Agricultural Spot Detection by Image Segmentation and Clustering by ANN Technique

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Abstract :- The agriculture sector is the main contributor in Indian economy and doing well in white, green and blue revolution. According to APEDA by 2014 export of Indian agriculture will reach to 5% of total production of the world and rank 10th in the ranking [1]. Agriculture plays very important role in the provision of food surplus to expanding population, contribution to capital formation, provides raw material to industries, market for industrial products and major contribution in international trade. With increasing population, even though the contribution is continuously falling since independence from 55.1% in 1950 to 14% in 2012, it remained the major employment sector with a marginal difference. So there is a need to accelerate the pace for competitive, productive, diversified and sustainable agriculture. Raising agricultural productivity per unit of land, reducing rural poverty through a socially inclusive strategy and ensuring that agricultural growth responds to food security needs are three major challenges for Indian agriculture [2].

I. INTRODUCTION

The agricultural land mass is something other than being a nourishing sourcing in this day and age. Indian economy is profoundly reliant of horticultural efficiency. Consequently in field of agribusiness, location of infection in plants assumes an imperative part. To identify a plant ailment in extremely introductory stage, utilization of programmed malady recognition system is gainful. For example an illness named little leaf infection is an unsafe malady found in pine trees in United States. The influenced tree has a hindered development and kicks the bucket inside 6 years. Its effect is found in Alabama, Georgia parts of Southern US. In such situations early location could have been productive. The current strategy for plant sickness recognition is essentially bare eye perception by specialists through which recognizable proof and identification of plant infections is finished. For doing as such, an expansive group of specialists and in addition consistent checking of plant is required, which costs high when we do with extensive ranches. In the meantime, in a few nations, ranchers don't have legitimate offices or even thought that they can contact to specialists.

1.1 Digital Image Processing -Advanced picture handling is essential field of outlining and development. In current period each field relies upon the employments of modernized picture dealing with, in cutting edge picture getting ready, automated depiction of pictures for the most part require a generous number of bits.

	Fruits		Vegetables		Flowers	
Year	A	P	A	P	A	P
2007-08	5857	65587	7848	128449	166	868
2008-09	6101	68466	7981	129077	167	987
2009-10	6329	71516	7985	133738	183	1021
2010-11	6383	74878	8495	146554	191	1031
2011-12	6705	76424	8989	156325	254	1652

Area And production statistics for 5 years(Indian Horticulture database- 2012) (A= Area in '000 hectors , P= Production in '000 MT)

In various applications, it is basic to examine approach for suggesting a photo, or the information contained in the photo, with less bits. By wiping out dull or unnecessary information, picture weight is the development that tends to this point. Picture getting ready systems have been associated with a couple of scopes of picture and video taking care of, for instance, correspondence, video conferencing et cetera. In the automated picture and video weight it is required to diminish bit rate need and improves speed of transmission. Picture weight strategies are generally detached in two social events is lossless and lossy. In picture denoising it is required to recover the main picture at the yield, in both examination this investigation focus to upgrade the execution of curvelet change for better nature of recovered pictures in term of PSNR.

1.2 Image Compression - Picture pressure is essential term for successful transmission and picture stockpiling. Necessity of picture pressure is in correspondence framework for the information and picture change, it is need of telecom industry, in the field of sight and sound information in the broadcast communications system and ring the mixed media information through Internet. Some other necessity of picture pressure is as in the field of advanced cameras, prerequisites for information stockpiling, control, and exchanges of computerized pictures, has grown violently [22]. These picture records can be huge and can involve expansive memory. A dim

scale picture of 256 x 256 pixels has 65, 536 components to store, and a downloading and transferring of these pictures are exceptionally tedious undertaking. Picture information involve a profound bit of the sight and sound information and they possess the real segment of the correspondence transfer speed for media correspondence [23].

1.3 Feature Extraction **-** By feature extraction we can diminish the picture into few numbers or gatherings of numbers that depict the material components of the picture [26]. These components fundamental be deliberately chosen such that they create great portrayal of the picture and outline the basic data. Certain cases of elements are mean, standard deviation, angle and edges of picture. More often than not, a gathering of components is utilized to deliver a model for the pictures. By Cross validation on the pictures we can see which highlights speak to the picture well. Components can be doled out weights to show the significance of that elements.

