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AN IDENTIFICATION OF CROP DISEASE USING IMAGE SEGMENTATION

K. Vinoth Kumar [*1] and T. Jayasankar [2]

Department of Electronics & Communication Engineering [1], Karpagam Institute of Technology, Coimbatore - 641105, Tamil Nadu, India.
Department of ECE [2], University College of Engineering (Bharathidasan Institute of Technology Campus), Anna University, Trichirappalli - 620024, Tamil Nadu, India.

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Correspondence to Author:
Dr. K. Vinoth Kumar

Associate Professor,
Department of Electronics & Communication Engineering,
Karpagam Institute of Technology,
Coimbatore - 641105, Tamil Nadu,
India.

E-mail: vinodkumaran87@gmail.com

ABSTRACT: Agriculture forms a vital part of India's economy. More than 50% of India's population is dependent on agriculture for their livelihood. In India, many crops are cultivated, out of which wheat is one of the most important food grains that this country cultivates and exports. Thus it can be seen that wheat forms a major part of the Indian agricultural system and India's economy. Hence, the maintenance of the steady production of the above-stated crop is very important. The main idea of this project is to provide a novel approach based on a deformable model is proposed to handle the segmentation of the system for detecting crop diseases. The existing system is based on the segmentation method simple linear iterative clustering to detect disease in plant leaves. It also shows visual attributes such as color, gradient, texture, and shape to describe the features of leaves. The proposed system will define the cropped image of a wheat plant through image processing and feature extraction algorithms. The RGB color space is converted so that the color information contained in the images can be used effectively to differentiate image and segmentation usage of the k-means algorithm has been suggested.

INTRODUCTION: Plants become a very important supply of energy and solely a primary supply to the matter of worldwide warming. The harm caused by rising, re-emerging and endemic pathogens, is very important in plant systems and results in potential loss economically. Additionally, crop diseases contribute directly and indirectly to the unfolding of human infectious diseases and environmental harm.

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As these diseases area unit spreading worldwide inflicting harm to the conventional functioning of the plant and conjointly damaging the condition by considerably reducing the number of crops mature. The crop production losses its quality because of abundant sort diseases and typically they occur; however area unit even not visible with naked eyes.

Farmers estimate the diseases by their expertise; however, this is often not the correct method. The most approach adopted in applies for detection and identification of plant diseases is oculus observation of consultants. The choice creating capability of associate degree skilled conjointly depends on his/her wholeness, akin to fatigue and visual modality, work pressure, operating conditions akin to improper lighting, climate, *etc*.

it's overpriced as continuous watching of consultants in giant farms. So, we want a quick method and remote sensing type to shield the crop from unwellness.

The external look of agricultural merchandise is that the main quality attribute. The outer look greatly affects their value and customer's shopping for behavior. Therefore, the standard inspecting and grading systems area unit essential in agricultural field to cultivate sensible, healthy plants. Plant diseases have changed into a (significant) downside because it will cause significant reduction and losses in each quality and amount of agricultural merchandise. An enormous majority of the growing national population depends on agriculture yields.

However, the cultivation of those crops for optimum yield and quality manufacture is very technical. It is often improved by the help of technical support and mechanized farming. Several authors have worked on the event strategies for the automated detection and classification of leaf diseases supported high resolution multispectral, hyperspectral and stereo pictures.

The different kinds of crop diseases area unit as follows:

1. Black spot
2. Botrytis blight
3. Leaf spot
4. Powdery mildew
5. Rust

FIG. 1: BLACK SPOT

Fig. 1 represents the diseases affected in roses, especially hybrid tea roses, are highly susceptible to this infectious fungal disease. Black spots, as the name implies, will appear on the leaves, followed by a yellowing surrounding the spots.

FIG. 2: BOTRYTIS BLIGHT

Fig. 2 represents the fungal disease that affects flowering plants, ornamentals, and fruits and vegetables. Also known as a gray mole, it can cause dying tissue and buds as well as fruit or bulb spot.

FIG. 3: LEAF SPOT

Fig. 3 represents the leaf spot diseases affects many different types of plants, but most commonly attacks trees and shrubs. In large clusters or rows, it may also be referred to as anthracnose.

