Hyperspectral anomaly detection for a subspace target

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Hyperspectral imaging is particularly useful in surveillance of a large natural area for an anomalous man-made object. The objective of this research is to develop an anomaly detection algorithm based on a statistical model for the detection of a subspace target. Observations from experimental results on hyperspectral anomaly detection for such an anomalous target have shown that target pixels and background pixels form two subspaces in the spectral space and the target can be detected in the residual of the pixel. The anomaly detector is based on the Mahalanobis distance of the residual from a pixel that is partitioned non-uniformly according to the groups in the spectral components in the pixel. The residual is obtained by partialing out the main background from the pixel by predicting linear combinations of each subset of the partitioned pixel with linear combinations of the main background. Experimental results show that the anomaly detector outperforms conventional anomaly detectors.