Introduction
The Hyperspectral Image Analysis Toolbox (HIAT) is a MATLAB™ toolbox for the analysis of hyperspectral imagery. HIAT includes a collection of algorithms for processing of hyperspectral and multispectral imagery under the MATLAB environment. The objective of HIAT is to provide a suite of information extraction algorithms to users of hyperspectral and multispectral imagery across different application domains. HIAT has been developed as part of the NSF Bernard M. Gordon Center for Subsurface Sensing and Imaging Solutionware that seeks to develop a repository of reliable and reusable software tools that can be shared by researchers across research domains. HIAT includes feature extraction and selection, supervised and unsupervised classification algorithms, unmixing, and visualization algorithms developed at the UPRM Laboratory for Applied Remote Sensing and Image Processing. Here we present the use of the recently released MATLAB Jacket Toolbox developed by AccelRays LLC that allows implementation of MATLAB programs in GPUs and combining with MATLAB Parallel Toolbox.

State of The Art
Hyperspectral Image analysis is supported by a variety of software packages. The best known commercial product is the Environment for Visualizing Images (ENVI) of ITT Visual Solutions. ENVI provides code extensibility through the Interactive Data Language (IDL), allowing the possibility for routine and features expandability. Among the educational non-commercial products, the best known is MultiSpec developed at Purdue University by Dr. David Landgrebe and the Remote Sensing research group in Purdue’s LARS. Multispec provides similar features to ENVI but does not provide extensibility.

CenSSIS Value Added
The Hyperspectral Image Analysis Toolbox provides support for CenSSIS Researchers and Students from R2C, S1, S3, and S4 using spectral imaging. The toolbox will be part of the tools that will be disseminated with the proposed Introduction to Subsurface Sensing and Imaging textbook.

HIAT is a key element in implementing CenSSIS Vision of “Diverse Problems Similar Solutions”.

BIOSCI BIO-MED Environ-Civil
L2 L3 Validating TestBEDs
L1 Fundamental Science

HIAT Statistics

Year | Downloads
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First | 229
Second | 311
Third | 418
Fourth | 238
Fifth | 1726
Total | 2992

HIAT Online Help & Documentation
How to Download the Toolbox
Go to www.censsis.neu.edu

- Click in Research link.
- Click in Application.
- Click under Software.
- Available for download.
- Hyperspectral Toolbox

Using the Tool user can select different algorithms for each image analysis stages.
- From image enhancement to post-processing.
- Fast way change image analysis parameters.
- Fast way to find better results with couple clicks.

Classification and Unmixing

Supervised & Unsupervised Classification

Unsupervised Unmixing

Image Analysis Example
An AVIRIS image of 914 x 556 x 224 was used for the analysis. The architecture used a quad core with Intel Xeon 2.2GHz, NVIDIA Tesla C1060 4 GB (DDR3) (24xcores per GPU), 12 GB RAM, Windows XP 64bit, Matlab 2009b, Jacket 1.2 and CUDA 2.3.

Computational Gain using GPU: Mahalanobis Distance and Maximum Likelihood Classifier Speed UP

<table>
<thead>
<tr>
<th>Algorithm</th>
<th>Speed up</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum Likelihood</td>
<td>12</td>
</tr>
<tr>
<td>Mahalanobis</td>
<td>11</td>
</tr>
<tr>
<td>Euclidean</td>
<td>4</td>
</tr>
<tr>
<td>Angle detect</td>
<td>4</td>
</tr>
<tr>
<td>Anisotropic</td>
<td>5</td>
</tr>
<tr>
<td>Resolution enhancement</td>
<td>6</td>
</tr>
</tbody>
</table>

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