1.4 Segmentation Of Image Image segmentation is generally the first stage in any attempt to analyze or interpret an image automatically. It can also be regarded as a process of grouping together pixels that have similar attributes (Rafael et al 2002). Segmentation partitions an image into distinct regions that are meant to correlate strongly with objects as features of interest in the image.Segmentation is a critical component of computer vision system because errors in this process will be propagated to higher-level analysis processes and increases the complexity of the subsequent tasks. Ideally the segmented regions within the image should have the following characteristics.

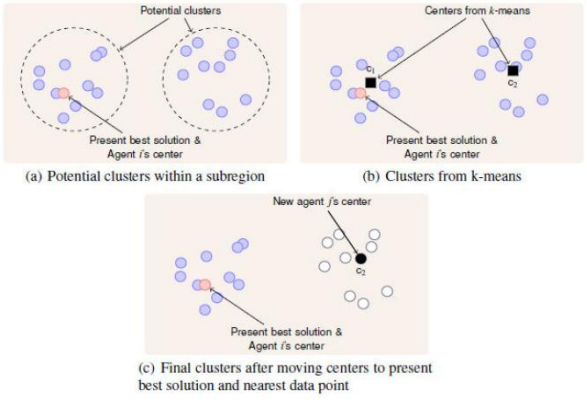

Figure 1.2: Illustration Of Process Used To Establish An Agent j Given Points In A Single Agent i's Sub Region.

1.5 Image Clustering - Cluster by nature are the collection of identical objects. Each set or cluster is homogeneous, i.e., objects relating to the similar set are having equivalent behavior to each other. Also, each set or cluster should be different from other clusters, i.e., objects which are allocated to a cluster should be dissimilar from the objects which are found in different cluster. It is the process of putting together identical objects, and it may be hard or fuzzy. Every element is destined to a particular cluster in the time period of its operation in hard clustering; however, each element has a degree of membership depending on its degree of association to several other clusters in cluster which is created through fuzzy clustering.

II. LITERAURE REVIEW

Detection of Plant Leaf Diseases Using Image Segmentation and Soft Computing Techniques

[1] Vijai Singh et all in "Detection of plant leaf diseases using image segmentation and soft computing techniques in INFORMATION PROCESSING IN AGRICULTURE 4 (2017) 41–49" in 2017 Proposed Agricultural productivity is something on which economy highly depends. This is the one of the reasons that disease detection in plants plays an important role in agriculture field, as having disease in plants are quite natural. If proper care is not taken in this area then it causes serious effects on plants and due to which respective product quality, quantity or productivity is affected. For instance a disease named little leaf disease is a hazardous disease found in pine trees in United States. Detection of plant disease through some automatic technique is beneficial as it reduces a large work of monitoring in big farms of crops, and at very early stage itself it detects the symptoms of diseases i.e. when they appear on plant leaves.

Image Processing Based Leaf Rot Disease, Detection Of Betel Vine (Piper Betlel.)

[2] Amar Kumar Dey et all in "Image Processing Based Leaf Rot Disease, Detection of Betel Vine (Piper BetleL.)" in International Conference on Computational Modeling and Security 2016 Proposed deals with leaf rot disease detection for betel vine (*Piper betel* L.) based on image processing algorithm. The measurement of plant features is a fundamental element of plant science research and related applications. The information related to plant features is especially useful for its applications in plant growth modeling, agricultural research and on farm production. Few methods have been applied in leaf rot disease detection for betel vine leaf (*Piper Betel* L.). Traditional direct measurement methods are generally simple and reliable, but they are time consuming, laborious and cumbersome. In contrast, the proposed vision-based methods are efficient in detecting and observing the exterior disease features. In the present investigation, image processing algorithms are developed to detect leaf rot disease by identifying the color feature of the rotted leaf area. Subsequently, the rotted area was segmented and area of rotted leaf portion was deduced from the observed plant feature data. The results showed a promising performance of this automatic vision-based system in

practice with easy validation. This paper describes the steps to achieve an efficient and inexpensive system acceptable to the farmers and agricultural researchers as well for studying leaf rot disease in betel vine leaf.

