COTTON FOREIGN MATTER CLASSIFICATION BY SHORTWAVE INFRARED HYPERSPECTRAL IMAGING

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Abstract

Various types of cotton foreign matter seriously reduce the commercial value of cotton lint and further degrade the quality of textile products for consumers. This research was aimed to investigate the potential of the near infrared liquid crystal tunable filter (LCTF) hyperspectral imaging technique for inspection of the foreign matter on the cotton lint surface. The foreign matter samples used in this study included botanical foreign matter (i.e., stem, bark, brown leaf, green leaf, and seed meat) and non-botanical foreign matter (i.e., twine, module cover, and poly woven bag). Hyperspectral images of the foreign matter on top of the cotton lint surface were acquired from 480 samples (30 for each type of the foreign matter) using a LCTF hyperspectral imaging system with a spectral range from 900 to 1700 nm. The mean spectra of the foreign matter and lint samples were extracted from the regions of interest manually. Stepwise linear discriminant analysis was developed to select the key wavelengths and to discriminate various foreign matter and cotton lint according to their spectral features. Overall, using near infrared hyperspectral imaging, over 90% of the samples were correctly classified in the calibration process. The results demonstrated that the liquid crystal tunable filter hyperspectral imaging technique has the potential to discriminate various foreign matter from cotton lint.