

**MR PRISM – AN IMAGE ANALYSIS TOOL AND GIS FOR CRISM.** A. J. Brown<sup>1,2</sup>, J.L. Bishop<sup>1,2</sup> and M.C. Storrle-Lombardi<sup>3</sup>, <sup>1</sup>SETI Institute, 515 N. Whisman Rd Mountain View, CA 94043, <sup>2</sup>NASA Ames Research Center, Moffett Field, CA, 94035, <sup>3</sup>Kinohi Institute, Pasadena, CA 91101.

**Introduction:** We describe a computer application designed to analyze hyperspectral data collected by the Compact Infrared Spectrometer for Mars (CRISM) [1]. The application links the spectral, imaging and mapping perspectives on the eventual CRISM dataset by presenting the user with three different ways to analyze the data [2].

**Goals:** One of the goals in developing this application is to build in the latest algorithms for detection of spectrally compelling targets on the surface of the Red Planet, so they may be available to the Planetary Science community without cost and with a minimal learning barrier to cross. This will enable the planetary community to look for targets of interest such as ices, hydrothermal minerals, sulfate minerals and hydrous minerals and be able to map the extent of these minerals using the most up-to-date and effective algorithms.

**Rationale:** The challenge of analyzing data from hyperspectral images, with bands numbering in the 100's, has only been met by a limited number of products. The software most often used is the ENVI product from ITT – which requires an expensive licence and is not overly user-friendly.

We have taken a different approach to the development of an image analysis tool. In MR PRISM, we have merged three programs in one – a spectral analysis tool, an image analysis tool, and a map analysis tool (GIS). Figure 1 shows an early version of MR PRISM operating in the all three modes.

MR PRISM has extensive support for automated routines, including the ability to run long-lived processes in the background while the user completes other tasks. This will be important for running the automated absorption band analysis routines discussed earlier.

MR PRISM is designed to be extendable by end users. Embedded within the application is a scripting language similar to Java or Javascript called “Groovy”. This allows a user to run commands within the application *while the application is running*, similar to ‘EASI’ on *Geomatca* or ‘IDL’ on *ENVI*. MR PRISM loads Groovy scripts on startup that can be loaded into menus automatically. These sample scripts are shipped with MR PRISM.

**Platforms and Release Date:** The application is programmed in Java and runs on Windows, Mac and Linux platforms. Users will be able to embed Groovy scripts into the program in order to extend its functionality. The first collection of CRISM data occurred in September of 2006 and this data will be made publicly

available late in 2007 via the Planetary Datasystem (PDS). Work is currently ongoing to document all the features of MR PRISM on a Wiki internet website similar to *Wikipedia*. Potential Beta testers are encouraged to contact the authors.

**Home Planet Applications:** Although exploration of the CRISM data set is the motivating force for developing these software tools, the ease of writing additional Groovy scripts to access other data sets makes the tools useful for mineral exploration, crop management, and characterization of extreme environments here on Earth or other terrestrial planets. The system can be easily implemented for use by high school, college, and graduate level students.

**Development:** MR PRISM is currently in the prototyping stage and already it owes much to the Java open source community. Development has been inspired by Java projects such as JMars, ImageJ, Jade Display and GeoVirgil. It uses the Java Advanced Imaging library from Sun Microsystems. Code has been used from open source projects such as: JGoodies, JFreeChart, Gui-Commands, Colt, GeoApi, Groovy and OsterMillerUtils. It was developed on the fantastic open source IDE, Eclipse.

**Future Work:** Future developments for MR PRISM include a Bayesian analysis engine, the capacity to handle atmospheric correction routines provided by the CRISM team, the ability to display MOC, THEMIS and HiRISE data and eventually the ability to run on a distributed network in order to speed up processing of large images. When MR PRISM is eventually released to beta test, we hope it will become the ‘front end’ for many more complicated routines from all branches of Mars research.

**Acknowledgements:** The overall goal of the MR PRISM project is to make the CRISM analysis more enjoyable, and hopefully reduce the barrier between hyperspectral analysis and the planetary science community. We thank the entire CRISM team for producing and operating a fantastic instrument. The best is yet to come.