An Image Processing Technique for Estimation of Betel Leaf Area

[3] Amar Prasad Soni et all in "An Image Processing Technique for Estimation of Betel Leaf Area" in Electrical, Electronics, Signals, Communication and Optimization (EESCO), 2015 The green heart shaped betel leaf, in India it is known as Paan. It is useful in number of traditional remedies such as weakness of nerves, stomach disorder, headache, respiratory disorders, constipation, sore throat, inflammation, scanty or obstructed urination and wounds. There are many more traditional uses of the betel leafs. This paper includes the easy, accurate, and less expensive method of leaf area measurement. Leaf area of plants is a useful tool in physiological and agronomic studies. Investigation of betel leaf area is done over 100 leaves out of which some are included in this paper. Results are compared with the graphical technique of leaf area measurement. The advantage of this method is the easiness and the stability of precise estimation of area.

Detection of Diseases on Cotton Leaves Using K-Mean Clustering Method

[4] Pawan P. Warne et all in "Detection of Diseases on Cotton Leaves Using K-Mean Clustering Method" in International Research Journal of Engineering and Technology Volume: 02 Issue: 04 in 2015 proposed an approach for careful detection of diseases, diagnosis and timely handling to prevent the crops from heavy losses. The diseases on the cotton are critical issue which makes the sharp decrease in the production of cotton. So for the study of interest is the leaf rather than whole cotton plant because about 85-95 % of diseases occurred on the cotton leaves like Alternaria, Cercospora and Red Leaf Spot. In this proposal initially preprocessing the input image using histogram equalization is applied to increase the contrast in low contrast image, K-means clustering algorithm is used for segmentation which classifies objects based on a set of features into K number of classes and finally classification is performed using Neural-network.

Extraction Of Rice Disease Using Image Processing

[5] Daisy Shergill et all in "EXTRACTION OF RICE DISEASE USING IMAGE PROCESSING" In INTERNATIONAL JOURNAL OF ENGINEERING SCIENCES & RESEARCH TECHNOLOGY in 2015 proposed a Crop diseases cause significant damage and economic losses in crops worldwide. It is difficult for farmers as well as experts/doctors to identify the symptoms of diseases correctly and to specify right remedy. It is very difficult task for farmers to monitor the large farms always so farmers are in great need to develop a computerized system that monitors crop when it is infected with diseases. This can be performed by capturing an image of a crop leaf, then extracting a predefined feature from the captured image and finished by determining the disease. The proposed method is useful in crop protection especially large area farms, which is based on computerized image processing techniques that can detect diseased leaves using color information of leaves.

III. THEORY OF PROPOSED WORK

3.1 Color Image Processing(CIP):

Color is a powerful descriptor of an object and has an advantage over gray scale. Color information is an important feature like shape, texture which has been successfully used for many image processing applications like object recognition, image matching, CBIR, color image compression. The object in the scene as perceived by human eyes or the camera system is characterized by its radiance R (λ, x, y, t) where λ is the wavelength of the electromagnetic radiation at position (x, y) and at time t for a particular color.The fundamental difference between color image and gray image is the values assigned. For color images in color space a color vector is assigned to a pixel where as in gray image a gray value is assigned. Thus in Color Image Processing vector valued functions are used. Depending on the principles of processing CIP can be broadly classified into two classes [8].