FIG. 4: POWDERY MILDEW

The above **Fig. 4** shows the numerous strains of fungi are commonly referred to as powdery mildew. Since this disease removes essential nutrients from the plant, leaves may become yellow, stunted or drop off prematurely.

FIG. 5: RUST SPORES

The above **Fig. 5** represents the rust spores travel through the air and land on plants, spreading the fungal disease. Although plants do not die from rust, it can contribute to the plant's decline.

The machine learning-based detection and recognition of plant diseases will offer in-depth clues to spot and treat the diseases in its early stages. Relatively, visually or oculus identification of plant diseases is overpriced, inefficient, inaccurate and tough. Automatic detection of plant diseases is incredibly vital to analysis topic because it could prove the advantages in watching giant fields of crops, and therefore mechanically discover the symptoms of diseases as presently as they seem on plant leaves. So trying to find quick, automatic, more cost-effective and correct technique to discover disease cases is of nice realistic significance. While not correct malady designation, correct management actions can't be used at the acceptable time. Image process is one in every of the widely used technique for plant leaf diseases detection and classification.

The previous and classical approach for detection and recognition of plant diseases is predicated on oculus observation, that is incredibly slow technique conjointly offers less accuracy. In some countries, consulting specialists to search out the disease is dear and time intense because of the convenience of skilled. Irregular check from plant ends up in the growing of varied diseases on the plant which needs a lot of chemicals to cure it conjointly these chemicals are unhealthful to different animals, insects and birds that are useful for agriculture.

The classification and recognition of crop diseases are of the most important technical and economic importance within the agricultural business. The most diseases of plants ar infectious agent, plant and microorganism malady. The infectious agent malady is because of infectious agent changes in the setting; plant malady is because of the presence of plant within the leaf and microorganism malady is because of the presence of germs in leaf or plants. Automatic discovering of plant diseases is a very important analysis topic recently because it could prove advantages as mechanically detecting the diseases from the symptoms that seem on the plant leaves.

Digital image process is that the use of PC algorithms to perform an image process on digital pictures. A picture could also be outlined as a 2 dimensional perform, f(x, y), wherever x and y are spatial (plane) coordinates, and therefore the amplitude of at any try of coordinates (x, y) is termed the intensity or gray level of the image at that time. When x, y and therefore the intensity values of f are all finite, separate quantities, we tend to decision image a digital image. A digital image consists of a finite range of components, every of that encompasses an explicit location and worth.

These components are noted as image components, image components, pels, and pixels. Component is that the term most generally accustomed denote the weather of a digital image. Vision is that the most advanced of our senses, thus it's not shocking that pictures play the one most significant role in human perception. DIP is the one that uses PC algorithms to make, process, communicate, and show digital pictures. The input of that system may be a digital image and therefore the system method that image mistreatment economical algorithms, and provides a picture as associate degree output.

When some diseases don't seem to be visible to oculus however really they're a gift; then it's tough to discover it with the oculus. And once it's visible, it'll be too late to discover malady and can’t facilitate any longer. Earlier, the magnifier is employed to discover the malady; however, it becomes tough on observe each leaf and plant. So, a quick and effective approach may be a remote sensing technique. Detection and recognition of diseases in plants mistreatment machine learning are incredibly fruitful in providing symptoms of

distinguishing diseases at its earliest. Plant pathologists will analyze the digital pictures mistreatment digital image process for designation of plant diseases.

Computer process systems are developed for agricultural applications appreciate detection of leaf diseases, fruits diseases, *etc*. altogether these techniques, digital pictures are collected employing a camera and image process techniques are applied on these pictures to extract helpful data that are necessary for additional analysis. Digital image process USA ed is employed for the implementation which can take the image as input so perform some operation on that so offer us the desired or expected output. Application of pc vision and image process techniques assist farmers altogether the areas of agriculture activities. Numerous types of crops are created in an Asian country, with rice and wheat constituting virtually 1/2 the whole crop production. So it's become necessary to take care of a gentle production rate for each these crops. But it's exhausting to take care of this consistency in production as many times the whole harvest gets destroyed because of numerous reasons.

Most of the time the explanation for crop destruction is because of some reasonable malady that has affected the plant harvest. A farmer is incredibly abundant at risk of human error let's say one could become late in detective work the malady or would possibly miss the fact that bound portion of the harvest has already been infected, *etc*. thence, so as to avoid this type of human error, associate degree intelligent automatic system is required that may alert the farmers if diseases strike any portion of the harvest. Detection of malady may be created by learning the leaf since they clearly show the symptoms.

