Illness Detection on Cotton Leaves by Gabor Wavelet

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Abstract: In this article, a research of distinguishing and diagnosing cotton illness is presented, the pattern of illness is important part in that, and various features of the images are extracted in other words. the color of actual infected image, there are so many illness occurred on the cotton leaf so the leaf color for different illness t is also different, also there are various other features related to shape of image, also there are different shape of holes are present on the leaf of the image, generally the leaf of infected image have elliptical shape of holes, so calculating the major and minor axis is the major task. The features could be extracted using self organizing feature map together with a back-propagation neural network is used to recognize color of image. This information is used to segment cotton leaf pixels within the image, now image which is under consideration is well analyzed and depending upon this software perform further analysis based on the nature of this image.
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1. Introduction

The antiquity of cotton has been traced to the fourth millennium BC. The world textile industries are being ruled by “Cotton”. In Iran, cotton is the most important cash crop grown on an area of 11.00 lak ha with production of 23 lak bales of cotton. Illness on the cotton is the main problem that decreases the productivity of the cotton. The main source for the illness is the leaf of the cotton plant. About 75 to 85 % of illness on the cotton plant is on its leaves. So for that our study of interest is the leaf of the cotton tree rather than whole cotton plant the cotton leaf is mainly suffered from illness like mildews, foliar leaf spot of cotton, alternate leaf spot of cotton. Study of illness on the cotton leaf can robustly studied by the image processing toolbox. And also the diagnosis by using MATLAB helps us to suggest necessary cure for that illness arises on the leaf of cotton plant.

In the research of distinguishing and diagnosing cotton illness using computer vision intellectively in the agriculture, feature selection is a key question in pattern recognition and affects the design and performance of the classifier. In this paper, the fuzzy feature selection approach -fuzzy curves and surfaces is proposed to select features of cotton illness leaves image. In order to get best information for diagnosing and distinguishing, a subset of independent significant features is identified exploiting the fuzzy feature selection approach. Firstly, utilize FC to automatically and quickly isolate a small set of significant features from the set of original features according to their importance and eliminate spurious features; then, use FS to get rid of the features dependent on the significant features. This approach reduces the dimensionality of the feature space so that lead to a simplified classification scheme appropriate for practical classification applications. The results show that the effectiveness of features selected by the FC and FS method is much better than that selected by human randomly or other methods. Also another approach is used to diagnosis the cotton leaf illness identification or diagnosis, i.e. paper explaining the cotton leaf illness detection from color imaginary using hybrid intelligent system, in that automatic plant illness diagnosis using multiple artificial intelligent techniques. The system can diagnose plant leaf illness without maintaining any expertise once the system is trained. Mainly, the cotton leaf illness is focused in this work. The proposed system consists of three main parts (1) cotton leaf color segmentation (2) cotton leaf illness segmentation and (3) analysis and classification of illness. The cotton leaf illness segmentation is performed using modified self organizing feature map with genetic algorithms for optimization and support vector machines for classification. Finally, the resulting segmented image is filtered by Gabor wavelet which allows the system to analyze leaf illness color features more efficient. The support vector machines are then again applied to classify types of cotton leaf illness. Similar idea can be applicable to cotton leaf illness diagnosis.

2. Proposed Technique

Various illness are found on the cotton plant out of this we discuss the illness some of the major illness which are often found on the leaves of cotton. As

shown in bellow Figures the, the illness is known as foliar illness arises due to potassium deficiency [2], [3], [4]. the early stage of this illness is as shown in Figure 1, now if the more spots of this illness results into the final stage of this plant where the plant leaf is get fall so it is called as Foliar illness of the cotton plant as shown in Figure 2. The leaf is having multiple numbers of spots which clearly mark more potassium deficiency in the plant.

Figure 1. The early stage of the illness

Figure 2. Foliar illness of the cotton plant

Cotton leaf curl Gemini virus causes a major illness of cotton in Asia and Africa [1], [3], [4]. Leaves of infected cotton curl upward Figure 3. and bear leaf-like negations on the underside along with vein thickening Figure 4. Plants infected early in the season are stunted and yield is reduced drastically. Severe epidemics of CLCuV have occurred in Iran in the past few years, with yield losses as high as 80% in fields where infection occurred early in the growing season. Another cotton Gemini virus, cotton leaf crumple virus (CLCrV), occurs in Arizona, California, and Mexico. CLCrV symptoms are distinguishable from CLCuV symptoms in that infected leaves curl downward accompanied by interregnal hypertrophy and foliar mosaic Figure 5. Both CLCrV and CLCuV infect dicotyledonous plants and are whitefly-transmitted previous studies and suggested that they belong to the subgroup III Gemini viruses. However, little information is available on the relationship of these two viruses with each other and with other subgroup III Gemini viruses.

Figure 3. Leaves of infected cotton curl upward

Figure 4. Bear leaf-like negations on the underside along with vein thickening

Figure 5. Malvacearum Bacterial plague.

Malvacearum Bacterial plague starts out as angular leaf spot with a red to brown border [2], [3], [5]. The angular appearance is due to restriction of the wound by fine veins of the cotton leaf. Spots on infected leaves may spread along the major leaf veins. As an illness progresses, leaf leafstalk as shown in Figure 6. the angular leaf spot, results in premature loss of leaves and stems may become infected

resulting in premature defoliation. The illness affects older leaves of mature plants. The spots are round or irregular in shape yellowish brown, with purple, dark brown or blackish borders and white centers affected leaves become pale in color and finally fall off [2], [5], [6]. As shown in Figure 7. As shown in Fig 8, small, pale to brown, round or irregular spots measuring 0.5 - 3 mm in diameter and cracked centers appears on the affected leaves of the plant. Affected leaves become dry and fall off [3], [4], [5], [6]. The illness may cause cankers on the stem. The infection spreads to the bolls and finally falls off.

Figure 6. leaf leafstalk

Figure 7. white centers affected leaves

Figure 8. irregular spots

It is one of the color image feature extraction technique, this technique is called as color image segmentation [8], [9]. Using this technique it is easy for us to extract the various features of illness leaf of cotton image. In our method the input image is enhanced by using anisotropic-diffusion technique to preserve the information of extracted pixels before extracting cotton leaf color from background and B components from HIS and LAB color space, respectively, are use to reduce effect of illumination. The resulting color pixels are clustered by the unsupervised SOFM network to obtained group of color in the image. The back propagation neural network is then applied to extract cotton leaf color from illness part of image.

The image background is additionally processed to remove the edge pixels in order to preserve the actual affected pixels as many as possible. In additions A, U, and Cr components from LAB, UVL and YCbCr colour space, respectively is applied for affected leaf colour extraction with the purpose of less illumination effects. The remaining colour pixels are then extracted for cotton leaf illness colour by using modified self organization feature map; the clustering process does not require any training or predefined no of colour groups. This network is also adjustable allowing similarity of each colour group to be fine tuned.

3. Conclusion

In this paper, there is more scope to reduce the various errors which will be occurred during the simulation, that can be minimize as the more no of input is provided accordingly. The fuzzy feature extraction method is more complex and very much tedious to use. If we use the Gabor wavelet method to exact intensity pattern to various illness accordingly it is then possible to analyze the n no of cotton illness and it works very efficiently, where the fuzzy method fails from that point. That is because of training feature of this approach which will not available with fuzzy method. This method is 80 to 90% more reliable than that of fuzzy method.

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