International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 07 Issue: 04 | Apr 2020 www.irjet.net p-ISSN: 2395-0072

Plant Leaf Disease Detection and Automated Medicine Using IoT

Nireeshma R[1], Rashmi R[2], Sangeetha M[3], Spoorthi M E[4], Shilpa B L[5]

[1,2,3,4]*Students, Dept. of Computer science and Engineering, Vidya Vikas Institute of Engineering and Technology, Mysore, Karnataka, India*
[5]*Professor, Dept. of Computer science and Engineering, Vidya Vikas Institute of Engineering and Technology, Mysore, Karnataka, India*

Abstract – *India being an agricultural country is facing a lot of challenges regarding various diseases on crops. Due to the usage of pesticides it affects the farmer's lifestyle. Lack of maintenance of farm results in gradual decrease in yield of crop. So we need a fast detection and identification of diseased plants. To resolve the above problem, it is required to develop a new system which keeps track of the farm and identify the disease as soon as possible. In this paper we have proposed a novel prototype to solve the above problem by monitoring the crops in a timely manner using agricultural robot and with the usage of the technique called image processing which gives a better solution to the above problem statement. The agricultural robot system is developed to develop and monitor the crop disease. The agricultural robot sprays the pesticides to crops to prevent them from diseases and also identifies the diseases on various infected leaves.*

***Key Words*: Agricultural robot, image processing, pesticides for crops, prototype, diseases.**

1. INTRODUCTION

Agriculture is said to be the best sources of income in India. It alone can constitute about 22% of the country's income. Infected plants often lead to a reduction in quantity of the yield and if more infected then results in no yield thereby reduces the income. By spraying pesticides on infected crops increases yield and income but this requires continuous monitoring of the farm by farmers. Farmers cannot look into their farms all the time due to many reasons. This issue is solved by introducing an agricultural robot which automatically detects infected crop and sprays required amount of pesticides to that infected crop thereby reducing the work of a farmer. Manual identification of infected crops in farms is time consuming and at the same time is not as accurate as agricultural robot.

We have used image processing as a technique to identify the amount of disease spread around a leaf and to spray a proper pesticide to it. This can include a series of steps from capturing the image of the leaves to identifying the type of the disease and spraying pesticides using Raspberry PI. Raspberry PI is being used to interface the camera used for capturing the images and display device through which the data is stored in the cloud. One of the important features is the crops are continuously monitored and the data is being streamed lively. Next the captured images are analysed by various steps such as Acquisition, Pre-processing, Segmentation, Clustering etc. This reduces the need of the labours in the farm and also the productivity can be increased.

The Concept of using Image Processing Techniques through python OpenCV platform is used for leaf disease identification through detection of diseases. Generally, Leaf identification process includes recognizing the leaves through its structures like pattern, colour, texture and type of disease. This automation will help the farmers to reduce their efforts and also their working time. By using this method, we can differentiate between the normal leaves and the diseased leaves and the Agricultural robot will spray the pesticides to the diseased leaves.

1.1 Problem Statement

India is well known for its agriculture and most of the people are dependent on agriculture as their income. While cultivating the crops farmers are facing many challenges like spots on the leaves. It is required to identify the disease and take certain measures to avoid them.

1.2 Aim

Our main aim is to load the image data sets of various common leaf diseases then input image as test dataset, identify an infected area and build a model based on SVM algorithm. This helps our farmers to classify the disease and to spray pesticides by comparing data defined using features and segments.

2. EXISTING SYSTEM

The existing system for plant leaf disease detection is simply visual monitoring of farms by farmers or experts. This system requires large number of people to monitor and it also requires continuous monitoring of plants which will result in a very high labor cost when the land is too large.
Visual monitoring of farms as mentioned above is time consuming as well as is not accurate. To overcome this issue, leaf diseases are identified using image processing techniques however there's no correct application to classify the leaf once capturing its images and identifying its attributes. In plant leaf classification leaves have completely different morphological options. A number of the classification techniques being used are Fuzzy Logic, Principal component Analysis, K- Nearest Neighbor Classifier.

3. PROPOSED SYSTEM

To remove the challenges faced by our farmers we have come up with a new technique for identifying diseases and to spray pesticides to the leaves. Digital camera is used to capture the images of different leaves. Image processing techniques are applied to those leaf images to process and to get some useful information for further studies. Once it detects the disease, proper pesticide is sprayed to that infected leaf in a required amount. Disease detection is done through SVM (Support Vector Machine) algorithm which is a supervised machine learning algorithm used for classification or regression challenges. However, it is mostly used in classification problems. By doing so, it has reduced farmer's tension regarding diseases that affect crops and also reduces the consumption of time and money.

4. METHODOLOGY

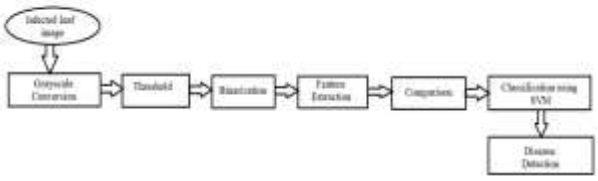

Fig -1: Stages in Leaf Disease Detection

The first stage of the content identification is image pre processing which is done with the help of cropping, clipping and other processes. Before processing, the image needs to be converted into the grayscale image because it provides the better results.

Frame Extraction is usually modelled as a typical clustering process that divides one video shot into several clusters and then one or several frames are extracted based on low or high-level features.

Grayscale Conversion:

Diseased leaf image is given as an input to the application and is converted to gray scale. Gray scale conversion involves a pixel which is made up of 4 components. They are Alpha, Red, Green and Blue. Alpha determines the transparency while red, green and blue determines the color of the pixel. These 4 components are denoted as A-alpha, R-red, G-green, B-Blue and each of these 4 components (ARGB) has a value ranging between 0 and 255. 0 means the component is missing while 255 means components are fully present. We can represent the value 0 to 255 using bits and hence each component can be represented using 8 bits.