Related Work: In this paper, the author projected the Identification of Soybean Foliar Diseases exploitation pilotless Aerial Vehicle pictures [1]. Soybean has been the most Brazilian agricultural goods, conducive considerably to the country's balance. However, foliar diseases are the key issue which will undermine the soy production, typically caused by fungi, bacteria, viruses, and nematodes. This letter proposes a pc vision system to trace soybean foliar diseases within the field exploitation pictures captured by the low-priced pilotless aerial vehicle model DJI Phantom three. The projected system is predicated on the segmentation technique straightforward Linear repetitive agglomeration to notice plant leaves within the pictures and on visual attributes to explain the options of foliar physical properties, equivalent to color, gradient, texture, and shape. Our methodology evaluated the performance of six classifiers for various heights, as well as one, 2, 4, 8, and 16 m. Experimental results showed that color and texture attributes result in higher classification rates, achieving the exactness of ninety-eight. 34% for heights between one and a couple of m, with the decay of twenty-two at every meter. Results indicate that our approach will support consultants and farmers to watch diseases in soybean fields.

In this paper authors, proposed [2] the deep learning classification of the land cowl and crop sorts exploitation remote sensing information Deep learning could be a powerful progressive technique for image process as well as remote sensing pictures. This letter describes a structure metric capacity unit design that targets land cowl and crop kind classification from multitemporal multisource satellite imaging. The pillars of the design are an unsupervised neural network that's used for optical imaging segmentation and missing information restoration thanks to clouds and shadows, Associate in Nursing an ensemble of supervised NNs.

As basic supervised NN design, we tend to use a conventionally connected multilayer perceptron and also the most ordinarily used approach in RS community random forest and compare them with convolutional NNs. Experiments are administrated for the joint experiment of crop assessment and watched take a look at the web site inland for classification of crops during heterogeneous setting exploitation nineteen multitemporal scenes noninheritable by Landsat-8 and Sentinel-1A RS satellites. The design with Associate in the Nursing ensemble of CNN's outperforms the one with MLPs permitting the US to raised discriminate sure summer crop sorts, especially maize and soybeans, and yielding the target accuracies over eighty fifths for all major crops (wheat, maize, sunflower, soybeans, and sugar beet).

The retrieving soybean leaf space index from pilotless aerial vehicle hyperspectral remote sensing [3]. Leaf space index is a very important indicator of plant growth and yield which will be monitored by remote sensing. Many models have created exploitation datasets derived from SRS and STR sampling ways to work out the best model for soybean (multiple strains) LAI inversion for the total crop growth amount and one growth amount. Random forest, artificial neural network, and support vector machine regression models were compared with a partial least-squares regression model. The RF model yielded the best exactness, accuracy, and stability with V-R2, SDR2, V-RMSE, and SDRMSE values of zero. 741, 0.031, 0.106, and 0.005, severally, over the total growth amount supported STR sampling.

The ANN model had the best exactness, accuracy, and stability (0.452, 0.132, 0.086, and 0.009, respectively) over one growth section supported STR sampling. The exactness, accuracy, and stability of the RF, ANN, and SVM models were improved by the inclusion of STR sampling. The RF model is appropriate for estimating LAI once sample plots, and variation is comparatively massive (*i.e.,* the total growth amount or over one growth period). The ANN model is a lot of acceptable for estimating LAI once sample plots and variation are comparatively low (*i.e.,* one growth period).

The scene classification *via* a gradient boosting random convolutional network framework [4]. Due to the recent advances in satellite sensors, an outsized quantity of high-resolution remote sensing pictures is currently being obtained daily. A way to mechanically acknowledge and analyze scenes from these satellite pictures effectively and with efficiency has become a giant challenge within the remote sensing field. Recently, tons of labor in scene classification has been projected, that specialize in deep neural networks that learn hierarchical internal feature representations from image information sets and turn out progressive performance. However, most ways, as well as the normal shallow ways and deep neural networks, solely think about coaching one model. Meanwhile, neural network ensembles have well-tried to be a strong and sensible tool for a variety of various prognostic tasks.