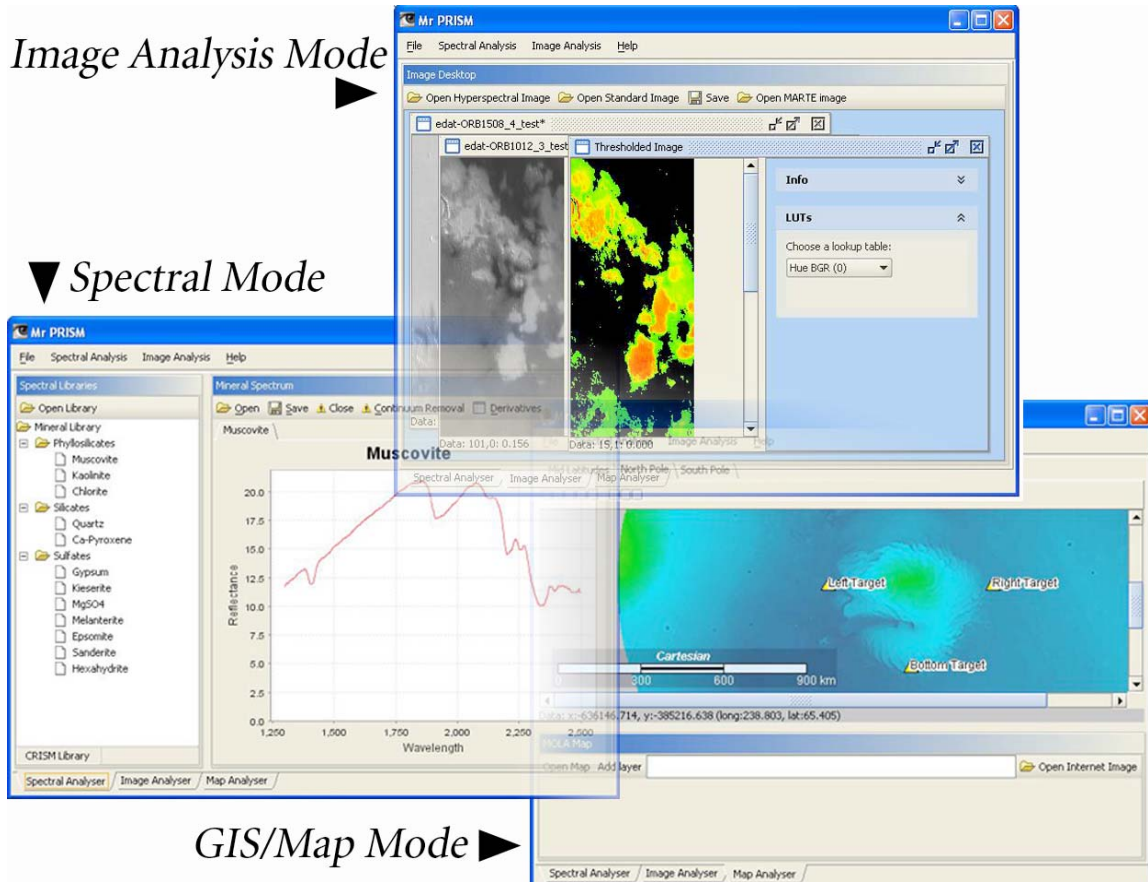
**References:** [1] Murchie S. L. et al. (2005) *Proceedings of SPIE, Volume 5660*, 66–77, [2] Brown A. J. and Storrle-Lombardi, M.C. (2006) *SPIE Optics and Photonics Volume 6309*, doi:10.1117/12.677107.

**Additional Information:**

Relevant website: <http://abrown.seti.org>

*Image Analysis Mode* ▶

▼ *Spectral Mode*



*GIS/Map Mode* ▶

Figure 1 – MR PRISM in operation – (uppermost) Image Analysis (lower left) Spectral Analysis (lower left) Map (GIS) Analysis