International Journal of Innovative Technology and Exploring Engineering (IJITEE)
ISSN: 2278-3075 (Online), Volume-9 Issue-1, November 2019

Leaf Disease Classification using SVM Classifier in Cloud

Raghavendran.S, P.Kumar, Darwin P

Abstract*: In this modern era the clinical laboratory have greater attention to produce an accurate result for every test particularly in the area of leaf disease. The leaf disease is very essential to detect. For the identification of leaf disease three phases are used. First phase is the segmentation and the segmentation used here is the Otsu's threshold based segmentation. While using the Otsu's threshold based segmentation we get better result when compared to the previous method. Second phase is the feature extraction here the feature is extracted using the ABCD feature. And the third or final phase is the classification. SVM classifier which is used to categorize the leaf disease separately. The simulations are done on MATLAB application.

Keywords* : *Leaf disease, bilateral filter, Otsu's segmentation, ABCD feature, Support Vector Machine.

I. INTRODUCTION

India is a cultivated country. Then approximately 80% of the people relies upon on agriculture. Agriculturalists have huge kind of several desirable crops and locating the appropriate herbicides and pesticides for plant. Disease on plant leads to the convincing deduction in together the quality as well as productivity of agricultural merchandise. Plant disease prevention and control has always been widely discussed as plants are exposed to the external environment and prone to diseases. Generally, accurate and rapid prognosis of disease plays an important function in controlling plant disorder, on the fact that beneficial safety measures are often taken after accurate diagnosis. [1].

This system is based on image processing technology and makes use of MATLAB as the principle processing tool. In addition, virtual image processing, mathematical facts, plant pathology, and different related fields are also considered. In order to develop an automated technique to analyze the infections, a database is generated.

Revised Manuscript Received on November 30, 2019.
***** Correspondence Author
Raghavendran.S*, Research Scholar, Centre for Information Technology and Engineering, Manonmaniam Sundaranar University, Abishekapatti, Tirunelveli-627012, Tamilnadu, India and Assistant Professor, Department of Computer Science and Engineering, Vel Tech Rangarajan Dr.Sagunthala R&D Institute of Science and Technology, Chennai. Email: vsraghavendran@gmail.com
P.Kumar, Assistant Professor, Centre for Information Technology and Engineering, Manonmaniam Sundaranar University, Abishekapatti, Tirunelveli-627012, Tamilnadu, India. Email: kumarcite@gmail.com
Darwin P, Research Scholar, Centre for Information Technology and Engineering, Manonmaniam Sundaranar University, Abishekapatti, Tirunelveli-627012,Tamilnadu, India.Email: darwin009@gmail.com

The database contains data related to plant leaf condition, minerals in the soil and the symptoms of disease to be affected. The plant details and the identification of disease from the feature variation are stored in the Cloud database. The entire database is viewed and compared on capturing the image. The application is developed for accessing the data and providing intimation to the farmers. Thus the variation in image from the database and the test image indicates the disease in the leaf.

II. LITERATURE SURVEY

For Plant leaf disease Savita N et al. [7] various order processes considered. Each example of magnificent preparing is classed in classification technique essentially dependent on their morphological element. Different systems, for example, Artificial Neural Network, Probabilistic Neural Network, Genetic Algorithm, k-Nearest Neighbour, PCA and Fuzzy rationale. This situation is an intense mission to pick a grouping approach, since of the reality each arrangement techniques take its very specific benefits and negative marks. This system empowers to close, which request to appropriate for a specific programming. K-Nearest-Neighbour approach is a champion among the best computations to test classes anyway it is very time troublesome with making desires. A neural framework takes ability to endure boisterous data in any case having hard to catch set of standards shape. For requesting high-dimensional instructive record SVM set out to be the best available machine learning is determined

Sanjay et al. [8] proposed the programmed identification of plant leaf. The way that morphology with their regenerative structure might be utilized to recognize entities was distinguished Microscopic living beings have less perplexing lifestyles cycle just as generally have single cell. It parcels into two cells matched parting and addition in numbers. Diseases are non-protein related protein and genetic solid based totally almost no particle. They built up a getting ready arrangement with 4 phases. In any case, takes input RGB picture and makes concealing change. Second, conversion from RGB to HIS takings region for concealing descriptor. Third, wrapping of pixel just as ejection of unwanted concealing the use of unequivocal edge, in perspective on that extraction of beneficial division has stayed wrapped up. Fourth, register the information from SGDM networks just as review plant leaf diseases.