In this paper, we tend to propose a gradient boosting random convolutional network frame-work for scene classification, which might effectively mix several deep neural networks. As way as we all know, this is often the primary time that a deep ensemble framework has been projected for scene classification. Moreover, within the experiments, the projected technique was applied to 2 difficult high-resolution information sets: one) the UC Merced information set containing twenty one completely different aerial scene classes with a submeter resolution and 2) a state capital information set containing eight land-use classes with a 1.0-m spatial resolution. The projected GBRCN framework outperformed the progressive ways with the UC Merced information set, as well as the normal single convolutional network approach.

The machine learning paradigms for weed mapping *via* pilotless aerial vehicles. This paper presents a unique strategy for weed watching, exploitation pictures gaga pilotless aerial vehicles and ideas of image analysis and machine learning [6]. Weed management in exactness agriculture styles site-specific treatments supported the coverage of weeds, wherever the secrets to producing precise weed map timely. Most ancient remote platforms, *e.g.,* piloted planes or satellites, are, however, not appropriate for early weed watching, given their low temporal and special resolutions, as opposition he ultra-high special resolution of UAVs. The system here projected makes use of UAV-imagery and is predicated on 1) Divide the image, 2) work out and binaries the vegetation indexes, 3) notice crop rows, 4) optimize the parameters and 4) learn a classification model.

Since, crops are typically unionized in rows, the employment of a crop row detection algorithmic rule helps to separate properly weed and crop pixels, that could be a common handicap given the spectral similitude of each. Many computer science paradigms are compared during this paper to spot the foremost appropriate strategy for this subject (*i.e.,* unsupervised, supervised and semi-supervised approaches). Our experiments conjointly study the result of various parameters: the flight altitude, the sensing element and also the use of antecedently trained models at a unique height. Our results show that 1) promising performance is often obtained,

even once exploitation only a few tagged information and 2) the classification model are often learned during a subplot of the experimental field at low altitude and so applied to the total field at the next height, that simplifies the total method. These results inspire the employment of this strategy to style weed watching methods for early post-emergence weed management.

This paper projected the advances during automated and high-throughput imaging technologies have resulted in a deluge of high-resolution pictures and sensing element information of plants [7]. However, extracting patterns and haves from this huge corpus {of information of knowledge of information} needs the employment of machine learning tools to modify data assimilation and feature identification for stress phenotyping. Four stages of the choice cycle in plant stress phenotyping and plant breeding activities wherever completely different cc approaches are often deployed are (i) identification, (ii) classification, (iii) quantification, and (iv) prediction (ICQP). we offer here a comprehensive summary and easy taxonomy of cc tools to modify the plant community to properly and simply apply the acceptable cc tools and best-practice tips for numerous organic phenomenon and abiotic stress traits.

Due to the fast technological development of varied completely different satellite sensors, a large volume of high-resolution image information sets will currently be no inheritable [8]. A way to with efficiency represent and acknowledge the scenes from such high-resolution image information has become an important task. During this paper, we tend to propose Associate in nursing unsupervised feature learning framework for scene classification. By exploitation the salience detection algorithmic rule, we tend to extract a representative set of patches from the salient regions within the image information set. These untagged information patches are exploited by Associate in Nursing unsupervised feature learning technique to be told a collection of feature extractors that are strong and economical and don't would like in an elaborate way designed descriptors equivalent to the scale-invariant-feature-transform-based algorithmic rule. We tend to show that the statistics generated from the learned feature extractors will characterize a posh scene okay and might turn out glorious classification accuracy. To scale back over fitting within the feature learning step, we tend to any use a recently developed regularization technique known as "dropout," that has well-tried to be effective in image classification. Within the experiments, the projected technique was applied to 2 difficult high-resolution information sets: the UC Merced information set containing twenty one completely different aerial scene classes with a sub-meter resolution and also the state capital information set containing seven land-use classes with a 60-cm special resolution.

