [2].

H. Al-Hiary, S. Bani-Ahmad., al., proposed the identification of the disease in the tomato plant using deep learning technique system. The tomato which would wants to grow it needs moisture content, sunlight and some environment conditions. The image processing system is used to find the kind of disease which is get affected. The image of the tomato leaf is get captured in the some various section of the leaf. The capture box model is used to capture the image in periodically. The capture box which is the motor controlled it can capture according to that. The dot spot leaf and colour changed leaf is mainly consider in account. The deep learning technique of convolution system has been used. The particular occurrence of breed Diamante max which is used as the test breed for this paper. The data set which has the 5000 sets of images it has both the affected and unaffected leaf. The leaf can be compared with the data by using convolution neural method. This method can predict the result of the crops in which nearly 80% of the crops are healthy and 10% of the crops get affected and the remaining 10% of the crop is half affected from disease. The RCCN can trained to identified which type disease the tomato plant is get affected which is accurate [3].

Piyush Chaudhary, Anand K. Chaudhari et., al., proposed In India the major fruit which is get grown over all the places are the grapes. In some period of season the production of grapes gets reduced. Due to the disease get affected in the grapes plant. The major leaf disease are the fungal, bacterial and viral. To predict the accurate disease in which the grapes get suffer in this paper proposes the use of the image processing technique. This can capture the images of the grapes plant by preprocessing. The SVM algorithm is used to find out the result. At the initial stage the k means system is used to segment each section of the leaf and they clustered to each other. Then the colour and the texture is extracted. After this the SVM method is used to predict the accurate type of disease in which the plant is suffered. This method can gives a approximate result of satisfying nearly 85% [4].

S. Arivazhagan, R. Newlin Shebiah et., al., proposed the use of the artificial neural network technique to detect the disease in the brinjal plant. The leaf disease in the brinjal can be identified by the image processing technique. In spite of considering the whole plant for the disease identification considers the leaf part is enough because nearly 80-90% of the disease takes place in the brinjal leaf. The major disease which affect the leaf are the bacterial, Tobacco mosaic virus which is commonly says as the TMV. Some several dot spots in the leaf parts. By using the neural technique the particular disease is get identified. The k means system is used to segmentation of the affected leaves and it get clustered. The clustered image is get compared with the data by using the artificial technique. It can found nearly 82% of the accurate result of the affected leaf disease [5].

Chanchal Srivastava, Saurabh Kumar Mishra et., al., proposed the disease test is done in the tomato plant. Because the most of the tomato plants are majorly

affected by the disease. The disease can be predicted by the detection algorithm using deep learning technique. The disease in the plant can be predicted by the VGC16 method which implies less amount of time to predict the result. The disease plant gets under goes into some level of section the segmentation is the part of the processing which can be done using the k means system. The affected part gets cluster into one section. The data in the set can be compared with the one another to identified the disease. In china these system is followed there most of the tomato plants gets affected by the disease which result in lack of production in the farming. The preprocessed method is trained using Tensor flow and the deep learning framework is made to get the accuracy of about 90% [6].

Mrunalini R. Badnakhe, Prashant et., al., proposed about the major fruit which is grown in India. The grapes fruit which is get cultivated in enormous number. The plant gets affected by some common disease we can't able to find out all the affected plant manually it is impossible one. This can reduces the yield and result in loss of money. To overcome this they propose that the use of the image processing technique it uses the SVM and neural network method. The SVM method can preprocess the affected leaf from among the common leaf. The leaf is get segmented and then get extracted using the artificial technique. The SVM can collect the affected leaf and compare the leaf data with the data in the data set. Based upon the comparison the type of disease the plant gets affected. This method can reduce the infection of the grapes plant in the earlier stage. And the precaution has been made to prevent the spreading of the disease to the neighboring plant. The ANN method can plays a vital role in identification of the disease in the grape plant. The proper detection can gives a approximate grade of 70-75% [7].