For plant diseases detection as well as classification Pramod and S. landgeet [9] arranged a picture preparing based programming.

Because of absence of agricultural business master get to it clears up how Indian ranchers faces issue with plant diseases. In view of their shape, surface and masking the plant disease is perceived consequently. After identification of plant disease this gadget gives quick and prompt records to ranchers with SMS. This machine will lessen cost, substance testing strategy, time as well as upgrade productiveness

Ashwin Patil R. K and H. Kulkarni. [10] Conceived a system to distinguish plant conditions appropriately. This methodology joins picture planning strategies alongside Artificial Neural Network (ANN). This system first catch unrefined picture of plants. After that using the gabor channel the picture is chosen and divided. At that point, separate the shading data from sectioned image. Utilizing Artificial Neural Network the leaf image is recognized among solid and unhealthy plant analyzer. For ANN based classifier masking and surface are two profitable parameters. This classifier keeps running with continuous requirements and presentations 91% exactness on execution.

In [11] Haiguang Wang et al. planned a model to enhance correctness of image acknowledgment as well as determination of plant infection. Two sorts of wheat issue (wheat stripe rust just as leaf rust) just as grapes infections (grape wool structure just as fine develop) have been underneath assessment. Picture planning which consolidates picture pressure, picture altering and picture denoising together with k-infers batching figurings for division were used for picture affirmation. 25 surface features, 21 shading features and four shape features were removed from the each image. The ailment was recognized using Back Propagation (BP) counts based classifier. Results appear, back propagation systems are amazingly powerful to character the ailments. The measurement information is included utilizing standard Component Analysis (PCA).

Piyush Chaudhary et al. [12] a image handling method to planned a framework for spot division for plant leaf maladies. In view of the division of plant conditions the underlying and critical stage for plant location. While contrasting and plant leaf masking, diseases marks are similar in hues yet unique now power. So RBG masking change can be a superior decision for ailments spot division. This work, impact of HSI, CIELAB shading as well as spaces relationship for spot discovery. Image smoothing is come to through middle channel. To figure edge Otsu technique is given to recognize disease spot on shading segment. Different "Dicot" as well as "Monocot" family plants leaves were analyse in together uproarious as well as clam or free (white) foundation. Created calculation is autonomous of maladies spot shading, plant type as well as foundation commotion.

M. Egmont-Petersen [13] partitioned into different applications for image preparing calculations. Arrangement is achieved with as a two dimensional scientific categorization. One estimation portrays object affirmation, data decline/feature extraction, pre-handling, division, improvement and picture understanding. Two estimation grasp data and do distinctive reflection level task as structure-level, object-set-level, pixel-level, object-level close by segment level just as scene portrayal.

Muhammad Faisal Zafar et al. [14] organized the grape leaf assurance system. It joins three rule organize: beginning one is stunning back ground concealing extraction, next concealing extraction contaminated bit of leaf and last one is ailment gathering. Concealing examination has been performed with the usage of self-organizing feature blueprint back proliferation neural framework. GA just as MSOFM are submitted for leaf disease division and SVM passed on for gathering. After these filtration of picture has remained performed through Gabor Wavelet just as associated with SVM for portrayal of clear disease. Grapes leaf ailments are isolated into three social occasions in this system: Rust disease, Scab ailment and No illness. This system shows wide execution for country use

ArnalBarbedo and Jayme Garcia [15] proposed a work to distinguish plant infections by different picture preparing strategies in the obvious range. In this, just one leaf plant is analyzed on the framework and study is done in a matter of seconds. NiketAmoda and SmitaNaikwadi [16], start another product advancement for leaf and grouping of sick plant. After the procedure of division, two stages are effectively joined. In the initial step, distinguish which pixel has the most green shading and the subsequent advance is conceal with Otsu's technique with the specific limit worth characterizing the specific pixel. The fringe pixels are totally evacuated and the pixels are included with zero, red, green, and blue qualities. At last, it is a hearty method to identify plant leaf infection.

