ESTIMATION OF NITROGEN CONTENT IN MAIZE LEAVES USING IMAGE PROCESSING TECHNIQUES

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Abstract - *Agriculture is the practice of farming, including cultivation of soil for the growing of crops. Nitrogen is one of the nutrients which plays important role in yield of crops. It is an important to detect and manage nitrogen level in crops to get better yield. It is cumbersome to find out the nitrogen content in leaf using chemical test method.*

In this project work, we are going to address this problem and explore a new method to identify nitrogen level in crops using image processing techniques. Here we are considering crop leaves like maize, paddy or corn to identify percentage of nitrogen level. Applications include prevention of diseases of crops in advance, quality and quantity of crop yield etc.

Key Words: Nitrogen, image processing, agriculture, entropy, mean, variance.

1. INTRODUCTION

Finding out the nitrogen content in maize leaf by image processing technique is the aim of this system. We use regression modeling to find the correlation between various image features and nitrogen content of leaves got from laboratory test results. Regression model technique is statistical to determine the relationship between many variables. Regression is primarily used for causal inference and prediction. It is important to recognize that regression analysis is fundamentally different from ascertaining the correlations among different variables. Correlation determines the strength of the relationship between variables, while regression attempts to describe that relationship between these variables in more detail.

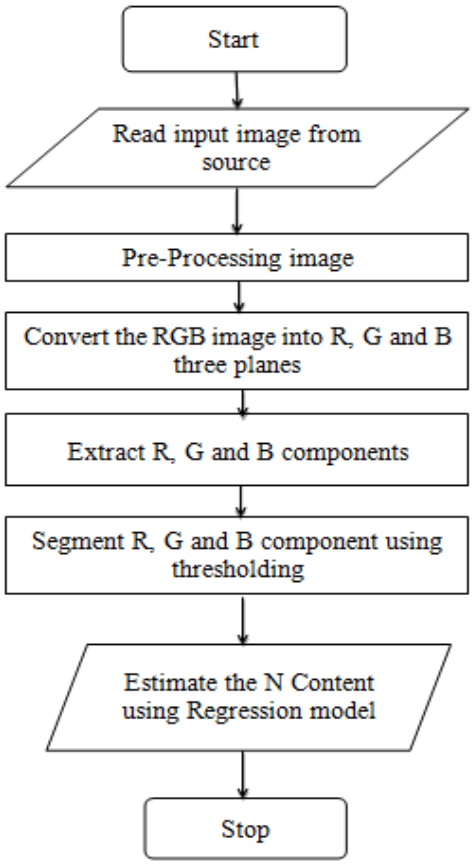
1.1 Proposed system

The proposed system framework contains the procedures to collect the sample images of maize leaf using camera under different illuminations (i.e., natural day light, fluorescent light & incandescent light), image pre-processing, by using the regression model analysis can able to predict the nitrogen content in the leaves.

1.2 Problem Statement

To design and implement an efficient method for "Estimation of Nitrogen Content in Maize Leaves using Image Processing Technique". Here, the input is an image of a maize leaf and output is percentage of nitrogen in the leaf. Estimation of nitrogen content in leaves by extracting the features like entropy, mean, average energy and variance using image processing techniques and regression modelling.

2. DETAILED DESIGN



The image is obtained through digital camera using different light sources such as day natural light, fluorescent light and incandescent light. The camera is located at a position normal to the object. Subsequent to getting the image, pre-processing techniques are used to remove the noise in source image. Then convert the RGB image into R, G and B images considering a segment R, G and B part utilizing thresholding techniques [2].Then apply regression model to estimate the maize plant nitrogen content.

Regression model were developed between image feature and the plant nitrogen percentage, finding by chemical analysis with Kjeldahl method. After pre-processing of the

image of the leaves, they were converted into the R, G, B, normalized 'r' and normalized 'g' image. Various image features were calculated such as variance, mean, average entropy and energy. After features calculation, they were compared with the actual lab values to develop a regression model to get a straight line equation. Then we take feature value and multiply it with slope value (m) of the regression line then add the y intercept constant value to get the estimated nitrogen content of that sample.

2. FANCTIONAL TEST CASES

Testing focuses on functional task of the system. Here the results obtained manually from Agriculture University that the results we are compared with the computed results obtained from the program. Some test results mentioned in below table and all other test results represented in results and analysis section. Here we compared three illumination images, and then we are deciding which illumination is correctly matched to actual results.

Sl.no	Illumination image	Test status
1	 Day Natural Light	Accepted
2	 Fluorescent Light	Accepted
3	 Incandescent Light	Rejected

2.1 prediction results and manual results on leaves

Test case	Illumination Type	Actual results or Chemical test result	Estimation of N content using regression model	Errors in %
Sample 1 a)		0.43425	0.486	11
b)		0.43425	0.388	10
c)		0.43425	0.488	-12
Sample 2 a)		0.45763	0.485	6
b)		0.45763	0.364	20
c)		0.45763	0.488	-7

3. CONCLUSION

In this project, estimation of nitrogen content in a maize leaf is done based on color and texture features like entropy, mean, average energy, and variance. The literature review outlines several methods of estimation of nitrogen content in the leaf. The two estimation methods like Kjeldahl (chemical test) and SPAD meter, these are costlier and time consuming. The image processing methods like regression techniques may work well with commonly speedier for estimating nitrogen content in leaves.

ACKNOWLEDGEMENT

I would like to take this opportunity to express my deep sense of gratitude to **Dr. Siva S Yellampalli**, Principal, VTU Extension Centre, UTL Technologies Limited, for his invaluable inspiration and guidance without which the internship work would not have progressed to its present state.

I cannot forget the constant encouragement, and help provided by my guide **Mr. Hemanth Kumar K S.** Assistant Professor, VTU Extension Centre, UTL Technologies Limited, Bengaluru who considered me like a friend and made me feel at ease in times of difficulty during my project work. I express my sincere gratitude to him.

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