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The Study of Crop leaf Disease Prediction: An Approach using Genetic Algorithm

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Abstract: Diseases in crops could hamper agriculture production drastically. Production of Agriculture crops can be improved by implementing advance technology that helps in farming to improve the production. In order to predict the diseases in any crop, their leaf images are taken. Images are data storage sample which can be extracted and processed further for important usages via editing through enhancement, segmentation, classification etc. Genetic Algorithm in particular and other evolutionary algorithms in general have been adopted to achieve faster processing times and better results for image enhancement.

Keywords: Genetic Algorithm, Segmentation, Crop leaf disease prediction,

I. INTRODUCTION

In Order to predict any crop leaf disease, the images of the leaf are taken and image segmentation is done via image processing. Image segmentation separates a feeded image into non-overlapping, homogenous and connected regions such that “union of any two spatially adjacent regions is not homogenous”. A region is homogenous, if all pixels in that region “satisfy homogeneity conditions defined per one or more pixel attributes, such as intensity, colour, texture, etc. and if connected path between any pixels exists within the region”.

The Genetic Image processing system consists of following steps, where segmentation is a part, as shown below in Fig. 1:-

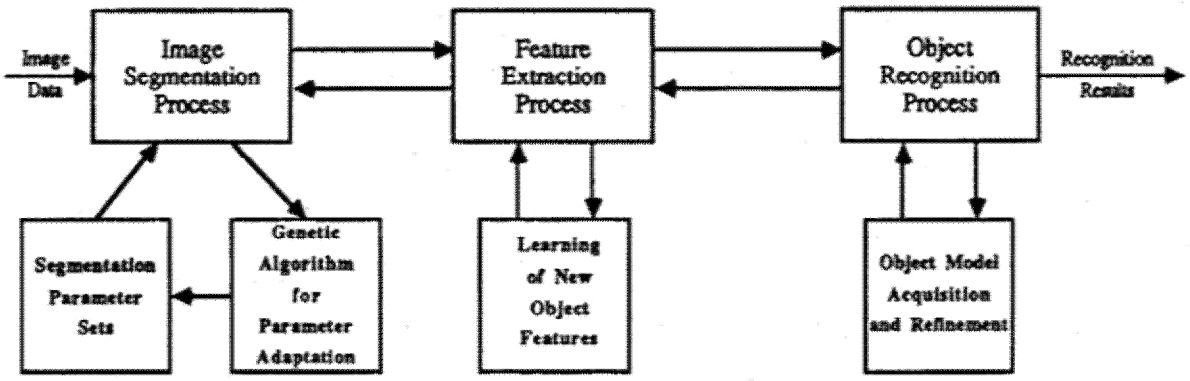

Fig. 1: Steps of General Image Processing System

II. MOTIVATION

Although image Segmentation is being used in many applications such as medical imaging, face recognition, material science, traffic control systems, etc. “fully automatic segmentation of arbitrary images is still seen as an unsolved problem”.

The study is to propose a way to obtain the good quality segmented objects from colour images, and to improve the performance to obtain the best segmented image in lesser number of iterations. While we have studied many aspects of state of art research on image processing & segmentation using Genetic algorithm, we have found following research gaps, which need to overcome:

A. Automatic Initialization of Cluster centre.
B. Lack of prior knowledge for Image Segmentation.
C. Need for improvement in classification accuracy to obtain good quality image after segmentation.
D. For generation of optimal number of clusters, no algorithm has been developed.

III. IMAGE SEGMENTATION WITH GENETIC ALGORITHM

Image Segmentation is an important step of Image processing and it partitions an input image into non-overlapping, homogenous and connected regions [1] such that "union of any two spatially adjacent regions is not homogenous". However, Keri Wood [2] suggested that good image segmentation should meet the following requirements:

A. Every Pixel in the image must belong to a region and each region should be homogenous with respect to a chosen characteristic, which could be syntactic e.g. color, intensity or texture or the characteristic based on semantic interpretation.
B. Every region should be connected and non-overlapping i.e. any two pixels in a particular region should be connected by a line that does not leave the region.
C. It should not be possible to merge two adjacent regions from a single homogenous region.

Each pixel of coloured images is denoted by three component values i.e. Red, Green, Blue and as such these are more comp;lex as far as segmentation is concerned, than grey scale images which have a single intensity value for pixel. Coloured image segmentation can solve many contemporary problems in medical imaging, mining and mineral imaging, bioinformatics and material sciences [3].
Image Segmentation using Genetic Algorithm uses classification algorithm and estimators for automatic initialization of cluster centres and dealing with outliers. Further Genetic Algorithm with classification can be used to obtain good quality image after segmentation. According to the study, incorporation of prior knowledge about outliers is required. G- Estimator can be used for dealing with outliers and for speeding up the process of template matching. Firstly green colored pixels can be masked and removed in the infected clusters and then Genetic Algorithm can be used to obtain the output segments to classify the leaf diseases. The main advantage of proposed approach is that is also provides environment friendly measures of the identified disease.
The proposed approach has been shown below in Fig. 2:

