

Extending the Lunar Mapping and Modeling Portal – New Capabilities and New Worlds

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Abstract

NASA's Lunar Mapping and Modeling Portal (LMMP) provides a web-based Portal and a suite of interactive visualization and analysis tools to enable mission planners, lunar scientists, and engineers to access mapped lunar data products from past and current lunar missions (<http://lmmp.nasa.gov>). During the past year, the capabilities and data served by LMMP have been significantly expanded. New interfaces are providing improved ways to access and visualize data. At the request of NASA's Science Mission Directorate, LMMP's technology and capabilities are now being extended to additional planetary bodies. New portals for Vesta and Mars are the first of these new products to be released.

This presentation will provide an overview of LMMP, Vesta Trek, and Mars Trek, demonstrate their uses and capabilities, highlight new features, and preview coming enhancements.

1. Introduction

LMMP provides a suite of interactive tools that incorporate observations from past and current lunar missions, creating a comprehensive lunar research Web portal. The online Web portal allows anyone with access to a computer to search through and view a vast number of lunar images and other digital products. The portal provides easy-to-use tools for browsing, data layering and feature search, including detailed information on the source of each assembled data product and links to NASA's Planetary Data System. While mission planning is LMMP's primary emphasis, LMMP also addresses the lunar science community, the lunar commercial community, education and outreach, and anyone else interested in accessing or utilizing lunar data. Its visualization and analysis tools allow users to perform analysis such as

lighting and local hazard assessments including slope, surface roughness and crater/boulder distribution. LMMP features a generalized suite of tools facilitating a wide range of activities including the planning, design, development, test and operations associated with lunar sortie missions; robotic (and potentially crewed) operations on the surface; planning tasks in the areas of landing site evaluation and selection; design and placement of landers and other stationary assets; design of rovers and other mobile assets; developing terrain-relative navigation (TRN) capabilities; deorbit/impact site visualization; and assessment and planning of science traverses. Significant advantages are afforded by LMMP's features facilitating collaboration among members of distributed teams. Team members can share visualizations and add new data to be shared either with the entire LMMP community or only with members of their own team. Sharing of multi-layered visualizations is made easy with the ability to create and send LMMP bookmarks. LMMP is also a powerful tool for education and outreach, as is exemplified by its mobile clients (Moon Tours for iOS and Android), serving of data to NASA's Eyes on the Solar System, and serving of data to a growing community of digital planetariums.

At the request of NASA's Science Mission Directorate, LMMP's development team has extended the capabilities of LMMP to additional planetary bodies. Two new web-based portals, Vesta Trek and Mars Trek are the first of these new products to be released. The initial releases of these new products are intended primarily for outreach purposes. However, they contain capabilities that make them of interest to a full range of users. These products make use of a new, fuller-featured interface that will become the standard across the LMMP line of web portals.

2. LMMP Enhancements

Over the past year, LMMP has been significantly enhanced with additional data products, improved data analysis tools, the integration of its touch table client in mission site selection and analysis, new interfaces to external devices including 3D printers, and improved serving of data to external clients. Many of the recent enhancements to LMMP have been specifically in response to the requirements of the proposed Resource Prospector mission, and as such, provide an excellent example of the application of LMMP to mission planning. As the EPSC community looks forward to new lunar decade of surface activities working towards a lunar robotic village with strong opportunities for science and exploration, as well as preparation for human return to the Moon, tools such as LMMP will become increasingly essential.

LMMP is currently working with the Astromaterials Office at NASA's Johnson Space Center to integrate their database of the returned Apollo lunar samples into LMMP. For a given sample, LMMP will display images and information about the sample, and allow the user to put the sample into context by providing visualizations of the location on the lunar surface from which it was retrieved.

3. Vesta Trek

On March 31, 2015, the LMMP team released Vesta Trek (<http://vestatrek.jpl.nasa.gov>), a web-based application applying LMMP technology to visualizations of the asteroid Vesta. Data gathered from multiple instruments aboard Dawn have been compiled into Vesta Trek's user-friendly set of tools, enabling users to study the asteroid's features. The application includes:

- Interactive maps, including the ability to overlay a growing range of data sets including topography, mineralogy, abundance of elements and geology, as well as analysis tools for measuring the diameters, heights and depths of surface features and more.
- 3-D printer-exportable topography so users can print physical models of Vesta's surface.
- Standard keyboard gaming controls to maneuver a first-person visualization of "flying" across the surface of the asteroid.

4. Mars Trek

With an initial release in June, 2015, Mars Trek replicates the functionality of Vesta Trek for the surface of Mars. While the entire surface of Mars is covered, higher levels of resolution and greater numbers of data products are provided for special areas of interest. Early releases focus on past, current, and future robotic sites of operation. Future releases will focus on potential human exploration areas of interest as they are identified.

5. Summary and Conclusions

NASA's Lunar Mapping and Modeling Portal has grown considerably from its origins as a mission planning tool for the Constellation Program. Its new features make it especially useful for the planning of a new generation of lunar exploration missions, conducting a wide range of lunar science research, and facilitating exciting visualizations and exploration in the realms of education and outreach. LMMP is currently being used in lunar mission site selection and analysis activities. Two new web-based applications, Vesta Trek and Mars Trek, extend the capabilities of LMMP to new destination worlds. Other destinations will follow soon. The user community is invited to provide suggestions and requests as the development team continues to expand the capabilities of LMMP, its related products, and the range of data and tools that they provide.

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