Advances in Science Planning Tools with the Science Opportunity Analyzer

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ABSTRACT

For many years the diverse scientific community that supports JPL's wide variety of interplanetary space missions has needed a tool in order to plan and develop their experiments. The tool needs to be easily adapted to various mission types and portable to the user community. The Science Opportunity Analyzer, SOA, now in its third year of development, is intended to meet this need. SOA is a java based application that is designed to enable scientists to identify and analyze opportunities for science observations from spacecraft. It differs from other planning tools in that it does not require an in-depth knowledge of the spacecraft command system or operation modes to begin high level planning. Users can, however, develop increasingly detailed levels of design.

SOA consists of five major functions: Opportunity Search, Visualization, Observation Design, Constraint Checking, and Communications. Opportunity Search is a GUI-driven interface to external search engines which can be used to identify times when a spacecraft is in a specific geometrical relationship with other bodies in the solar system. This function can be used for advanced mission planning as well as for making last minute adjustments to mission sequences in response to trajectory modifications. Visualization is a key aspect of SOA. The user can view observation opportunities in either a 3D representation or as a 2D map projection. The user is given extensive flexibility to

customize what is displayed in the view. Observation Design allows the user to orient the spacecraft and visualize the projection of instrument fields of view for that orientation using the same views as Opportunity Search. Constraint Checking is provided to validate various geometrical and physical aspects of an observation design. The user has the ability to easily create custom rules or to use official project-generated flight rules. This capability may also allow scientists to easily evaluate the impact on science if flight rule changes occur. Finally, SOA is unique in that it is designed to be able to communicate with a variety of existing planning and sequencing tools.

From the very beginning SOA was designed with the user in mind. Extensive surveys of the potential user community were conducted in order to develop the software requirements. Throughout the development period, close ties have been maintained with the science community to insure that the tool maintains its user focus. Although development is still in its early stages, SOA is already developing a user community on the Cassini project which is depending on this tool for their science planning. There are other tools at JPL that do various pieces of what SOA can do; however, there is no other tool which combines all these functions and presents them to the user in such a convenient, cohesive, and easy to use fashion.