HyperScope Image Exploitation Tool

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Problem

- **Too much imagery to process - Not enough analysts**
  - **Locating, loading, orienting, processing, analyzing is time consuming**
  - **Analysts often need to exploit just a small image area.**
- **Hyper cube data is voluminous, difficult/slow to display, process and analyze.**
- **Tools needed to:**
  - **Exploit imagery faster (EO, MS, HS, SAR, GMTI, LIDAR)**
  - **Integrate imagery from multiple sources (multi-INT)**
  - **Detect features more accurately.**

Objective

- Develop a working HyperScope prototype with core functionality.
- Implement conventional and new hyperspectral algorithms
  - Anomaly detection, principal component transformation, match filter signature detection with background selection.
- Demonstrate to key end user groups
  - Collect requirements /recommendations, evaluation of research prototype.
- Transition to government sponsor(s) for further development and customization.

HyperScope Description

- Viewer tool for retrieving, displaying and analyzing multi-INT imagery and hyper cube data of tiny geographic areas.

- An analyst positions the scope over a location and imagery for this small geographic area is automatically displayed for intense analysis
  - "Chips" of available imagery are displayed "just in time"
  - Image enhancements, transformations, and processing algorithms applied "on the fly."
- Analyze lots of data for a tiny area quickly and efficiently.
- Exploits EO, Multispectral, Hyperspectral, SAR, GMTI, LIDAR
  - Compares/ integrates images from different sources.

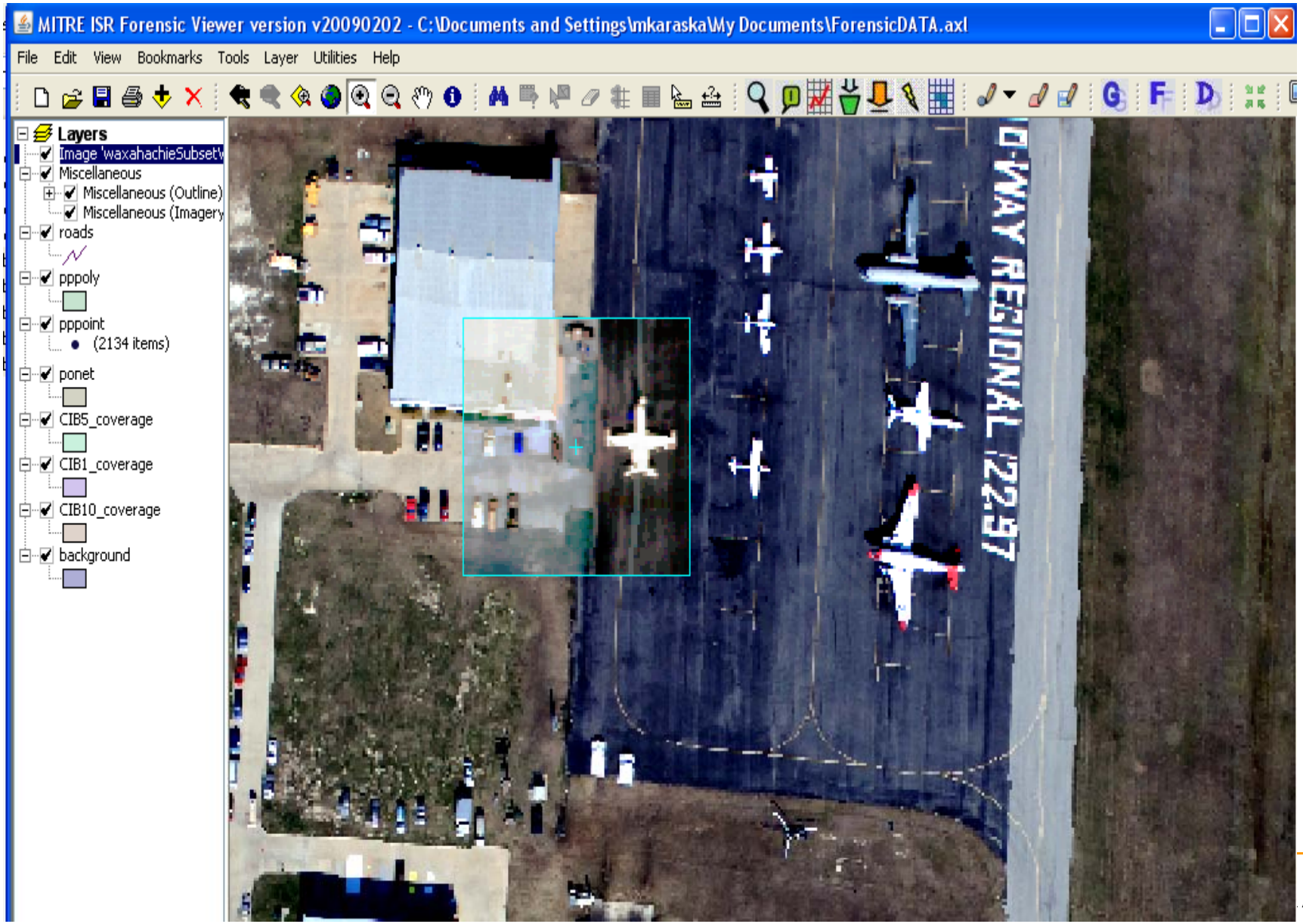
Activities

- Core infrastructure & Scope functionality development
  - Access multiple images from disk, stacking chips
  - Near real time processing & display
  - Viewer manipulations (SWIPE, Blend/Fade, contrast).
- Select, implement, test processing algorithms (RX, PCA, MF)
  - Identify best implementation
  - Compare processing times with & without HyperScope.
- Acquire exemplary datasets to test and demonstrate.
- Investigate follow-on functionality
  - Accessing image archives
  - Local Area Processing algorithms
  - Image chip registration
  - High performance computing for processing/compression.

Highlights

- Two end user groups identified
  - Image/All-source/GMTI analysts
    - Want to access/analyze diversity of imagery quickly
    - Simple spectral image processing choices, simple outputs
  - Spectral analysts
    - Do initial analysis at select points in large volumes of imagery
    - Advanced spectral processing
    - Conventional and new algorithms/ implementations.
- Working prototype with basic functionality demonstrated to two groups of analysts – JAN 09.
- Demonstrations planned for other data owners and stakeholders.

Demonstration



Impacts

- **Saves Exploitation Time**
  - **Quickly locate, orient, process, display, analyze large volumes of imagery, from multiple sources**
  - **Only the critical parts of images are used.**
- **More images can be exploited.**
- **Enhanced target discrimination with Local Area Processing**
  - **Global statistics not used**
  - **Algorithm settings/thresholds optimized for local area.**
- **Visual fusion tool**
  - **Allows data from multiple diverse sources to be displayed in an integrated fashion for synthesis.**

Future Plans

- Access images from a common image warehouse
  - Fast search, customized, adaptive compression, streaming.
- Develop new exploitation algorithms/implementations
  - Using local (not global) statistics
  - Automatic PCA band selection
  - Develop API for others to add algorithms.
- High Performance Computing for processing (GPU, Cell cluster/grid)
  - Covariance matrix, match filter applying many signatures.
- Automated image chip registration
  - For change comparison/detection.
- Transition to government sponsors.