2.5.1 3.1.1 RGB ColorSpace:

RGB color space is the most commonly used color space for computer application which uses the mixing of three primary colors viz. Red, Green and Blue with wavelength 700, 546.1 and 435.8 respectively. The model is based on the Cartesian coordinate system. Visible colors and wavelengths are not equivalent. In the RGB color space the color image is treated as the vector for three components R, G and B. Digital color image C(x,y) can be represented as

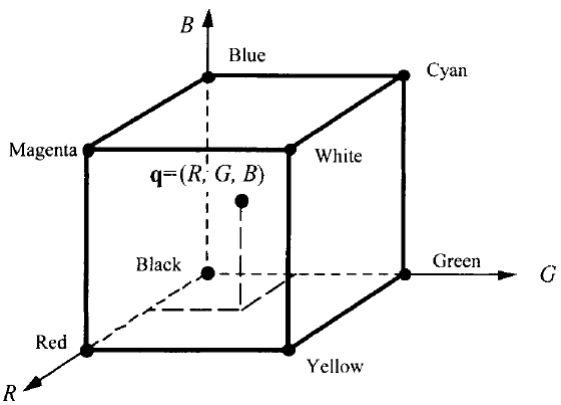

Figure 3.1: RGB color space

3.2 **CMYK colorspace:** Cyan, Magenta and Yellow are

the secondary colors of light or primary colors of pigment. Pure Cyan, Magenta and yellow do not reflect red, green and blue colors respectively. Addition of black color leads to CMYK model which forms base for printing process. A subtractive color space can be represented as follows

IV. IMPLEMENTATION WORK

4.1 Diseases type 1 -Alternaria - The shape Alternaria is a very much perceived sensitivity causing organism. Alternaria spores can be recognized from spring through pre-winter in most calm territories, and can achieve levels of thousands of spores for every cubic meter of air. Alternaria spores can be at their most elevated fixations amid dry, breezy conditions that are perfect for the spores to end up airborne. Alternaria is right now contained around 40-50 species.

Figure 3.1 Sample Image

4.2 Diseases type 2 -Bacterial- This fungal sickness disturbs several plants, comprising vegetables, fruits, and trees. It foundations gloomy, dipped lesions on leaves, stems, flowers, and fruits. It also occurrences unindustrialized discharges and intensifying leaves. It canister spread very quickly all through drizzly periods. Anthracnose is a general term for a variety of diseases that affect plants in similar ways. Anthracnose is especially known for the damage that it can cause to trees. Anthracnose is caused by a fungus, and among vegetables, it attacks cucurbits.

Figure 4.2 Sample of Anthracnose

4.3 Diseases type 3 Bacterial Blight - In the vegetable garden, bacterial blight is most often a problem on snap beans and lima beans. (Note that other crops also suffer from bacterial diseases that may be called bacterial blight.) Symptoms of infection are large, water-soaked, pale green spots on leaves that later turn brown. These spots may also appear on pods and can produce a yellowish ooze in wet weather. Leaves infected with halo bacterial blight develop many small dead spots with yellow halos around them; spots on pods produce a cream-colored ooze.

Figure 4.3 Sample of Bacterial Blight

4.4 Diseases type 4 Cercospora Leaf Spot - Cercospora leaf spot can be caused by a wide range of Cercospora contagious pathogen species relying upon the plant compose tainted. For instance, Cercospora beticola taints sugar beets while Cercospora rosicola contaminates rose plants. This is viewed as a foliar sickness and can be particularly pulverizing to sugar beet edits in North Dakota and Minnesota. This ailment is now and again misdiagnosed as dark spot.

Figure 4.4 Sample of Cercospora Leaf Spot

4.5 Healthy Leaves - A new hypothesis explaining the adaptive significance of bright autumn leaf colors argues that these colors signal tree quality to myrmecophilous specialist aphids. In turn, the aphids attract aphid-tending ants during the following spring, which defend the trees from other aphids and herbivores. In this context, other types of plant coloration, such as the color change observed in young and old spring leaves, may function as a signal of plant quality for aphids and other myrmecophilous hemipterans.

Figure 4.5 Sample of Healthy Leaves

V. PROBOLEM FORMULATION

5.1 Mean Calculation :- The mean is the average of all numbers and is sometimes called the arithmetic mean. To calculate mean, add together all of the numbers in a set and then divide the sum by the total count of numbers.

5.2 Standard Deviation calculation - Standard deviation is a measure of dispersement in statistics. "Dispersement" tells you how much your data is spread out. Specifically, it shows you how much your data is spread out around the mean or average. For example, are all your scores close to the average? Or are lots of scores way above (or way below) the average score?. Standard deviation represented by σ.

