THE SPACECRAFT CONTROL TOOLBOX FOR MATLAB

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SCT

The Spacecraft Control Toolbox (SCT) for use with MATLAB®* lets you design, analyze and simulate spacecraft. This product is used worldwide by leading research and development organizations and spacecraft manufacturers. Over two thousand functions are provided for attitude and orbit dynamics, simulation, analysis and design. You can build spacecraft from components using the built in computer aided design tools making the toolbox an ideal product for doing preliminary designs of spacecraft. You can do disturbance, thermal and power analyses using the supplied utility functions in the toolbox. Customization is straightforward since full source code is provided. You can build a satellite using the graphical CAD tools; design and analyze the control systems; perform disturbance analyses and test the control system in a six degree-of-freedom simulation - all in the MATLAB environment. The toolbox allows you to design and test control systems in a matter of hours, not days or weeks.

Proven in Flight PRINCETON SATELLITE SYSTEMS has used this toolbox over the past 15 years to design the complete Indostar/Cakrawarta-1 transfer and geosynchronous attitude control systems; the TDRS momentum management system; formation flying systems for NASA/GSFC and on many other projects. Many of the tools are the product of our own research and development and are not available anywhere else!

Extensive documentation is included such as our 500 page theory textbook, Spacecraft Attitude and Orbit Control. The User's Guides can be downloaded online and for free.

Version 9.0 of the Spacecraft Control Toolbox (SCT) has been released. The SCT has been organized so that it consists of the core toolbox and three add-on modules: FORMATION FLYING, SOLAR SAIL, AND SPIN AXIS ATTITUDE DETERMINATION. THE CORE TOOLBOX IS AVAILABLE IN BOTH PROFESSIONAL AND CLASSROOM LEARNING EDITIONS.

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Price List (£)

- **Spacecraft Control Toolbox Learning Edition (SCTLE) (68.00) GBP + VAT (Classroom License / user), minimum order is 10-user license.**
- **Spacecraft Control Toolbox v9 - Professional Edition (6,663.00) GBP + VAT (Single User License).**
- **SCT Sail Module (1,995.00) GBP + VAT (Single User License).**
- **SCT Formation Flying Module (1,995.00) GBP + VAT (Single User License).**
- **SCT Spin Axis Module (1,995.00) GBP + VAT (Single User License).**

1. FEATURES

The SCT includes attitude dynamics, attitude control, estimation, orbit dynamics and control, thermal, power, link and propulsion functions. It also includes imaging tools for optical GN&C, formation flying software for multi-vehicle modeling, as well as a CubeSat module for design and development of small satellites.

The following functions are new in Version 9:

- Over 20 new demos
- Low energy orbit maneuvers
- New optical navigation methods
- Camera calibrations for imaging
- Magnetic torquer actuator analysis
- Thermal analysis functions for aerodynamic heat flux
- Published demos and New help system

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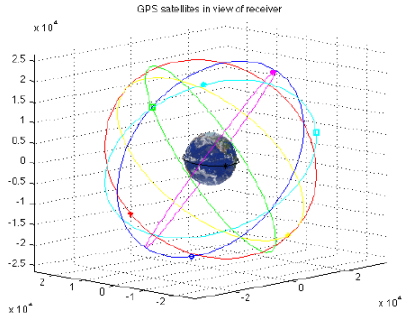
2. NEW HELP/DEMO SYSTEM

The Spacecraft Control Toolbox help system has now been integrated into the MATLAB help system. This allows you to browse all of the functions provided by SCT. They are organized by folder depth and grouped together in modules. These functions are completely searchable within MATLAB's search field as well. Once you have selected a function, a page will open showing you the function description including it's inputs and outputs. It will also list any children functions that it might use to make you aware of any other functions that this particular function depends on.

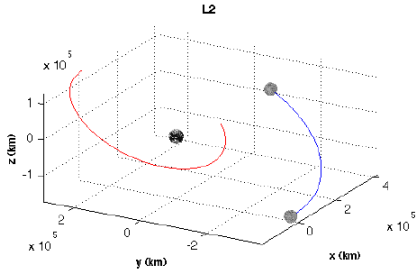
You can now access the SCT's 200+ demos right from MATLAB's built in help system. You can search or browse all of the demos by module and even run them directly from the MATLAB help menu. These demos are now broken down and gone through step by step showing you how each function is

being called and evaluated. Every demo has a table of contents that will guide you directly where you need to go in the demo to see where each function is being called. It even displays the results and graphs in a nice and neat manner directly where they are initialized in the demo.



3. OPTICAL NAVIGATION SIMULATIONS

Three new demos help show off the new methods of space guidance and navigation. The first one allows for orbit determination using an Unscented Kalman Filter and referencing the position of two planets and a star. This method is pictured to the left. The sun is the reference star located in the bottom right corner at (0,0). Earth and Mars are the two reference planets used to determine the orbit of the spacecraft. The other two demos both also utilize the Unscented Kalman Filter (UKF). One determines the orbit using centroid data from a planet. The other uses lunar landmark data from the Hipparcos catalog to estimate a spacecraft in geosynchronous orbit.



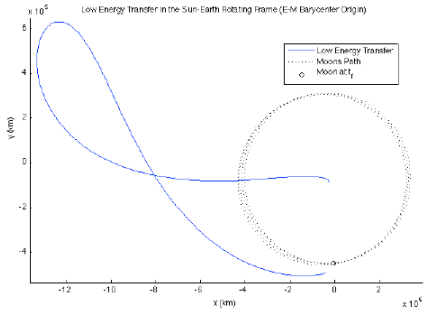
4. LOW ENERGY TRANSFER MANEUVERS

These additional functions will help formulate trajectories using Low Energy Transfer (LET) maneuvers to save on fuel cost. These maneuvers utilize optimization methods to find the transfer orbit for a low energy trajectory between two orbits in the Circular Restricted Three Body Problem (CRTBP).

A specific trajectory can also been formulated for a transfer to a lunar orbit that requires less fuel than the typical elliptical parking/transfer orbits. This new trajectory incorporates a Low Energy Transfer maneuver to a ballistic lunar capture. This transfer capitalizes on the Sun's perturbation of the Earth-Moon system to raise the orbit's perigee to lunar distance, and allow ballistic transition to a lunar orbit through the Earth-Moon L2 Lagrange point.

These methods were developed for a NASA SBIR proposal that went on to receive a letter of commendation. The SBIR was for a Phase II contract for a Low Energy Mission Planning Toolbox. Note that this portion of the Toolbox requires the Optimization Toolbox.

LET Maneuvers are an essential capability for many future missions being planned at NASA, ESA and in the commercial sector. It is still a new and developing technology. The LET functions provide a comprehensive and valuable set of tools for any organization embarking on such a mission.



5. UPGRADING TO VERSION 9.0

If you have purchased or upgraded the Spacecraft Control Toolbox within the last year, you will receive this release for free. Prior customers should contact us for their upgrade price.

6. SUPPORT

SCT Professional is required to make use of the SCT add-on modules for Sail, Formation Flying, and Spin Axis. All purchases of SCT Professional include access to the Spacecraft Attitude and Orbit Control textbook. Annual maintenance fees, which provide for one year of free email technical support and product updates, are 1/3 the current price of the product.