

The Lunar Mapping and Modeling Portal: Tools for Mission Planning, Science, and Outreach

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Abstract

NASA's Lunar Mapping and Modeling Project (LMMP) has developed 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. New features and capabilities are enhancing LMMP's value for mission planning, scientific research, and education/outreach.

This presentation will provide an overview of LMMP uses and capabilities, highlight new features, and preview coming enhancements.

1. Introduction

The Lunar Mapping and Modeling Portal (LMMP) provides a web-based Portal and a suite of interactive visualization and analysis tools enabling mission planners, lunar scientists, and engineers to access mapped lunar data products from past and current lunar missions. While emphasizing mission planning, LMMP also addresses the lunar science community, the lunar commercial community, education and public outreach (E/PO), 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. Originally designed as a mission planning tool for the Constellation Program, LMMP has grown into 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.

2. New Features and Coming Enhancements

Significant advantages are afforded by LMMP's features facilitating collaboration among members of distributed teams (e.g., mission planning team, mission proposal team). 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 distribute LMMP's digital bookmarks.

Current data products include image mosaics, digital elevation models, local hazard assessment tools (such as maps of slope, surface roughness and crater/boulder distribution), lighting assessment tools, gravity models, and resource maps such as soil maturity and hydrogen abundance. LMMP is soliciting input from its community of users as the list of included data products is expanded.

Current development efforts include an enhanced pipeline from the Planetary Data System to LMMP, improved lighting analysis performance, and interfaces to a range of devices including 3D printers and hyperwalls.

LMMP fosters outreach, education, and exploration of the Moon by educators, students, amateur

astronomers, and the general public. These efforts are enhanced by Moon Tours, LMMP's mobile application, which makes LMMP's information accessible to people of all ages, putting opportunities for real lunar exploration in the palms of their hands. Moon Tours allows users to browse and search LMMP's entire catalog of over 600 data imagery products ranging from global basemaps to LRO's Narrow Angle Camera (NAC) images providing details of down to .5 meters/pixel. Users are able to view map metadata (e.g., abstract of the data) and can zoom in and out of the map to view more or less data, as well as pan around the entire lunar surface with the appropriate basemap. They can arbitrarily stack the maps and images on top of each other, showing layered views of the surface with layer transparency adjusted to suit the user's desired look. They can even view lunar terrain data rendered in realtime 3D, and calculate distances between locations on the lunar surface.

While great utility is provided by LMMP's interface and tools, it also provides particular value through its ability to serve data to a variety of other applications. In the outreach realm, this has been demonstrated with data served to planetariums and NASA's Eyes on the Solar System.

3. 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. Moon Tours, the new mobile app version of LMMP, dramatically increases the accessibility of the rich store of data provided by LMMP. The user community is invited to provide suggestions and requests as the development team continues to expand the capabilities of LMMP and the range of data products that it provides.

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