

Title Discrimination of black walnut shell and pulp in hyperspectral fluorescence imagery using Gaussian kernel function approach

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Abstract

Automated discrimination between walnut shell and pulp has become an imperative task in the walnut postharvest processing industry in the US. During the last several years, hyperspectral fluorescence imaging has been widely used to inspect agricultural products for quality and safety due to its full of spectral information and ability of identifying different chemical components in the subject. This paper studied the feasibility of analyzing the difference of black walnuts shell and pulp by hyperspectral fluorescence imaging. Meanwhile, a Gaussian-kernel based support vector machine (SVM) approach was used to classify the walnuts shell and pulp. Experiments result with an overall 90.3% recognition rate based on 6257 samples showed that hyperspectral fluorescence imaging and proposed classification method were effective in differentiation of walnuts shell and pulp. In order to further evaluate the performance of proposed SVM classifier, the experiment results of SVM were compared to that of traditional principal component analysis (PCA) and Fisher's discriminant analysis (FDA) methods. The conclusion was made that SVM with the Gaussian kernel function method was better than PCA and FDA in classifying the walnuts shell and pulp.