The Challenges and Opportunities of Multimodality and information Fusion in Remote Sensing [9]. Remote sensing is one among the foremost common ways to extract relevant info regarding Earth and our surroundings. Remote sensing acquisitions are often made by each active (synthetic aperture microwave radar, LiDAR) and passive (optical and thermal vary, multispectral and hyperspectral) devices. per the sensing element, a spread of data regarding the layer is often obtained. {The data the info the info} no inheritable by these sensors will give information regarding the structure (optical, artificial aperture radar), elevation (LiDAR), and material content (multispectral and hyperspectral) of the objects within the image. Once thought-about along their complementarily is often useful for characterizing land use (urban analysis, exactness agriculture), injury detection (*e.g*., in natural disasters equivalent to floods, hurricanes, earthquakes, oil spills in seas), and provides insights to potential exploitation of resources (oil fields, minerals).

Additionally, recurrent acquisitions of a scene at completely different times permits one to watch natural resources and environmental variables (vegetation phonology, snow cover), social science effects (urban sprawl, deforestation), climate changes (desertification, coastal erosion), among others. During this paper, we tend to sketch the present opportunities and challenges involving the exploitation of multimodal information for Earth observation. This is often done by investing the outcomes of the information fusion contests, organized by the IEEE Geosciences and Remote Sensing Society since 2006.

The author projected the spectral-spatial classification of hyperspectral information supported deep belief network. Hyperspectral information classification could be a hot topic in remote sensing community [10]. In recent years, an important effort has been targeted on this issue. However, most of the ways extract the options of original information during a shallow manner. During this paper, we tend to introduce a deep learning approach into hyperspectral image classification. a brand new feature extraction and image classification framework are projected for hyperspectral information analysis supported a deep belief network.

First, we tend to verify the eligibility of restricted Boltzmann machine and DBN by the subsequent spectral information-based classification [11]. Then, we tend to propose a unique deep design, which mixes the spectral-spatial metal and classification along to induce high classification accuracy. The framework could be a hybrid of principal element analysis, hierarchical learning-based metal, and logistical regression. Experimental results with hyperspectral information indicate that the classifier gives a competitive answer with the progressive ways [12].

The artificial aperture microwave radar image classification could be a hot topic within the interpretation of SAR pictures [13]. However, the absence of effective feature illustration and also the presence of speckle noise in SAR pictures create classification troublesome to handle. So, as to beat these issues, a deep convolutional motorcar encoder is projected to extract options and conduct classification mechanically. The deep network consists of eight layers: a convolutional layer to extract texture options, a scale transformation layer to combination neighbor info, and four layers supported thin motorcar encoders to optimize options and classify, and last 2 layers for post process. Compared with hand-loomed options, the DCAE network provides Associate in nursing automatic technique to be told discriminative options from the image [14]. A series of filters is meant as convolutional units to comprise the gray-level co-occurrence matrix and physicist options along. Scale transformation is conducted to scale back the influence of the noise that integrates the related to neighbor pixels [15]. Thin motorcar encoders request higher illustration of options to match the classifier since coaching labels are added to fine-tune the parameters of the networks. Morphological smoothing removes the isolated points of the classification map. The total network is meant ingeniously, and every half contains a contribution to the classification accuracy [16]. The experiments of Terra SAR-X image demonstrate that the DCAE network will extract economical options and perform higher classification result compared with some connected algorithms.

Crop Disease Identification Using Deformable Method: Deformable models are normally semi-automatic. However, two issues can appreciably affect their performance and therefore, need to be well defined: the initial conditions and the values of the parameters used. The RGB color space is converted so that the color information contained in the images can be used effectively to differentiate normal crop image and affected images. The differences in the color channels are combined to define the speed function and the stopping criterion of the deformable model.

The methodology of the proposed system can be broken down into two segments:

(a) Image Processing Segment: Where the properties of the leaf image will be enhanced segmented from the background and

(b) Pattern Recognition Segment: Where the required features will be extracted and this information will be matched with the predefined knowledge about the plant diseases for detecting which disease has actually affected the plant.

Fig. 6 represents first a color complexity analysis framework is presented, which was used to design the proceeding proposed work. The color complexity analysis framework is comprised of the following four steps.

- **Step 1:** Transform the image to a perceptually uniform color space.
- **Step 2:** Construct color-spatial representations that model the color information for a patch (*i.e.*, local grid) of pixels.
- **Step 3:** Cluster the patch representations into k color clusters using GLCM energy calculations.

- **Step 4:** Quantify the variance found using the leaf image and the k representative colors of features image.

Image Preprocessing: This step can be further broken down into three parts: first being image enhancement, second being color-space conversion and third being image segmentation.