5.3 Root Mean Square Calculation - For a set of n numbers or values of a discrete distribution x_1, ..., x_n, the root-mean-square (abbreviated "RMS" and sometimes called the quadratic mean), is the square root of mean of the values x_i^2, namely.

5.4 Entropy Calculation- In this situation, **entropy** is defined as the number of ways a system can be arranged. The higher the entropy (meaning the more ways the system can be arranged), the more the system is disordered.

5.5 Kurtosis Calculation - kurtosis is a statistical measure that is used to describe the distribution. Whereas skewness differentiates extreme values in one versus the other tail, kurtosis measures extreme values in either tail. Distributions with large kurtosis exhibit tail data exceeding the tails of the normal distribution (e.g., five or more standard deviations from the mean).

5.6 Skewness Calculation - Skewness is a term in statistics used to describes asymmetry from the normal distribution in a set of statistical data. Skewness can come in the form of negative skewness or positive skewness, depending on whether data points are skewed to the left and negative, or to the right and positive of the data average. A dataset that shows this characteristic differs from a normal bell curve.

5.7 Correlation Calculation :- Related. For example, height and weight are related; taller people tend to be heavier than shorter people. The relationship isn't perfect. People of the same height vary in weight, and you can easily think of two people you know where the shorter one is heavier than the taller one. Nonetheless, the average weight of people 5'5" is less than the average weight of people 5'6", and their average weight is less than that of people 5'7", etc.

5.8 Energy calculation - Leaf is a renewable energy and sustainable technology investment firm providing venture and growth capital across the renewable energy industry to support innovative, well-managed, rapidly-growing companies. Leaf is backed by some of the world's leading institutional investors.

5.9 Homogeneity Calculation - In physics, a **homogeneous** material or system has the same properties at every point; it is uniform without irregularities. A uniform electric field (which has the same strength and the same direction at each point) would be compatible with homogeneity (all points experience the same physics).

VI. SIMULATION RESULT

6.1 Introduction of MATLAB Software : - MATLAB is a commercial "Matrix Laboratory" package which operates as an interactive programming environment. It is a backbone of the Mathematics Department programming lineup and is additionally accessible for PC's and Macintoshes and might be found on the CIRCA VAXes. MATLAB is all around adjusted to numerical analyses since the hidden calculations for MATLAB's worked in capacities and provided m-records depend on the standard libraries LINPACK and EISPACK.

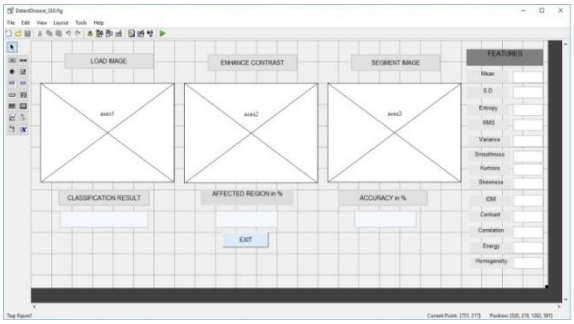

Figure 6.1 Graphical User Interfaces for proposed work

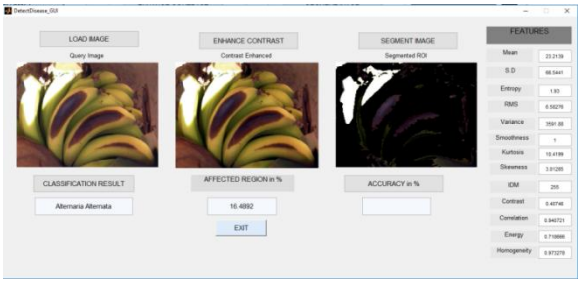

Figure 6.2 Image Graphical User Interfaces for proposed work

6.2 Simulation Result of Object One & Two :- Cucurbits and Cherrey object we can take for result simulation we can calculate various parameter**.**