Salem Saleh Al-amri, Dr. N.V. Kalyankar et., al., proposed the comparison of the leaf based upon the colour segmentation. The cotton leaf which is get affected by the disease, the colour of the leaf is get varied. The image is captured based upon the colour change of the leaf. The major disease which the leaf gets affected is the viral, bacterial, and the fungal. The disease are get classified according to the colour segmentation of the leaves. The leaf whose layer is get more rough when the disease is get affected. By using the detection algorithm the colour of the each cotton plant leaves is identified and comparison is made to predict the disease. Based upon the result the precautions have been taken. It can provide a satisfying value in the range of 87-89%. The disease can be identified in the earlier stage and protect it from spreading to the neighboring plant [8].

Prof. Sanjay B. Dhaygude, Mr.Nitin P.Kumbhar et., al., proposed the Indian economy mainly depends in the agriculture. So there is the responsibility to protect and maintain the field. The crops in the field is get affected by the disease, the disease affection among the crop is the common thing. So the manual work for identifying the plant disease is not possible for the large farm. So the automation identification of the disease in the plant is get

proposed. This can be achieved by the image segmentation technique in which the affected leaf is get captured and the leaf is subjected to operations and using the genetic algorithm the disease in the plant can be predicted. This can saves the quality of yielding and loss of money in the agriculture. Without agriculture we can't able to live a special concern has been made to take consideration. To predict the leaf at the earlier stage the segmentation model can be more useful. The leaf are get majorly affected by the bacterial, fungal and TVM. These disease can be identified at the initial stage and prevent the crops [9].

Dheed Al Hiary, S. Bani-Ahmad et., al., proposed the productivity gets decreased or the plant growth is decreased is mainly to do the plant gets affected by the disease. The disease affected plant can be easily identified by the leaf of the plant. Because most of the disease will majorly affect in the leaf. The researches has been made to predict the disease but it will not gives a exact result. So in this paper they propose the use of the SVM and KNN technique which can predict the disease in the initial stage. They can undergo three different sections the processing, segmentation and extraction. The affected leaf image is compared with the data images and identified the disease. When the leaf is get affected by the disease it look like dark spots on the layer or patches in the layer. This approach can gives nearly 90% off expected disease identification [10].

3. Review in Automatic Leaf Disease Identification And Classification Using Image Processing and Python

This mainly shows about the plant disease identification using image processing technique. Various several method are there but all are not providing the accurate result. Here the image processing is implemented in the paddy crops. The plant if it gets affected by the disease it can be characterized by the spots in the leaf and change in the colour of the leaf. The image processing can capture the image of the affected leaves and it undergoes three stages pre-processing, training and identification. To identified an accurate disease in paddy.

4. Results

The disease of the above uploaded image comes out to be Alternaria Alternata agent. Its prevention, an image of the disease-causing agent and further details are given in Figure 8. For knowing further details about the leaves, redirect to table 4.1

Table 4.1 - disease detection by different clusters

Disease Detected	Value of K	Actual Disease
Cercospora	5	Alternaria
Cercospora	7	Alternaria
Alternaria	9	Alternaria
Alternaria	11	Alternaria
Alternaria	13	Alternaria
Bacterial Blight	15	Alternaria
Anthrachnose	17	Alternaria

The table 4.1 shown below is the resultant output for the loaded image. Results obtained after detection of this leaf disease which is coming out to be Alternaria Alternata, is also calculated for different cluster values while performing K means segmentation. The clusters 9, 11, 13 give the correct value of disease.

