Automated, Accurate Material Detection in Hyperspectral Data

Climate Tech

Software & Algorithms

This technology introduces an automated algorithm that detects materials in hyperspectral data with high accuracy and reliability. The method combines and improves existing spectral matching algorithms by automatically identifying the optimal background spectrum and reducing noise across the full spectral range. Demonstrated on Mars satellite data, the algorithm accurately mapped calcium sulfate minerals on the Martian surface, achieving more efficient and robust identification than manual or traditional methods. The algorithm can be applied to any spectral dataset, provided a reference spectrum is available.

APPLICATIONS

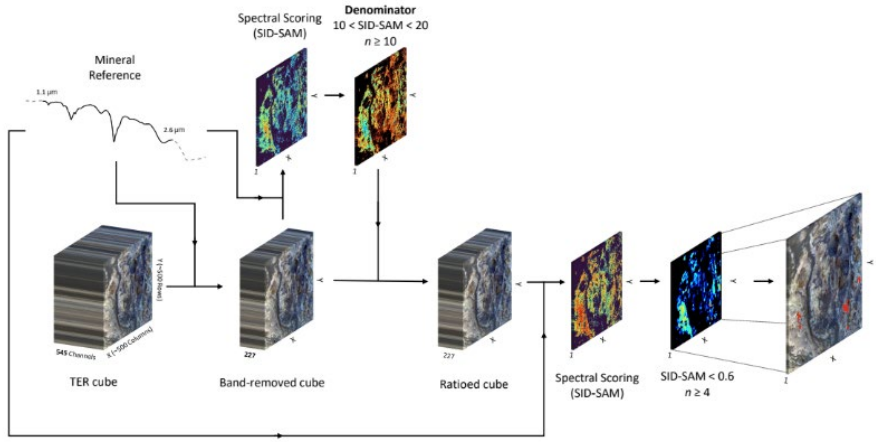
- Mineral exploration – automated identification of mineral deposits on Earth or other planets
- Environmental monitoring – detection of pollution signatures such as oil spills or chemical contamination
- Forensic and regulatory enforcement – detection of illegal dumping, mining, or land-use violations
- Medical imaging – potential for tissue or tumor classification based on spectral features

DIFFERENTIATION

- Automated background and noise correction
- Combines multiple spectral matching metrics for higher accuracy
- Analyzes billions of pixels within minutes, replacing manual inspection
- Applicable across spectral ranges and material types

DEVELOPMENT STAGE

A working prototype was developed and validated on hyperspectral satellite data from Mars (CRISM/MRO), successfully identifying known and new mineral deposits (gypsum and bassanite) and demonstrating superior performance over standard manual analyses. Ground-truthing on Earth-based datasets is ongoing to validate performance for terrestrial and industrial use.



Algorithm Processing Pipeline

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