

Kittipong Powbunthorn 2012: Detection of Brown Leaf Spot Disease in Cassava using Image Analysis. Master of Engineering (Agricultural Engineering), Major Field: Agricultural Engineering, Department of Agricultural Engineering. Thesis Advisor: Mr. Wanrat Abdullakasm, Ph.D. 156 pages.

The objectives of the present study were to develop image analysis techniques for *in situ* detection of the Brown Leaf Spot disease in cassava (*Manihot esculenta* Crantz) caused by *Cercosporidium henningsii* Allesch, as well as for assessing its severity level. Digital images of cassava leaves captured in both controlled and actual field conditions were used in the analyses. Several color indices were used as descriptors to distinguish the infected leaves from the healthy ones. These included red ( $r$ ), green ( $g$ ) and blue ( $b$ ) chromatic coordinates derived from original RGB values, contrast indices  $r - g$ ,  $g - b$ ,  $(g - b) / |r - g|$  and  $2g - r - b$ , and hue ( $H$ ), saturation ( $S$ ) and intensity ( $I$ ) which forms the HSI space. The artificial neural network (ANN) and discriminant analysis (DA) were applied to classify the healthy and the diseased leaves. Experimental results indicated the validity of color indices associated with the ANN and DA classification approach in discriminating the diseased plants from the non-diseased ones. Additional image processing algorithms based on color were further developed in order to locate the positions of brown spot on leaves which allows a higher precision in detecting the disease. The results showed that the algorithm relying on intersection between  $H$  and *Excess Green (ExG)* yielded highest accuracy. Comparison between the number of brown spots detected by image analysis with that obtained from manual counting indicated a good correlation ( $R^2 = 0.8325$ ) and a least RMSE of 10.56.

In the severity level scoring, an image analysis algorithm has been developed. The  $H$  and  $I$  values were used in segmentation and feature extraction to calculate the percentage of infection area and to count the number of spots. Comparing the image analysis results with manual scoring performed by raters based on conventional illustrated diagram key demonstrated a satisfactory consistency ( $R^2 = 0.8993$ ).

---

Student's signature

---

Thesis Advisor's signature