III. METHODOLOGY

In the methodology the subsequent steps are used for finding the leaf disease. The initial step is the image acquisition here the input data is read and before resized. Second stage is the pre-processing here the noises are removed using bilateral filtering. Third step is based on Otsu's threshold based division here, leaf disease segmented. The fourth step is feature extraction. Here this feature is derived by ABCD feature. The fifth or final stage is the classification used to classify the SVM leaf disease image.

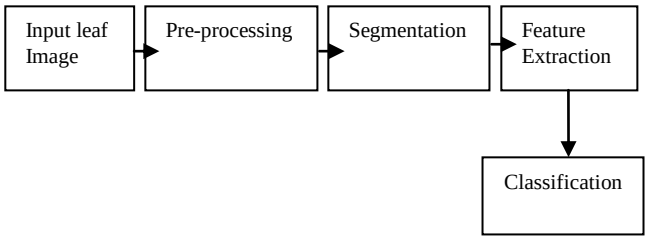

Figure 1: Proposed system Structure

1. Image acquisition:

Image verifying is the method of perusing just as resizing the picture. In image securing the information picture is obscured.

Bilateral filtering:

For preserving the edges of the smooth images bilateral filtering was used.

While using the BLF the image is grown up quickly and also this filtering is now recycled in pre-processing for such application as image demonising, image enhancement etc. Two-sided sifting is a non-iterative procedure and it is easy to pass on. Every pixel has a weighted normal of its neighboring pixels in the BLF that treats the power esteem.

A significant factor of the bilateral filtering is the Gaussian filter G_σ which is a smooth out filter however at the rate of less dissimilar edges [2]:

$$G\sigma(x) = \frac{1}{\sigma\sqrt{2\pi}} exp\left(-\frac{x^2}{2\sigma^2}\right)$$

Where σ is filter measure and it is a amount of serious of connection for a pixel x with additional pixel y

$$\text{sim(u)=} \quad \|u(x) - u(y)\|$$

The comparison between pixel x and its neighbour is characterised by the Gaussian filter Gσ , useful on the rigorous correspondence:

$$G\sigma(sim(u)) = \frac{1}{\sigma\sqrt{2\pi}} exp \quad \left(-\frac{\|u(x) - u(y)\|^2}{2\sigma^2}\right)$$

Bilateral filter B(u) [3][4][5] is set to corresponds with its neighbours yin the serious stage u of pixel x:

$$\mathrm{B(u)} = \frac{1}{Wx}\sum_{yes} G\sigma x(\|x - y\| \quad G\sigma r(sim(u))u(y)$$

Replace sim(u) in above equation :

$$\mathrm{B(u)} = \frac{1}{Wx}\sum_{yes} G\sigma s(\|x - y\|) \quad G\sigma r(\|x - y\|)u(y)$$

Where

σ_s and σ_r are the spatial & intensity filter scales.

W_x is normalized weight at x:

$$W_x(x) = \sum_{yes} G\sigma s(\|x - y\|) \quad G\sigma r(\|u(x) - u(y)$$

3. Otsu's threshold based Segmentation:

Otsu's method is finest method. This system is used for thresholding the objects from the background leaf. After segmenting the data is categorised to dual periods. the first thought is given as the picture through L dark levels. The system utilized here order the picture into two classes C0= {o, 1, 2,… t} & C1 = {t+1, t+2, t+3, ….., L-1}. The gray level i incidence possibility is known by:

$$pi = \frac{ni}{n}$$

Pi = Possibility of incidence of gray level i.

ni = Number of pixels in gray level i.

n = Total number of pixels in an input data.