Image Enhancement: In this process, the quality of the digital image is improved for providing a better perception of the image. The main aim is to modify the essential attributes of the image so that the image becomes suitable for a specific task. Image enhancement can be done at both spatial as well as a the frequency level of the image. Techniques such as median filter, histogram equalization, image smoothening, image sharpening, *etc*., can be used for performing image enhancement.

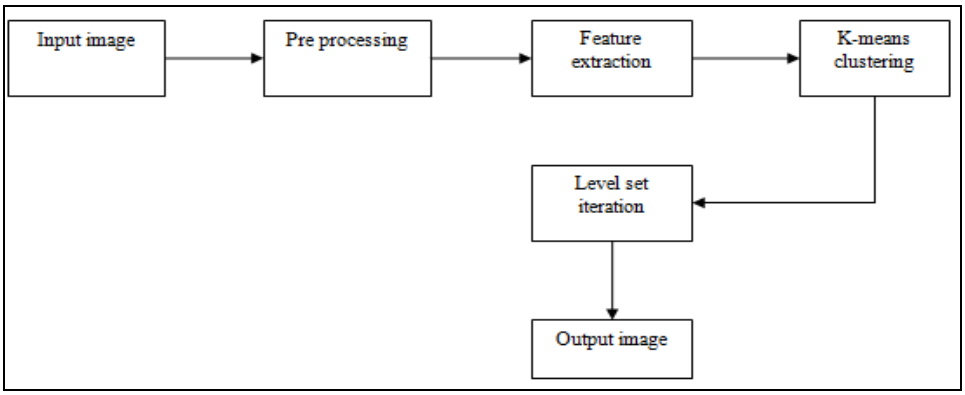

FIG. 6: PROPOSED SYSTEM BLOCK DIAGRAM

Color Space Conversion: It is the means through which a color management module transforms color from one device's space into another. The conversion process may need approximating the color values so that the image's most important color qualities are preserved and not lost. For example in certain cases for some software, there might be a need for converting images from RGB color space to Hue Saturation Value colour-space representation.

Image Segmentation: Image segmentation is the practice of partitioning a digital image into multiple fragments. The main goal of this step is to identify objects or extract other related information from digital images. There are numerous image segmentation techniques such as:

- Region-based
- Edge-based
- Threshold-based
- Feature-based Clustering
- Colour-based

Feature Extraction: It is the procedure of outlining a set of necessary features, or image characteristics that form the core element which when represented in an efficient or meaningful manner give the required information that is important for analysis and classification purpose. Feature extraction technique can be based on color, shape, or texture features. The most commonly used feature extraction technique is the texture extraction technique. Before texture extraction can be performed texture analysis must be performed. Texture analysis can be further broken down into statistical, structural, fractal, and signal processing techniques. Some of the algorithm techniques that can be used for texture feature extraction are Gabor filter, color co-occurrence methods, wavelet transform, *etc*.

Disease Identification: It is the process of understanding the meaning of the feature extracted from the image and matching the extracted information with the predefined set of rules and thus coming to a conclusion. This stage provides the result, *i.e*., in this stage the plant disease is identified and made known to the user. The different techniques that may be used for classification purpose are radial basis function, artificial neural network, support vector machine, *etc*. Wheat constitutes one of the oldest forms of crops to be cultivated in India. 'Gramineae' is the scientific name given to wheat plant and it belongs

to the genus, '*Triticum*.' India cultivates mainly four types of wheat plant *viz*. hard red winter wheat, soft wheat, durum, white wheat. Wheat too like any other crop is prone to diseases. Detection of these diseases becomes a mandatory task to protect and preserve the wheat harvest. This paper suggests an idea for developing an automated system that can detect the disease that has infected the plant by processing the image of the plant leaf. Some diseases that can affect the crop are:

Powdery Mildew: The symptoms are the formation of white powdery substance over the surface of the leaf.

Brown Rust: In this brown pustules are formed over the leaf that is either circular or elliptical.

Stripe Rust/Yellow Rust: The leaf may show bright yellow or dull yellow to orange-yellow stripe pustules (Uredia).

Black Rust: Pustules of dark reddish brown nature will occur on both sides of the leaf.

The methodology of the proposed system can be broken down into two segments:

Image Processing Segment: Where the properties of the leaf image will be enhanced segmented from the background.

