Spectral feature selection and classification of roofing materials using field spectroscopy data

ABSTRACT

Impervious surface discrimination and mapping are important in urban and environ-mental studies. Confusion in discriminating urban materials using multispectral systems has led to the use of hyperspectral remote sensing data as an effective way to improve urban analysis. However, the high dimensionality of these data needs to be reduced to extract significant wave-lengths useful in roof discrimination. Therefore, this research used feature selection algorithms of the support vector machine (SVM), genetic algorithm (GA), and random forest (RF) to select the most significant wavelengths, and the separability between classes was assessed using the SVM classification. Accordingly, the visible, shortwave infrared-1, and shortwave infrared-2regions were most important in distinguishing different roofing materials and conditions. A comparative analysis of the feature selection models showed that the highest accuracy of 97.53% was obtained using significant wavelengths produced by RF. Accuracy of spectra without feature selection was also investigated, and the result was lower compared with classification using significant wavelengths, except for the accuracy of roof type classification, which produced an accuracy similar to SVM and GA (96.30%). This study offers new insight into within-class urban spectral classification, and the results may be used as the basis for the development of urban material indices in the future.