The classes C_0as well as C_1characterise the object of attention as well as the background. W_0 and $W_1$are the probability of above programs and it is given by

$$W_0 = \sum_{i=0}^{t} pi \; and$$

$$W_1 = \sum_{i=t+1}^{L-1} pi$$

The two classes of the mean is given by

$$\mu_0(t) = \sum_{i=0}^{t} \frac{ipi}{w0(t).\mu 0(t)} \text{ and}$$

$$u_1(t) = \sum_{i=t+1}^{L-1} \frac{ipi}{w1(t)}$$

4. ABCD feature extraction:

In [6] based on the ABCD rule the feature extraction is extracted. ABCD is represented as Asymmetry, Border structure, Color variation as well as Diameter.

A. Asymmetry:

In image analysis the essential feature is Symmetry. If semi component is lost or noisy, before by means of symmetry feature full design may be received as well as rid the noisy component. By using the asymmetry index the degree of symmetry can be checked. It is designed using below formula.

$$AI = \frac{1}{2}\sum_{K=1}^{2} \frac{\Delta AK}{AL}$$

B. Border Structure:

By calculating Compact Index, Fractal Dimension and Edge Abruptness border structure can be analysed.

a. Compactness Index:

Compact indexes are used to measure the most well-known form of blocks that assess regular 2D objects. What's more, this measure is touchy to fuss along the fringe. The significance of CI is determined by the accompanying condition:

$$CI = \frac{pL^2}{4\pi AL}$$

b. Fractal Dimension:

An integer value is referred as fractal dimension. And it's miles designed for line, filed as well as cube the values is 1, 2 and then 3 measurement one by one. In any case, if there should arise an occurrence of fractal measurement it could well worth division. Utilizing the utilization of Box Counting method, fractal measurement can be intended as well with respect to this Hausdorff measurement system is pushed off. In this method the picture is dispersed into the crates.

c. Edge Abruptness:

Edge Abruptness only uncommon limits. Malady with anomalous limits takes enormous fluctuation of spiral space.

The gauge of boundary consistency is done by method for perusing the dissemination spiral space change. MD implies the separation of d2 between the objective point and the resistor.

$$C_r = \frac{\frac{1}{PL}\sum p \epsilon C\,(d2(p,GL) - md)^2}{md^2}$$

d. Pigment Transition:

The leaf pigmentation between the disease and surrounding leaf is described as pigment transition. In pigment transition we compute the mean and difference of the gradient it describes the change among the diseased leaves.

C. Color Variation:

The presence of shading variety in the shading is early indication of cercospor a leaf spot. Since cercospor a produce in cultivator shade, they are every now and again bright close by darker, or dark, reliant on the making of the color at changed profundity in the leaf.

5. SVM classification:

SVM is a controlled knowledge with learning process. For calculating accuracy, the SVM classifier is normally used in bioinformatics. The gene expression as well as exibility are highly found out while using the high-dimensional data. A kernel method is named as a general category and the SVM fit to that class. Through dot-product the kernel method algorithm is determined by the data specifically. For computing high dimensional feature space a kernel function can interchange this dot product and it will compute the dot product.

SVM effectively requires an understanding of the classifier's working principle. SVM trains a data; the experts want to create amounts of decisions to pre-process a data. Kernel ought to use in the parameters of SVM and kernel. The performances get decreased rapidly. Our aim is to give the user a thorough consideration of the options and also to deliver general usage guidelines. Some of the properties of SVM are its Flexibility of selecting a parallel function, Simplicity of solution when dealing with enormous data sets, It has the capacity to hold enormous feature spaces, Does feature Selection. SVM classifiers are used to solve real-world problems such as Gait recognition, Text categorization, Image classification, Bioinformatics.

Performance of SVM Classifier:

The arithmetical measures are accuracy

Accuracy:

The measure of improbability in a measurement with respect toa complete standard is well-known as accuracy.

Accuracy defines as

$$\text{Accuracy} = \frac{(TP+TN)}{(TP+FP+FN+TN)} \times 100\%$$

Applications of SVM

Applications of SVM is used efficiently as a classifier in different real-world problems

- Recognition of giant.
- Classification of Text
- Classification of Images
- Bioinformatics.

IV. EXPERIMENTAL RESULT

In this result and discussion part the input leaf image in use from the dataset. Using Matlab 2016a proposed method is implemented. The dataset consist of 80 images. Where 40 images are test images and 40 images are trained images.