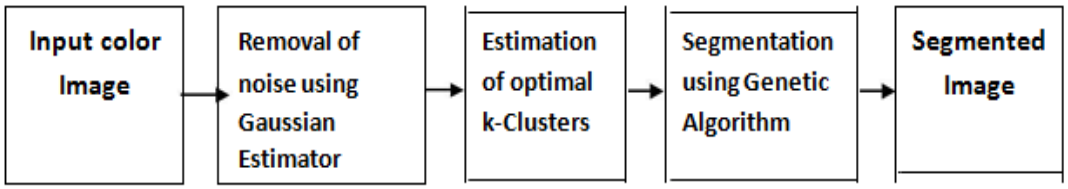

Fig. 2: Proposed Approach of Image Segmentation System

The Output Segmented image of the infected area could now be used in order to match the different values of the image with the pre known values in order to predict the possible disease in the leaf and classify the disease with the help of classifier. Examples of some crop leaf diseases are: Frog eye spot, Ash rust, Fungal disease, Sunburn disease, etc.

IV. CONCLUSIONS

The main advantage of using Genetic Algorithm in segmentation is that it gives many optimal solutions instead of one and as such one has many segmentation solutions to choose as per requirements. According to the study, the proposed approach could be used in order to identify the disease in a crop leaf with very less computational efforts and optimal results. Image Segmentation of the infected area of a leaf could be helpful in recognizing and classifying the crop leaf disease. One advantage of proposed approach is that it also provides environment friendly recovery measures of the identified Crop Leaf Disease.

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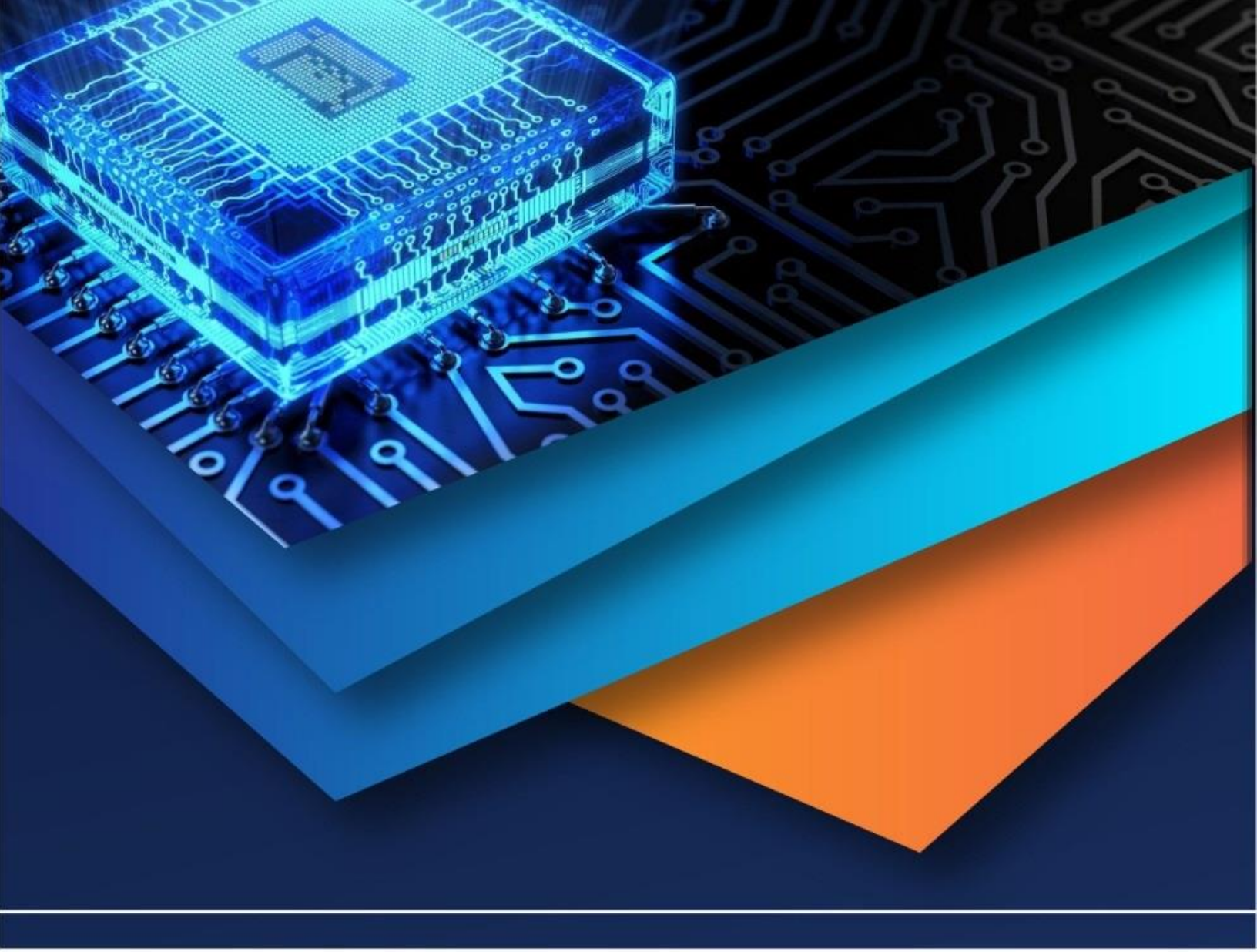

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