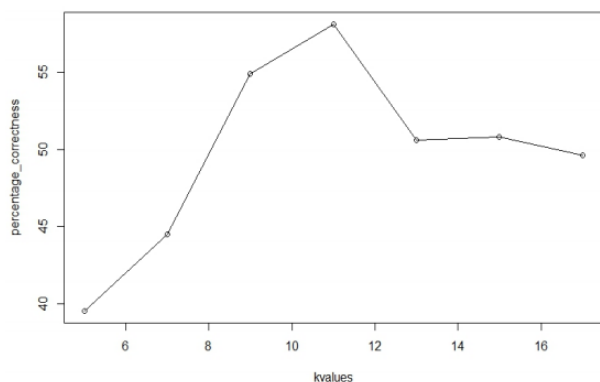


Figure 4.1: Plot showing accuracy for $k \in \{7, 9, 11, 13, 15, 17\}$

The graph shown above in figure 4.1 is highlighting the accuracy of prediction made by the proposed model. The maximum peak is giving more than 50% accuracy at cluster value 11. From our practical findings we observed that 11 means clustering ($k=11$) gave the best results of all the test set images chosen. From the results obtained we can conclude that by increasing the number of cluster points in the model, the accuracy also increases but after a certain threshold value, the accuracy again decreases. In this case, the threshold value is $k=11$. More information about the disease detected can be extracted from the proposed model like disease prevention, causing agents of the disease detected etc.

5. Conclusion

The use of automated monitoring and management systems are gaining increasing demand with the technological advancement. Widespread disease is the main cause of yield loss in the agricultural field. In Most of the cases detection and identification of the disease is noticed when the disease advances to the severe stage. Hence, it causes the loss in terms of yield, time and money. The proposed system is capable of detecting the disease at the earlier stage as soon as it occurs on the leaf. Therefore it is possible to save the loss and reduce the dependency on the expert to a certain extent. So that it helps the person who is having less knowledge about the disease. Depending on these goals, we have to extract the features corresponding to the disease. Future scope of this chatbot is very vast as researchers already mentioned that future era is messaging app, it means people are going to spent more time on the messaging app than other. So by using Chatbot it does not matter how far a person is, the only thing that is required are a simple desktop, tablet and smart mobile etc. The smartness and intelligence of the chatbot can be increased by conducting more study and

increasing the database so that Chabot could answer all type of question about every type of disease. Audio system can also be included in this system to make this Chabot more interactive.

References

- [1] Jayamala K. Patil, Raj Kumar, —Advances In Image Processing For Detection of Plant Diseases I, JABAR, 2011, 2(2), 135-141.
- [2] P.Revathi, M.Hemalatha, —Classification of Cotton Leaf Spot Diseases Using Image Processing Edge Detection TechniquesI, ISBN, 2012, 169-173, IEEE.
- [3] H. Al-Hiary, S. Bani-Ahmad, M. Reyalat, M. Braik and Z. ALRahamneh, —Fast and Accurate Detection and Classification of Plant DiseasesI, IJCA, 2011, 17(1), 31-38, IEEE-2010.
- [4] Piyush Chaudhary, Anand K. Chaudhari, Dr. A. N. Cheeran and Sharda Godara, —Color Transform Based Approach for Disease Spot Detection on Plant LeafI, IJCST, 2012, 3(6), 65-70.
- [5] S. Arivazhagan, R. Newlin Shebiah, S. Ananthi, S. Vishnu Varthini, —Detection of unhealthy region of plant leaves and classification of plant leaf diseases using texture featuresI, CIGR, 2013, 15(1), 211-217.
- [6] Chanchal Srivastava, Saurabh Kumar Mishra, Pallavi Asthana, G. R. Mishra, O.P. Singh, —Performance Comparison Of Various Filters And Wavelet Transform For Image De-NoisingI, IOSR-JCE, 2013, 10(1), 55-63.
- [7] Mrunalini R. Badnakhe, Prashant R. Deshmukh, —Infected Leaf Analysis and Comparison by Otsu Threshold and k-Means ClusteringI, IJARCSSE, 2012, 2(3), 449-452.
- [8] Mr. Salem Saleh Al-amri, Dr. N.V. Kalyankar and Dr. Khamitkar S.D, —A Comparative Study of Removal Noise from Remote Sensing Imagel, IJCSI, 2010, 7(1).
- [9] Prof. Sanjay B. Dhaygude, Mr.Nitin P.Kumbhar, —Agricultural p lant Leaf Disease Detection Using Image ProcessingI IJAREEIE, 2013, 2(1), 599-602.
- [10] Dheed Al Hiary, S. Bani-Ahmad, M. Braik, —A Framework for Detection and Classification of Plant Leaf and Stem DiseasesI, IEEE, 2010, 113-118.