Pattern Recognition Segment: where the required features will be extracted and this information will be matched with the predefined knowledge about the plant diseases for detecting which disease has affected the plant.

Image Processing Techniques Image Acquisition in Wheat: A input with the required wheat leaf image will be created for performing the necessary experiment.

Image Enhancement: If needed clipping algorithm may be applied as it might become necessary to separate the required region from its background.

Color Space Conversion: In this step, if the image is in RGB color space it would be converted into either Hue/Saturation/Intensity or Hue/ Saturation/ Value color space. In RGB color space of a digital image, the color components of an object's color are all correlated with the amount of light hitting the object. This makes object discrimination difficult in RGB color space. However, in HIS or HSV the chroma (color), components of an object is separate from the intensity components of the object thus making it easier to differentiate between the objects.

Image Segmentation: Many methods such as K-means clustering, threshold method, and edge detection can be used for performing image segmentation. For this automated system, edge detection technique and feature-based segmentation will be applied. The canny filter can be used for edge detection purpose and K-means clustering can be used for feature-based segmentation. Compared to the rest of the edge detection techniques, a canny filter is immune to noise and can produce perfect results as per the requirement. This method may be used with Markov Random field-based segmentation which is basically used for color segmentation. This combination of an algorithm will help in identifying the edges accurately.

In this step color feature, and texture feature will be extracted from the leaf. After extracting the necessary feature, it will be used by the classification step for identifying the disease. For this purpose, either gray-level co-occurrences matrix or Principal Component analysis method may be used for texture extraction.

PCA technique is mainly used for statistical pattern recognition for dimensionality and feature extraction. GLCM is also a statistical approach, which gives information about the relative position between two pixels in an image. Also for color feature extraction CIE L* a * b* color space can be used.

RESULTS AND DISCUSSION: In this chapter, we describe experiments and results obtained by the proposed approach. The proposed system was simulated using Mat lab software.
From the various simulation results, the proposed system has the following advantages.

