

Moon Trek: An Interactive Web Portal for Current and Future Lunar Missions

B. Day (1), E. Law (2)

(1) NASA Solar System Exploration Research Virtual Institute. NASA Ames Research Center. M/S 17-1. Moffett Field, CA, USA. 94035. (Brian.H.Day@nasa.gov, +01-650-604-2605)

(2) Jet Propulsion Laboratory, California Institute of Technology. M/S 168-200. 4800 Oak Grove Dr. Pasadena, CA, USA 91109. (Emily.S.Law@jpl.nasa.gov, +01-818-354-6208)

Abstract

NASA's Moon Trek (<https://moontrek.jpl.nasa.gov>) is the successor to and replacement for NASA's Lunar Mapping and Modeling Portal (LMMP). Released in 2017, Moon Trek features a new interface with improved ways to access, visualize, and analyse data. Moon Trek 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.

1. Introduction

This presentation will provide an overview of the uses and capabilities of NASA's Moon Trek online mapping and modeling portal, a web based suite of data visualization and analysis tools designed to support mission planning, scientific research, and education/outreach.

2. A Comprehensive Online Web Portal

Moon Trek 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. Interactive maps, include the ability to overlay a growing range of data sets including topography, mineralogy, abundance of elements and geology. Originally designed for mission planning, Moon Trek 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 measure the diameters, heights and depths of surface features, perform analyses such as lighting and local hazard assessments including slope, surface roughness and crater/boulder distribution. Moon Trek 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 Moon Trek'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 Moon Trek community or only with members of their own team. Sharing of multi-layered visualizations is made easy with the ability to create and send URL-encoded visualization links. Moon Trek is also a powerful tool for education and outreach, as is exemplified by its being designated as key supporting infrastructure for NASA Science Mission Directorate's STEM Activation Initiative, and its serving of data to a growing community of digital planetariums.

Developed at NASA's Jet Propulsion Laboratory (JPL) and managed as a project of NASA's Solar System Exploration Research Virtual Institute (SSERVI) at NASA Ames Research Center, Moon Trek is a browser-based web portal. There is nothing additional to buy or install.

3. Moon Trek Enhancements

The new Moon Trek interface provides enhanced 3D visualization and navigation. Standard keyboard gaming controls allow the user to maneuver a first-person visualization of “flying” across the surface of the Moon. User-specified bounding boxes can be used to generate STL and/or OBJ files to create physical models of surface features with 3D printers. This interface will become the standard across all of the Trek products including the portals for Mars, Phobos, Vesta, and more.

Moon Trek offers additional data products and improved data analysis tools. As an example, a new surface potential analysis tool based on algorithms from the DREAM 2 SSERVI team led by William Farrell at NASA GSFC, will allow users to model effects of the plasma environment on the lunar surface.

The features of the new client are supported by significant improvements to the back end server infrastructure. A new automated pipeline facilitates the production of high-resolution mosaics and digital elevation models. In addition to the web-based client, Moon Trek’s data is being served to exciting, new prototype clients including touch tables and virtual reality environments. An open set of APIs allows us to serve Moon Trek’s data to a wide range of external clients and customers.

The Moon Trek team is currently working with the Astromaterials Office at NASA’s Johnson Space Center to integrate their database of the returned Apollo lunar samples into Moon Trek. For a given sample, Moon Trek 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. We plan to augment this with linkages to the Apollo Lunar Collection of the Virtual Microscope produced by JISC, The Open University, and The OpenScience Laboratory.

4. Summary and Conclusions

Moon Trek’s 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 Trek is currently working with NASA and its Resource Prospector mission, KARI and its Korean Pathfinder Lunar

Orbiter mission, and ESA in its range of upcoming lunar exploration. The user community is invited to provide suggestions and requests as the development team continues to expand the capabilities of Moon Trek, its related products, and the range of data and tools that it provides. As the EPSC community looks forward to a new generation of surface and orbital lunar robotic activities, as well as preparation for human return to the Moon, tools such as Moon Trek will become increasingly essential.

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