Predicting yield, soil moisture and weather using images processing Problem

Problem Statement

In our country where farming is major source income the large share of the population in country territories is working in the horticulture field for their employment. Farmers need to face two fold problems, one thing is the hard effort they need to put for farming and even after this they have to face various natural calamities like rain exactly during the time when crop is ready to be cut. To handle these misfortunes of the net yield there are many parameters responsible, deficient utilities and assets, even with erratic emergencies, their unpredictable circumstances and business are relatively and drastically influenced. Although today in the era of computation, the situation may be somehow improved as the Information and Communication Technology fields with state or art innovation can give an incredible help to come out or to reduce the level of loss to the crop. The literature proposes the method by which we can compare some of the features of crop leaves with help of image processing. Here a special database of leave color chart is prepared and current image of the leaf is compared with available leaf color chart to find the deficiency. Thus with the help of image processing technology an effective approach can be developed for yield prediction using the color comparison of leaves. For this a mathematical model can be derived which can help the experts of agriculture field to provide effective solution to the current problem being developed in the crop can be taken care in due to time to increase the yield. In this direction technique could also be exploited to predict the weather conditions as preventive measure.

Background

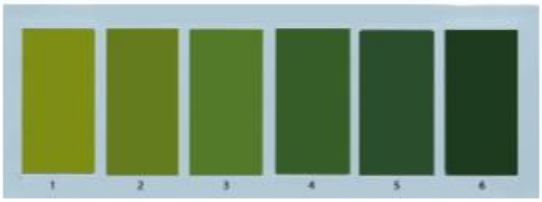
Savita N. Ghaiwat and Parul Arora ["Detection and Classification of Plant Leaf Diseases"] has proposed neural network approach, support vector based approach and K- Mean clustering based methods in their survey paper to detect the disease in plants.

Van Joshua L. Abergos, Philip Zesar Boreta etal., ".Android-Based Image Processing Application for Nitrogen Management" mentioned the android based application which can automatically predict the nitrogen content in paddy plants. The result were derived using Z-test approximations and bit wise operators and the accuracy was proved to be 80%.

Yao Qing, Ding-xiang, etal. Proposed the technique to automatically count he rice plant hoppers ["Automatic Counting of Rice Plant in Paddy Fields"] . This approach of determining the automatic counting extraction was based on Haar Feather extraction

Methodology

Real time images of paddy plant needs to taken and their leaf color chart will be prepared using MATLAB functions. Leaf color chart (LCC) is prepared to cover all the green color ranges in this.



Sample Leaf Color Chart (LCC)

1. Collect large number of paddy images from field.
2. In addition crop fertilization information needs to collected from government organization
3. Read the images to be analyzed
4. Perform image operations (Cropping/compression, Morphological operations a masking etc.)
5. Generation of database(LCC)
6. Compare test images with database
7. If found best match
   Calculate accuracy and yield outcome.
8. End.

Experimental design

while testing image data which is available to is in true color format which can't be processed with required accuracy. As image devices capture the image in RGB format, while the phenomenon used by retina of human eye if different. So there is a need of conversion from RGB format to other format of HIS (which is stated as Hue, Saturation and Intensity value). Following experimental design show the process of conversion.

$$H = \begin{cases} \theta & if\ B \le G \\ 360 - \theta & if\ B > G \end{cases}$$

: H is hue, B is Blue color, G is green color

$$S = \left[1 - \frac{3}{(R+G+B)}\right][\min(R,G,B)]$$

: To determine the saturation value.

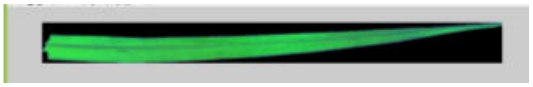
$$I = \frac{1}{3}(R+G+B)$$

: To determine the Intensity value

:Original Image of paddy leaf

:Binary Image (Noisy)

: Mapped and cropped test image in RGB



: Test image in HSI format

Result and discussion: The given test image once processed thruough the test is analysed through null hytpothesis and chi square test for goodness of fit and its correlation value is calculated and compared with LCC values to predict the state of the crop.