Figure 6.3 (a) Original Banana image (b) Enhance contrast Image

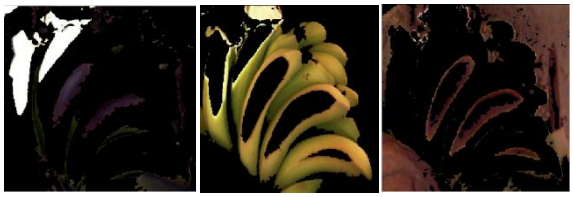

Figure 6.4 (a) Banana cluster 1 (b) Banana cluster 2 (c) Banana cluster 3

Figure 6.5 (a) Original Tamoto image (b) Enhance contrast Image

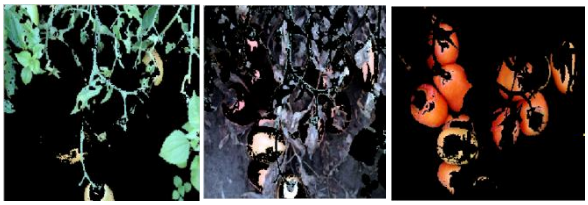

Figure 6.6 (a) Tamoto cluster 1 (b) Tamoto cluster 2 (c) Tamoto cluster 3

Parameter	Banana			Tamoto		
	Cluster 1	Cluster 2	Cluster 3	Cluster 1	Cluster 2	Cluster 3
Mean	23.2139	44.2283	21.2669	43.5312	56.0461	18.8179
Standard Daviation	66.5441	62.5007	34.3992	75.8584	67.752	53.483
RMS	6.58276	10.106	8.92816	8.12681	11.7598	5.19274
Affected Region	1.93	4.38655	3.27084	2.88409	5.33461	1.78971
Entropy	10.4199	3.69662	4.93272	3.30907	3.22933	11.0254
Kutosis	0.40746	0.508824	1.54856	1.6706	1.92381	0.576072
Contrast	3591.88	3213.28	841.182	5286.29	4391.17	2227.97
Smoothness	0.940721	0.919914	0.845914	0.833524	0.732962	0.845276
Correlation	0.718666	0.319507	0.456883	0.489647	0.216789	0.686281
Energy	0.973278	0.935685	0.952956	0.900646	0.817553	0.954567
Homogeneity	1	1	1	1	1	1
Variance	3.01285	1.29476	1.57327	1.38143	1.08424	2.9975
Skewness	255	255	255	255	255	255
IDM	Alternaria Alternata	Healthy Leaf	Healthy Leaf	Cercospora Leaf Spot	Cercospora Leaf Spot	Alternaria Alternata
Accuracy in %	16.4892	None	None	22.3008	15.0046	15.0015
Classification Result	98.3871	96.7742	98.3871	98.3871	98.3871	96.7742

VII. CONCLUSIONS

6.1 ***Conclusions*** Image Processing Toolbox™ provides a comprehensive set of reference-standard algorithms and graphical tools for image processing, analysis, visualization, and algorithm development. You can perform image enhancement, image deploring, feature detection, noise reduction, image segmentation, geometric transformations, and image registration. Many toolbox functions are multithreaded to take advantage of multi core and multiprocessor computers. Image Processing Toolbox supports a diverse set of image types, including high dynamic range, Gig pixel resolution, embedded ICC profile, and topographic. Graphical tools let you explore an image, examine a region of pixels, adjust the contrast, create contours or histograms, and manipulate regions of interest (ROIs). With toolbox algorithms you can restore degraded images, detect and measure features, analyze shapes and textures, and adjust color balance [19].

6.2 Future Scope of Work :- We have developed a fully automatic color image sensing based system for classifying the four most dangerous soya bean foliar infections, namely bacterial blight, frog's eye, brown spot, and soya bean rust. All four infections have similar color shades and are confusing for a non-plant pathologist. An algorithm was developed to find the refined lesion texture histogram and apply the DCT on statistical features of RLTH, followed by a normalization process. We develop a ST-NDCT based hybrid feature descriptor for lesion areas, and proved the suitability of using the same for classifying the infections under consideration.

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