1. Highest segmentation accuracy
2. High sensitivity and specificity
3. More robust
4. High computation efficiency

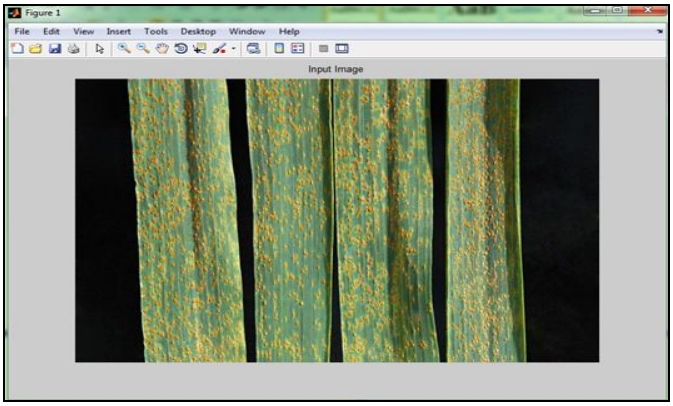

FIG. 7: INPUT IMAGES

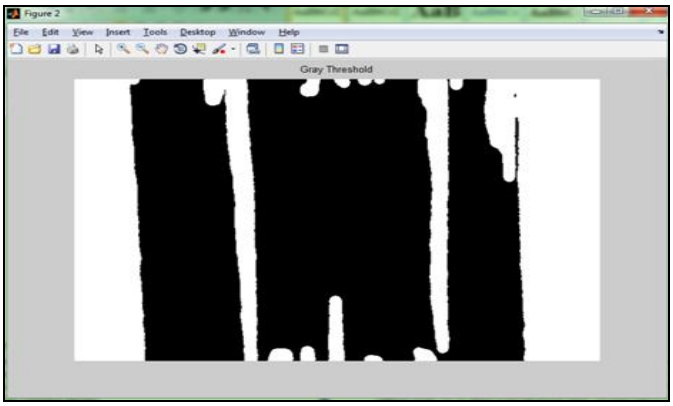

FIG. 8: THRESHOLD IMAGE

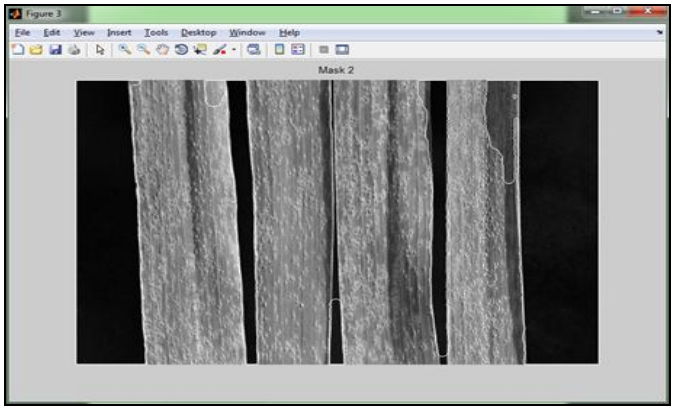

FIG. 9: MASK IMAGE RESULT

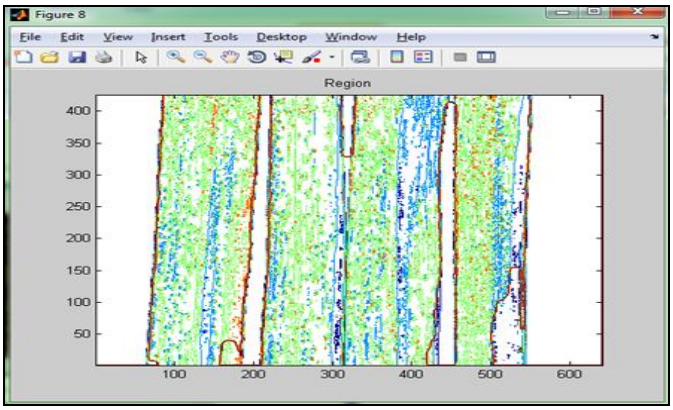

FIG. 10: CONTOUR REGION

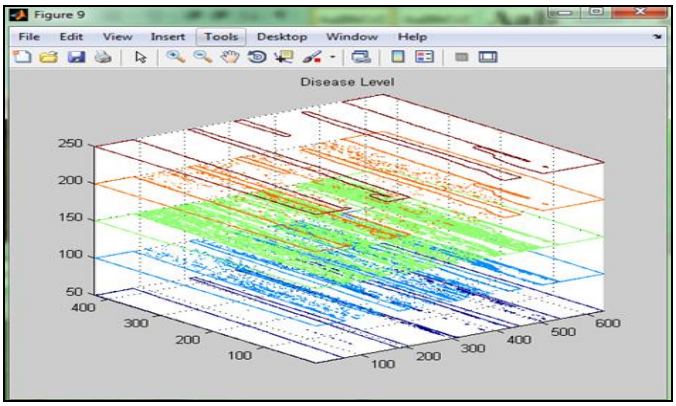

FIG. 11: CONTOUR DETECTION

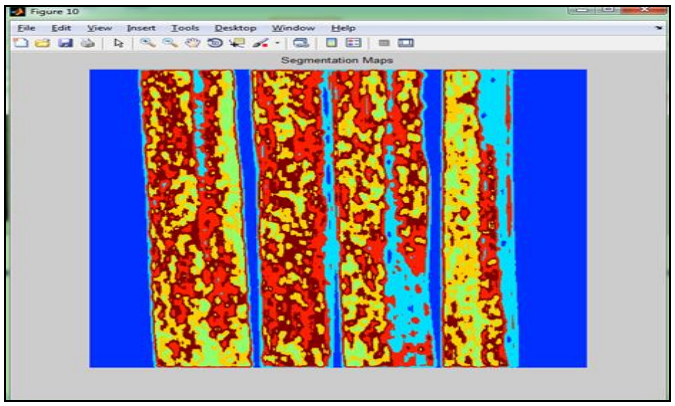

FIG. 12: SEGMENTATION OUTPUT

CONCLUSION: The progress in science and technology is a non-stop process new things and technology are being invented. The proposed automated system will be able to detect the wheat leaf disease through image processing. This system, when fed with a leaf image, will be capable of detecting the earlier mentioned diseases of the wheat plant. In the near future, this suggested system will be capable of showing physical results. In future we have an idea to identify the specific diseases of the crop and also display the mechanism and chemicals to resolve it. It is better if it implemented in hardware.

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