

Development of spectral indices for roofing material condition status detection using field spectroscopy and WorldView-3 data

ABSTRACT

Status observations of roofing material degradation are constantly evolving due to urban feature heterogeneities. Although advanced classification techniques have been introduced to improve within-class impervious surface classifications, these techniques involve complex processing and high computation times. This study integrates field spectroscopy and satellite multispectral remote sensing data to generate degradation status maps of concrete and metal roofing materials. Field spectroscopy data were used as bases for selecting suitable bands for spectral index development because of the limited number of multispectral bands. Mapping methods for roof degradation status were established for metal and concrete roofing materials by developing the normalized difference concrete condition index (NDCCI) and the normalized difference metal condition index (NDMCI). Results indicate that the accuracies achieved using the spectral indices are higher than those obtained using supervised pixel-based classification. The NDCCI generated an accuracy of 84.44%, whereas the support vector machine (SVM) approach yielded an accuracy of 73.06%. The NDMCI obtained an accuracy of 94.17% compared with 62.5% for the SVM approach. These findings support the suitability of the developed spectral index methods for determining roof degradation statuses from satellite observations in heterogeneous urban environments.