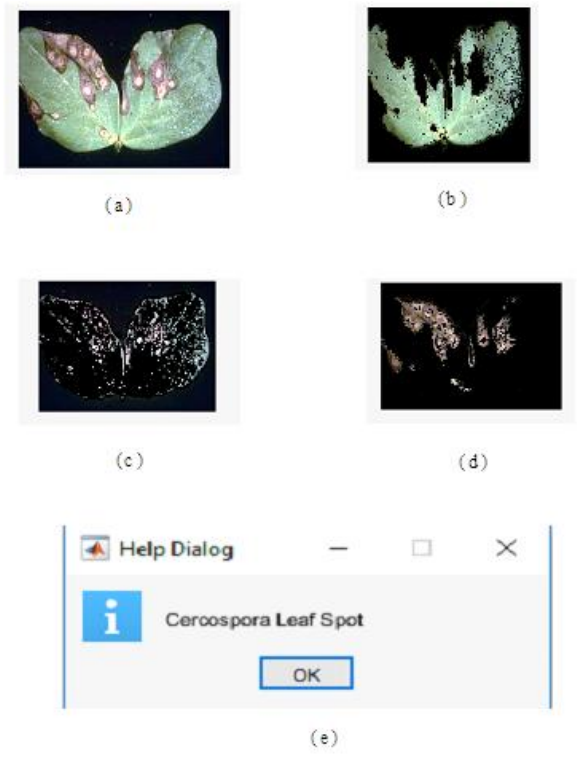

Figure 2: (a) Input Image, ((b), (c), (d)) Segmented image, (e) Dialogue box for the segmented image

Initially the input image is taken for image acquisition Step their image is read and then resized. After resizing the unwanted noises are detached using bilateral filtering. Then the input leaf image is segmented using the otsu's threshold based segmentation. Finally, using SVM classifier the leaf image is classified.

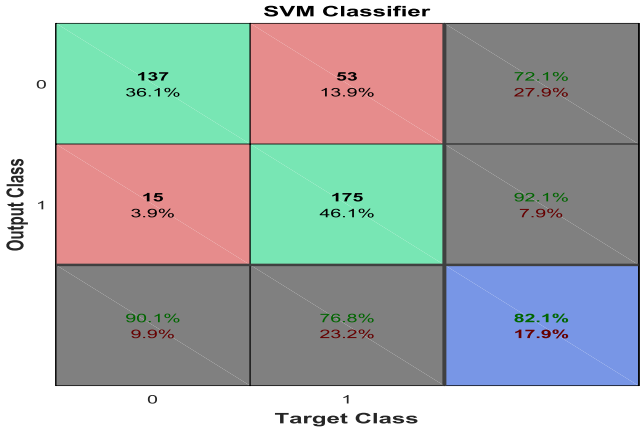

Figure 3: Confusion matrix for SVM classifier

V. CONCLUSION

In this paper SVM classifier is used to classify leaf disease from the cloud. The input image is readed and then resized and pre-processed by filtering technique to remove unwanted noise. Then using the Otsu's threshold based segmentation the filtered image is segmented after that features are extracted using ABCD feature and classified using the SVM classifier.

