Mission Analysis, Operations, and Navigation Toolkit Environment (Monte) Version 040
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Monte is a software set designed for use in mission design and spacecraft navigation operations. The system can process measurement data, design optimal trajectories and maneuvers, and do orbit determination, all in one application. For the first time, a single software set can be used for mission design and navigation operations. This eliminates problems due to different models and fidelities used in legacy mission design and navigation software.

The unique features of Monte 040 include a blowdown thruster model for GRAIL (Gravity Recovery and Interior Laboratory) with associated pressure models, as well as an updated, optimal-search capability (COSMIC) that facilitated mission design for ARTEMIS. Existing legacy software lacked the capabilities necessary for these two missions. There is also a mean orbital element propagator and an osculating to mean element converter that allows long-term orbital stability analysis for the first time in compiled code.

The optimized trajectory search tool COSMIC allows users to place constraints and controls on their searches without any restrictions. Constraints may be user-defined and depend on trajectory information either forward or backwards in time. In addition, a long-term orbit stability analysis tool (morbiter) existed previously as a set of scripts on top of Monte.

Monte is becoming the primary tool for navigation operations, a core competency at JPL. The mission design capabilities in Monte are becoming mature enough for use in project proposals as well as post-phase A mission design.

Monte has three distinct advantages over existing software. First, it is being developed in a modern paradigm: object-oriented C++ and Python. Second, the software has been developed as a toolkit, which allows users to customize their own applications and allows the development team to implement requirements quickly, efficiently, and with minimal bugs. Finally, the software is managed in accordance with the CMMI (Capability Maturity Model Integration), where it has been appraised at maturity level 3.

This work was done by Richard F. Sunseri, Hsi-Cheng Wu, Scott E. Evans, James R. Evans, Theodore R. Drain, and Michelle M. Guevara of Caltech for NASA’s Jet Propulsion Laboratory.

This software is available for commercial licensing. Please contact Daniel Broderick of the California Institute of Technology at danielb@caltech.edu. Refer to NPO-48184.