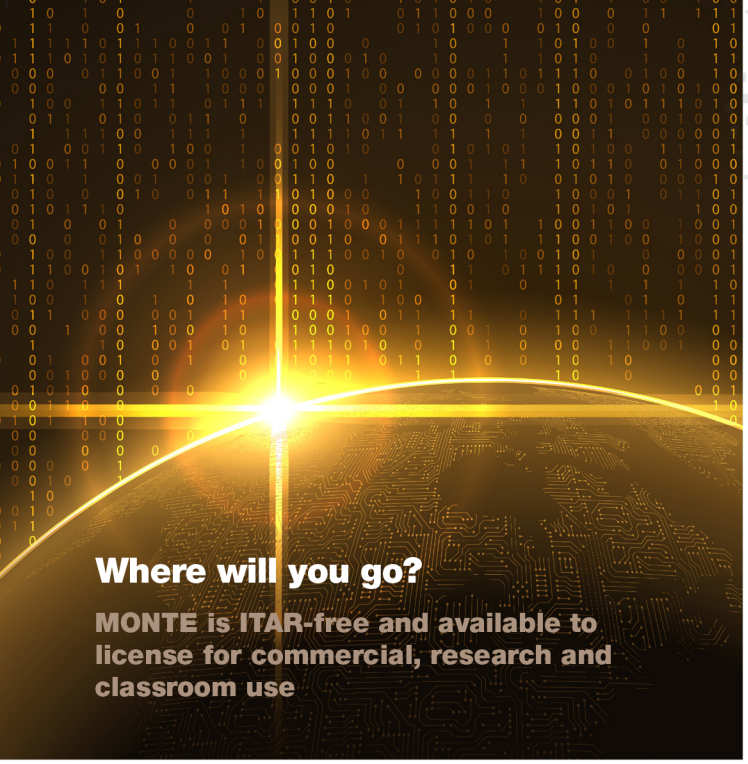

TEACHING TOOL

MONTE is the perfect teaching tool for students studying astrodynamics. It can provide basic infrastructure — state queries, coordinate frame rotations, data management, etc. — and allow students to focus on the topic at hand.

ASTRODYNAMIC PLATFORM

MONTE is a compelling astrodynamic programming platform. It can be used in conjunction with other Python scientific libraries to create powerful, customized applications.

MONTE is a product of the Mission Design and Navigation Section at the Jet Propulsion Laboratory and is Caltech Proprietary.

OBTAINING A LICENSE

For information on obtaining a MONTE license, send email to: mdn_software@jpl.nasa.gov

VISIT OUR WEBSITE FOR MORE INFORMATION

montepy.jpl.nasa.gov

National Aeronautics and Space Administration

Jet Propulsion Laboratory
California Institute of Technology
Pasadena, California

www.nasa.gov

JPL 400-1640 07/16

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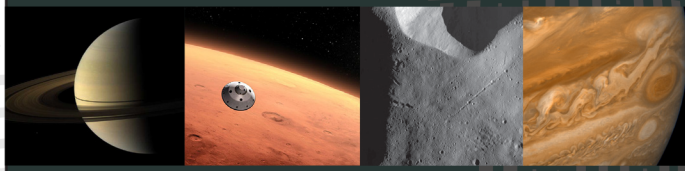
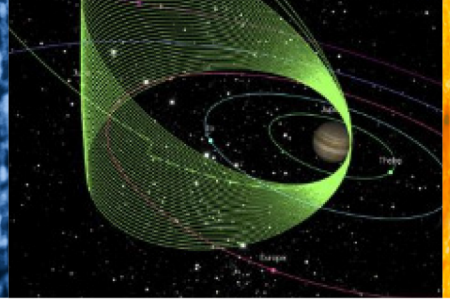
MONTE

MISSION ANALYSIS OPERATIONS AND NAVIGATION TOOLKIT ENVIRONMENT



JPL's signature astrodynamic computing platform, supporting all phases of space mission development from early-stage mission design and analysis through flight navigation services.



On the shoulders of giants ...

MONTE has roots reaching back to the dawn of the space age.

1960s

In the 1960s, JPL organized its growing expertise in trajectory design and spacecraft orbit determination into the Single Precision Orbit Determination Program — SPODP — which supported the early robotic reconnaissance of the Moon and inner solar system by navigating the Ranger, Surveyor, Lunar Orbiter, and early Mariner and Pioneer missions.

Starting in 1964, a group of engineers led by Ted Moyer began developing the algorithms and software that would eventually become the Double Precision Trajectory and Orbit Determination Program — DPTRAJ/ODP — which was used by JPL to navigate the "golden age" of deep space exploration, including the later Mariner and Pioneer missions, Viking, Voyager, Magellan, Galileo, and Cassini.

1990s

The story of MONTE begins in 1998, when JPL's navigation section commissioned an update to the aging DPTRAJ/ODP library. The goal was to translate these time-tested navigation algorithms from Fortran into a more maintainable, extensible, and better tested C++/Python application.

2000s

In 2007, MONTE received its first operational assignment — navigating the Mars Phoenix mission.

As of 2012, MONTE is powering all navigation services at JPL.

ORBIT DETERMINATION

MONTE's orbit determination toolset is its flagship product. It supports all mission phases, from preflight through mission operations.

- "UI System" Navigation Interface
- Measurement Simulation Toolbox
- High-Precision Earth Coordinate Frames
- Customizable Measurement Types
- Proven Batch/Sequential Estimation Filter
- Support for Stochastic and Consider Covariance Estimation

FLIGHT PATH CONTROL

MONTE's flight path control suite has a tight integration with the OD system for efficient and accurate maneuver design.

- "UI System" Navigation Interface
- Linear Analysis of Maneuver Performance (MONTE Lambic)
- Flexible Maneuver Optimization Tools
- Standardized Maneuver IO

TRAJECTORY DESIGN

MONTE provides an array of tools and applications for general mission design and analysis.

- MONTE Cosmic for Trajectory Optimization
- Low-Level Optimization Toolkit
- Trajectory Differential Corrector
- Launch Contour Analysis Tool ("Pork Chop" Plots)
- Horizons Small Body Ephemeris Interface (for Primitive Body Mission Analysis)
- 3-D Trajectory Viewer

A few of the places MONTE has been ...

Saturn
MONTE has navigated the Cassini spacecraft at Saturn since 2012.

Mars
The Mars Science Laboratory Curiosity rover was delivered safely to Mars courtesy of MONTE.

Jupiter
MONTE has been used since launch to navigate the Juno spacecraft.

Vesta and Ceres
The low-thrust Dawn spacecraft has used MONTE to visit protoplanet Vesta and dwarf planet Ceres in the asteroid belt.

Earth's Moon
MONTE navigated the dual Gravity Recovery and Interior Laboratory (GRAIL) spacecraft as they mapped the lunar gravity field.