Linked-List-Based Multibody Dynamics (MBDyn) Engine

Lyndon B. Johnson Space Center, Houston, Texas

This new release of MBDyn is a software engine that calculates the dynamics states of kinematic, rigid, or flexible multibody systems. An MBDyn multibody system may consist of multiple groups of articulated chains, trees, or closed-loop topologies. Transient topologies are handled through conservation of energy and momentum. The solution for rigid-body systems is exact, and several configurable levels of nonlinear term fidelity are available for flexible dynamics systems.

The algorithms have been optimized for efficiency and can be used for both non-real-time (NRT) and real-time (RT) simulations. Interfaces are currently compatible with NASA’s Trick Simulation Environment. This new release represents a significant advance in capability and ease of use. The two most significant new additions are an application programming interface (API) that clarifies and simplifies use of MBDyn, and a link-list infrastructure that allows a single MBDyn instance to propagate an arbitrary number of interacting groups of multibody topologies.

MBDyn calculates state and state derivative vectors for integration using an external integration routine. A Trick-compatible interface is provided for initialization, data logging, integration, and input/output.

This work was done by John Maclean, Thomas Brain, Leslie Quiacho, An Huynh, and Tushar Ghosh of Johnson Space Center. Further information is contained in a TSP (see page 1). MSC-24925-1

Multi-Mission Power Analysis Tool (MMPAT) Version 3

NASA’s Jet Propulsion Laboratory, Pasadena, California

The Multi-Mission Power Analysis Tool (MMPAT) simulates a spacecraft power subsystem including the power source (solar array and/or radioisotope thermoelectric generator), bus-voltage control, secondary battery (lithium-ion or nickel-hydrogen), thermostatic heaters, and power-consuming equipment. It handles multiple mission types including heliocentric orbiters, planetary orbiters, and surface operations. Being parametrically driven along with its user-programmable features can reduce or even eliminate any need for software modifications when configuring it for a particular spacecraft. It provides multiple levels of fidelity, thereby fulfilling the vast majority of a project’s power simulation needs throughout the lifecycle. It can operate in a standalone mode with a graphical user interface, in batch mode, or as a library linked with other tools.

This software can simulate all major aspects of a spacecraft power subsystem. It is parametrically driven to reduce or eliminate the need for a programmer. Added flexibility is provided through user-designed state models and table-driven parameters.

MMPAT is designed to be used by a variety of users, such as power subsystem engineers for sizing power subsystem components; mission planners for