

## **Synergistic use of genetic algorithm and spectral angle mapper for hyperspectral band selection of roof materials**

### **ABSTRACT**

Hyperspectral data are valuable for urban studies because of the continuous narrow bands and high spectral resolution of such data. However, using hyperspectral data presents certain difficulties because of the high dimensionality. Hyperspectral data dimensionality should be reduced without losing the spectral detail of the data. In this study, we aim to assess the capability of hyperspectral data to discriminate roof materials and evaluate the feasibility of the genetic algorithm (GA) combined with the spectral angle mapper classification to identify significant bands that are effective in discriminating roof materials. The performance of GA was estimated using the overall classification accuracy. Field spectral reflectance from 4 types of roof materials in different conditions based on age (new and old) was collected using an Analytical Spectral Devices FieldSpec 3 Spectroradiometer with a wavelength range of 350 nm to 2500 nm. In this study, we confirm the potential of GA, with high overall classification accuracy (85 %), for the selection of significant bands that have valuable information to discriminate various types of roof materials. Overall, the results from the GA analysis show 3 principle locations of bands which are located at 517, 823 and 2008 nm in the visible, near infrared and shortwave region for discriminating different materials. This finding is in agreement with previous studies in determining the significant bands for man-made materials discrimination. Previous studies also discovered similar locations and ranges in the electromagnetic spectrum.

**Keyword:** Hyperspectral; Band selection; Roof materials; Genetic algorithm; Classification