Therefore, we will need 32 bits to represent a pixel. Converting an image into gray scale is very simple and the steps for conversion are as follows:

1. Take the RGB value of the pixel.
2. Find the average of RGB (Avg=R+G+B/3).
3. Replace the R, G, B value of the pixel with Avg.

Threshold:

Image Thresholding is a simple, yet effective way of partitioning an image into a foreground and background. This image analysis technique is a type of image segmentation that isolates objects by converting grayscale images into binary images.

Binarization:

Binarization is a method of converting any gray scale image into black and whit images. To perform Binarization process, First find the value of the gray scale and check whether a pixel having a particular gray value or not. If the gray value of the pixel is greater than the threshold, then the pixels are converted into white and the pixels with lesser values are converted into black.

Feature Extraction:

The next stage is feature extraction. Invariant scale feature transform is used to derive the important features from the segmented region. This method retrieves the feature according to the relative position because it does not change from one image to another image. Features play a very important role in the area of image processing. Feature extraction techniques are applied to get the features that will be useful in classifying and recognizing. It also describes the relevant shape information contained in a pattern so that the task of classifying the pattern is made easy.

The main goal of feature extraction is to obtain the most relevant shape information from the original data and represent that information in a lower dimensionality space. When the input data to the algorithm is too large to be processed and is suspected to be redundant then the input data will be transformed into a reduced representation of set of features. Transforming the input data into the set of features is called Feature Extraction.

Comparison:

Here we define "Comparing two images" as finding differences or similarities between two images. Differences may be quantitative or qualitative. Comparing images may be useful if finding differences and similarities.

Classification using SVM:

Classification is done by using SVM algorithm and it involves the following steps:

1. Load the plant leaf diseased image dataset as trained dataset.
2. Input image as test dataset.
3. Build model using SVM.
4. Compare data by defining the features and the segments.
5. Classify disease.
6. Spray pesticides.

Disease Detection:

Once the feature is extracted the leaf disease can be identified using SVM and ANN algorithms.

5. CONCLUSION

The identification of diseased leaf and spraying relevant pesticides to them is very important for any farmer while cultivating crops which is done through an agricultural robot here. This robot which is used to detect diseases detects them at the initial stages and takes proper measure of the crops by spraying relevant pesticides in a limited amount and only to the infected part. In this paper we have discussed techniques to detect diseases and how to overcome from them by spraying pesticides.

REFERENCES

[1] P.Revathi, M.Hemalatha, ―Classification of Cotton Leaf Spot Diseases Using Image Processing Edge Detection Techniques‖, ISBN, 2012, 169-173, IEEE.
[2] Piyush Chaudhary, Anand K. Chaudhari, Dr. A. N. Cheeran and Sharda Godara, ―Color Transform Based Approach for Disease Spot Detection on Plant Leaf‖, IJCST, 2012, 3(6), 65-70.
[3] 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 features‖, CIGR, 2013, 15(1), 211-217.
[4] Gautam Kaushal, Rajni Bala, "GLCM and KNN Based Algorithm for Plant Disease Detection", International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering, Vol. 6, Issue 7, July 2017, pp. 5845 – 5852.
[5] V. Pooja, R. Das, and V. Kanchana, "Identification of plant leaf diseases using image processing techniques," in Proceedings of the 2017 IEEE Technological Innovations in ICT for Agriculture and Rural Development (TIAR), pp. 130–133, Chennai, April 2017.
[6] Pallavi. S. Marathe, "Plant Disease Detection using Digital Image Processing and GSM", International Journal of Engineering Science and Computing, April 2017, pp. 10513-15.
[7] Saradhambal G, Dhivya R, Latha S, R. Rajesh, "Plant Disease Detection and Its Solution Using Image Classification", International Journal of Pure and Applied Mathematics, Volume 119, No. 14, 2018.
[8] Santhosh Kumar S, B. K. Raghavendra, "Diseases Detection of Various Plant Leaf Using Image Processing Techniques: A Review", 2019, 5th International Conference on Advanced Computing & Communication Systems (ICACCS).
[9] Abirami Devaraj, Karunya Rathan, Sarvepalli Jaahnavi, K Indira, "Identification of Plant Disease using Image Processing Technique", 2019, International Conference on Communication and Signal Processing (ICCSP).
[10] Sukhvir Kaur, Shreelekha Pandey, Shivani Goel, "Semi-automatic leaf disease detection and classification system for soybean culture," IET Image Process, vol. 12, issue. 6, pp. 1038-1048, May 2018.
[11] G. Owomugisha and E. Mwebaze, Machine learning for plant disease incidence and severity measurements from leaf images, 2016 15th IEEE Int. Conf. Mach. Learn. Appl., 2016.
[12] Indumathi, R., N. Saagari, V. Thejuswini, and R. Swarnareka. "Leaf Disease Detection and Fertilizer Suggestion." In 2019 IEEE International Conference on System, Computation, Automation and Networking (ICSCAN), pp. 1-7. IEEE, 2019.
[13] Kuricheti, Gayatri, and P. Supriya. "Computer Vision Based Turmeric Leaf Disease Detection and Classification: A Step to Smart Agriculture." In 2019 3rd International Conference on Trends in Electronics and Informatics (ICOEI), pp. 545-549. IEEE, 2019.
[14] Jiang, Peng, Yuehan Chen, Bin Liu, Dongjian He, and Chunquan Liang. "Real-Time Detection of Apple Leaf Diseases Using Deep Learning Approach Based on Improved Convolutional Neural Networks." IEEE Access 7 (2019): 59069-59080.