## Detection of Powdery Mildew Disease in Strawberry Using Image Texture and Supervised Classifiers

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Abstract : Strawberry powdery mildew (PM) is a serious disease that has a significant impact on strawberry production. Field scouting is still a major way to find PM disease, which is not only labor intensive but also almost impossible to monitor disease severity. To reduce the loss caused by PM disease and achieve faster automatic detection of the disease, this paper proposes an approach for detection of the disease, based on image texture and classified with support vector machines (SVMs) and knearest neighbors (kNNs). The methodology of the proposed study is based on image processing which is composed of five main steps including image acquisition, pre-processing, segmentation, features extraction and classification. Two strawberry fields were used in this study. Images of healthy leaves and leaves infected with PM (Sphaerotheca macularis) disease under artificial cloud lighting condition. Colour thresholding was utilized to segment all images before textural analysis. Colour cooccurrence matrix (CCM) was introduced for extraction of textural features. Forty textural features, related to a physiological parameter of leaves were extracted from CCM of National television system committee (NTSC) luminance, hue, saturation and intensity (HSI) images. The normalized feature data were utilized for training and validation, respectively, using developed classifiers. The classifiers have experimented with internal, external and cross-validations. The best classifier was selected based on their performance and accuracy. Experimental results suggested that SVMs classifier showed 98.33%, 85.33%, 87.33%, 93.33% and 95.0% of accuracy on internal, external-I, external-II, 4-fold cross and 5-fold cross-validation, respectively. Whereas, kNNs results represented 90.0%, 72.00%, 74.66%, 89.33% and 90.3% of classification accuracy, respectively. The outcome of this study demonstrated that SVMs classified PM disease with a highest overall accuracy of 91.86% and 1.1211 seconds of processing time. Therefore, overall results concluded that the proposed study can significantly support an accurate and automatic identification and recognition of strawberry PM disease with SVMs classifier.

**Keywords :** powdery mildew, image processing, textural analysis, color co-occurrence matrix, support vector machines, knearest neighbors

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