

Image Recognition System for Paddy Leaf Diseases in Sri Lanka

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Introduction

Paddy is the major economic crop in Sri Lanka. There are mainly two seasons for paddy cultivation called *Yala* and *Maha*. Paddy diseases pose a major threat to rice production in Sri Lanka because of millions of rupees in direct losses and losses related to use of control measures. Ever since humans started farming, diseases have been one of the major obstacles in maximizing production. There are numerous diseases of rice such as fungi, bacteria, viruses and nematode. If we can identify these diseases in primary stages, it will give an additional advantage to prevent the diseases and to minimize the spread of them. There are mainly three paddy leaf diseases in Sri Lanka that spread speedily. Those diseases are Rice Blast (*Magnaporthe grisea*), Rice sheath blight (*Rhizoctonia solani*) and Brown spot (*Cochiobolus miyabeanus*).

Methodology

After giving chance to upload images of infected paddy leaves in the field, first the selected image needs to be digitized. Then separate the plant leaf from its background and its known as segmentation. For second step of the process, the infected spots in the space that represent the common color (reddish brown) for all three diseases need to be calculated. Then the ratio of surface area of spots over surface area of leaf is calculated (Gliverer, *et al.*, 2001). Finally that function compares the ratio value with given conditions and identify the disease.

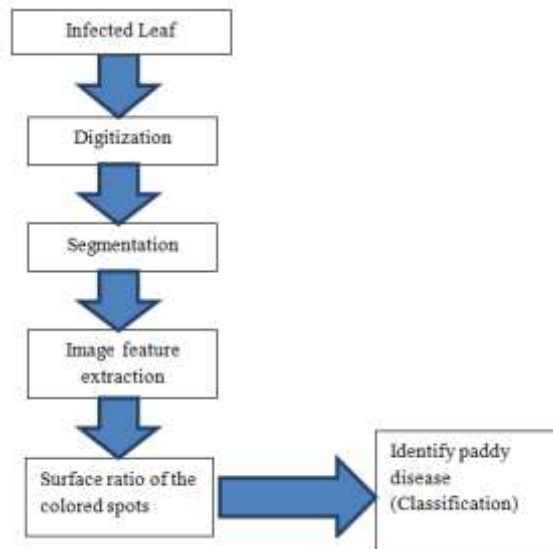


Figure 1. Functional diagram.

Image segmentation is the first step of image analysis (Martin & Sabritosunoglu, 2000). It is critical and essential step and is one of the most difficult tasks in image processing, as it determines the quality of the final result of analysis. There is main feature related to color of leaf image i.e. infected part of the particular disease leaf image is having the variations in its RGB values, means that variations are certain, when extraction of spot color surface, it identifies the predefined color range spots in hsv (hue saturation value). The features correspond to color characteristics are the mean and variance of the gray level of the red, green and blue channel of the spots. Therefore using this color extraction we can identify spot surface of the

image. This system is based on the *JavaCV* (wrapper for *OpenCV*) library and image processing methods. Java language is used to implement the system. If the user wants to compare the ratio values of each infected leaves, the system gives opportunity to compare leaves' spot ratios through bar chart.

Results and Discussion

The classification part is based on the calculated ratio of the image which is based on the predefined identical color ratio ranges of the each disease. The ratio value of each infected leaf is calculated using the equation given below.

$$\text{Ratio} = \frac{\text{spots surface}}{\text{Leaf surface}}$$

Table 1. Ratio range.

Ratio Range	Disease
If ratio value is less than 1.5 and more than 0	Brown Spots
If ratio value is less than 5 and more than 1.5	Rice Blast
If ratio value more than 5	Rice Sheath Blight

Table 2. Percentages of correctness of the results

Disease	Number of observed Images	Correct identifications	Wrong Identifications	Percentage of correctness
Brown Spots	20	17	3	85%
Rice Blast	30	26	4	87%
Rice Sheath Blight	25	22	3	88%

Conclusions

This system identifies the main paddy leaf diseases (Rice Blast, Brown Spots, Rice Sheath Blight) in Sri Lanka with near to 90 % correctness. High quality images will be an added advantage to the recognition of disease correctly.

References

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