REFERENCES

1. Pooja, V., Das and R. And Kanchana, V., April, 2017. Plant leaf disease identification with image processing techniques. IEEE Technological Innovations for Agriculture and Rural Development (TIAR) in 2017 (pp. 130-133). IEEEE
2. M., M., Fischer, M. And Bruckstein, A., from 1994. On the contribution of Gabor to enhancing the picture. Recognition of trends, 27(1), pp.1-8
3. Tomasi, C. and Manduchi, R., 1998, January. Bilateral gray and light filtering. In Iccv (Vol. 98, No. 1, p. 2).
4. Paris, S., Kornprobst, P., Tumblin, J. and Durand, F., 2009. Bilateral filtering: applications and theory. Computer Graphics and Vision Foundations and Patterns ®, 4(1), pp.1-73
5. Paris, S. and Durand, F., 2006, May. A rapid approximation of the bilateral filter using a signal processing approach. In the European Computer Vision Conference (pp. 568-580)
6. N.S., Ramteke. And in 2013, Jain, S.V. Automatic computer-aided detection of skin cancer based on ABCD rule using MATLAB. IJCTA, pp. 691-697, 4(4)
7. Ghaiwat, and S.N. And Arora, P., from 2014. Detection and identification using image processing techniques of plant leaf diseases: a summary. Global Engineering & Technology Journal of Recent Advances, 2(3), pp.1-7.
8. S.B. Dhaygude. And the 2013 Kumbhar, N.P. Detection of the disease of agricultural plant leaf using image processing. International Journal of Electrical, Electronics and Instrumentation Engineering Research, 2(1), pp.599-602.
9. Landge, P.S., Patil, S.A., Otari, O.D., Khot, D.S. And the 2013 Malavkar, U.G. Automatic detection and classification by image processing of plant disease. Computer Science and Software Engineering International Journal of Advanced Research, 3(7), pp. 798-801
10. A.H., Kulkarni. And Patil, A., from 2012. Use of image processing technique to identify diseases of plants. Modern Engineering Research International Journal, 2(5), pp.3661-3664.
11. Wang, H., Li, G., Ma, Z. and Li, X., 2012, October. Image identification of plant diseases based on back propagation networks. 5th International Image and Signal Processing Congress 2012 (pp. 894-900). IEEE.
12. Chaudhary, P., Cheeran, A.N. Chaudhari, A.K. And Godara, S., from 2012. A color transform method focused on the identification of disease spot on plant leaf. Computer Science and Telecommunications International Review, 3(6), pp. 65-70
13. M. de Ridder, D. Egmont-Petersen. And Commerce, H., 2002. Neural network image processing — a summary. Recognition of trends, 35(10), pp.2279-2301
14. Mohamad, D. Zafar, M.F. And Anwar, M.M., Dec. 2006. Recognition of online isolated handwritten characters by the use of sub-character primitive features of backpropagation neural networks. International Multitopic Conference of the IEEE in 2006 (pp. 157-162). IEEEE. IEEE
15. Barbedo, 2013, J.G.A. Techniques for digital image processing to detect, quantify and classify plant disease. SpringerPlus, p.660, 2(1).
16. Naikwadi, S. and Amoda, N., 2013. Advancements in plant disease identification image processing. Global Technology and Management Software or Innovation Journal (IJAIEM), 2(11).

AUTHORS PROFILE

Raghavendran.S has received his Master of Engineering (M.E) degree in Computer Science and Engineering from Anna University, Chennai, Tamilnadu, India in 2010 and Bachelor of Engineering (B.E) degree in Computer Science and Engineering from Anna University, Chennai in 2008. Currently, he is pursuing Research work leading to PhD degree in Centre for Information Technology and Engineering, Manonmaniam Sundaranar University, Abishekapatti, Tirunelveli-627012, Tamilnadu, India. His area of Research includes Cloud computing, Image Processing, Virtual machine optimization, Network security and Internet of Things. He has published over 5 papers in peer-reviewed International Journals. His current research work includes Agriculture Applications using IoT and cloud environment.

Kumar Parasuraman obtained his M.Tech., Ph.D., degree in Information Technology - Computer Science and Engineering from Manonmaniam Sundaranar University, India and M.B.A. degree in Systems from Alagappa University, India. He is currently working as an Assistant Professor with the Department of Information Technology and Engineering, Manonmaniam Sundaranar University, Tirunelveli, Tamil Nadu, India. He has published around 70 research papers in International / National journals/proceedings/books. His current research interests include signal and image processing, visual perception, Cyber Security, Pattern Recognition and Big Data Analytics.

Mr. P. Darwin, Research Scholar, Centre for Information Technology and Engineering, Manonmaniam Sundaranar University, Tirunelveli – 627012, Tamil Nadu, India. He has completed his M.Tech Computer Science and Engineering in 2011 and B.Tech Information Technology in 2006. His research areas are Image Processing, Cloud computing & Internet of Things