Visualization and Analysis of the Surface of Mars with NASA's Mars Trek Portal

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Originally released in June, 2015 as a public outreach tool, Mars Trek is currently being enhanced to support site selection and analysis for upcoming human and robotic missions to Mars. Many new data products are being added, with emphasis on providing detailed information for proposed exploration zones. Data products can be loaded and even combined from many different instruments aboard many different Mars-orbiting spacecraft including Viking, Mars Global Surveyor, Mars Odyssey, Mars Reconnaissance Orbiter, and Mars Express. Users can download data products from Mars Trek and access metadata for each product. Web services and APIs allow other clients to access data from Mars Trek's servers. A standardized interface across the Trek portals provides for advanced 3D visualization and navigation. Standard keyboard gaming controls allow the user to maneuver a first-person visualization of "flying" across the surface of the Mars. User-specified bounding boxes can be used to generate STL and/or OBJ files to create physical models of surface features with 3D printers. A new VR capability allows users to generate their own virtual reality flyovers for any user-defined paths along the Mars' surface.

Mars Trek's power as a tool for education and outreach 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.

As private industry and space agencies of a growing number of nations plan new missions to Mars, detailed maps and models of Mars' surface and climate will be essential for mission planning. Mars Trek's generalized suite of tools are being designed to meet the needs of this new generation of missions. The portal will also provide an outstanding means of dissemination of data from these missions. Layering and blending many different data products and putting individual products in the context of many others will facilitate mining of information going far beyond what individual products can provide separately. In addition to mission planning and planetary science, Mars Trek will continue supporting the essential task of engaging the public in this great adventure. Mars Trek is 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.

At the request of the Planetary Science Division of NASA's Science Mission Directorate, we are extending the technologies of our existing Trek platforms to create a new portal for Mars' largest moon, Phobos. In this effort, we are working with the International Phobos/Deimos Landing Site Working Group and with JAXA, with JAXA's MMX mission as a primary driver.
Mars Trek is one of the portals in the NASA Solar System Treks Project (SSTP), available at https://trek.nasa.gov. NASA's Solar System Trek online portals provide web-based suites of interactive data visualization and analysis tools to enable mission planners, planetary scientists, students, and the general public to access mapped data products from past and current missions for a growing number of planetary bodies including the Moon, Mars, Vesta, etc. These portals are being used for site selection and analysis by NASA and a number of its international partners, supporting upcoming missions. In addition to demonstrating the capabilities of Mars Trek in this presentation and providing a preview of Phobos Trek,

we will solicit input from the community for ideas for future enhancements to the portals.

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