

HYCORDER HANDHELD HYPERSPECTRAL IMAGING SYSTEM



Hyperspectral imaging (HSI) technology is a proven capability for identifying solid materials with high confidence. HSI continues to be a transformational technology, both from the hardware and the algorithmic perspective. Moving from large, expensive, and complicated airborne systems to small, lightweight, and easy-to-use handheld systems provides potential solutions for a wide range of applications.

HyCorder is an active, handheld hyperspectral imaging system with on-board reflectance calibration and an automated material identification capability and library. The use of non-conventional component technologies has resulted in order of magnitude increases in overall system performance and decreases in size, weight and power (SWaP). This end-to-end system delivers near real-time processing of multispectral detectors for:

- Improved SWaP
- Decreased cost
- Confidence in performance

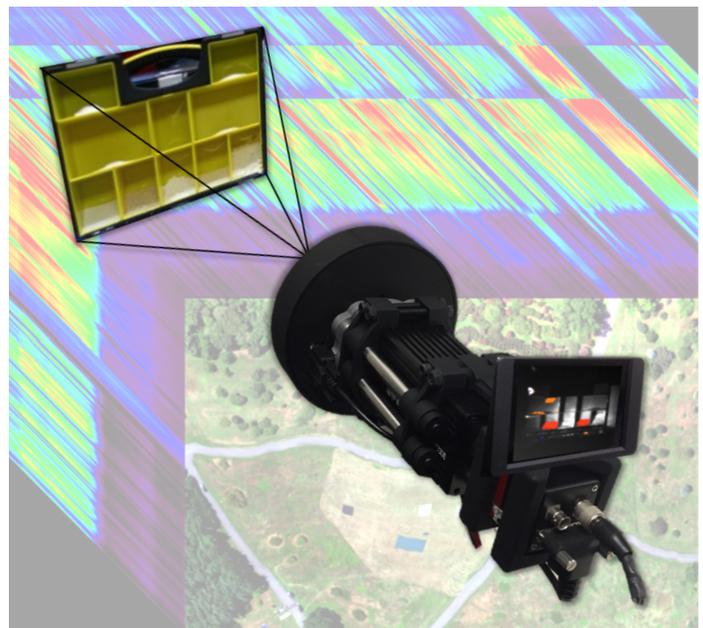
Benefits

HyCorder is a prototype portable system that runs on a small microcontroller, and packs in a backpack, ready for use in the field. Results are displayed in near real-time on a smartphone or tablet. This innovative technology embodied in a novel design delivers many benefits:

- Handheld and field portable (e.g., carry in a backpack)
- Extended battery performance (4 hours)
- Integrated automated processing
- Solid material identification in the short-wave infrared (SWIR)

- High spatial resolution (e.g., 0.5-inch GSD @10 m range)
- Day/night operations
- Active light source provides increased power and range capabilities
- Use of spectral multiplexing enables:
 - Streamlined form factor with increased power reduced weight, and cost
 - Short collection time (less than 1 second) by eliminating active spectral filtering

HANDHELD REMOTE SENSING



Applications

- Standoff threat detection, part of a layered security, screening system for border security and atomic inspection
- Military and defense threat detection including sensitive site exploitation and white powder response
- Spectral imaging has proven successful for use in material discrimination and identification for many types of materials, including chemical, radiological, nuclear, explosive, and narcotic signatures
- Precision agriculture, soil, sediment analysis are currently being explored in the research community for application of spectral imaging

Technology Details

HyCorder provides a portable and affordable integrated hyperspectral system (relative current commercial offerings), which includes both sensor hardware, data calibration, and material identification. HyCorder can be developed in either the visible, near-infrared (VNIR) or shortwave-infrared (SWIR), which have different applications and cost points.

Sensor hardware: The sensor hardware consists of a specialized commercial off-the-shelf (COTS) focal plane array and custom broadband illumination made from COTS light emitting diodes (LEDS).

Data calibration and material identification: The automated pre-processing software registers the raw imagery to account for user motion, reconstruction of the high spatial and spectral resolution data, performs source separation in mixed illumination conditions across the scene and converts the image to reflectance. This provides accurately corrected reflectance for hyperspectral imaging detection and material identification methodologies.

Intellectual property: The HyCorder technology includes a design package and technical data, and is backed by two U.S. patents: US Patent 9,076,039, Probabilistic Identification of Solid Materials in Hyperspectral Imagery, issued July 2015; and US Patent 10,451,548, Active Hyperspectral Imaging System, issued October 2019.

Licensing Opportunities

The MITRE Corporation is seeking licensees for commercial development of the HyCorder technology. HyCorder is a fully integrated, active handheld hyperspectral material identification system available for licensing to the commercial market. Using custom hardware, novel hardware integration and robust processing pipeline, HyCorder brings the power of large and expensive traditional airborne hyperspectral imaging systems to the hands of a user with near real-time, automated material identification capabilities.

For more information, please contact: techtransfer@mitre.org

APPLICATIONS FOR HYCORDER



MITRE's mission-driven teams are dedicated to solving problems for a safer world. Through our public-private partnerships and federally funded R&D centers, we work across government to tackle challenges to the safety, stability, and well-being of our nation.