This program is currently specialized to small-body proximity operations, but the underlying method can be generalized to other applications.

This program was written by Behçet Açikmeşe, John Carson, and Linh Phan of Caltech for NASA's Jet Propulsion Laboratory.

This software is available for commercial licensing. Please contact Karina Edmonds of the California Institute of Technology at (626) 395-2322. Refer to NPO-44291.

DSN Scheduling Engine

The DSN (Deep Space Network) Scheduling Engine targets all space missions that use DSN services. It allows clients to issue scheduling, conflict identification, conflict resolution, and status requests in XML over a Java Message Service interface. The scheduling requests may include new requirements that represent a set of tracks to be scheduled under some constraints. This program uses a heuristic local search to schedule a variety of schedule requirements, and is being infused into the Service Scheduling Assembly, a mixed-initiative scheduling application.

The engine resolves conflicting schedules of resource allocation according to a range of existing and possible requirement specifications, including optional antennas; start of track and track duration ranges; periodic tracks; locks on track start, duration, and allocated antenna; MSPA (multiple spacecraft per aperture); arraying/VLBI (very long baseline interferometry)/delta DOR (differential one-way ranging); continuous tracks; segmented tracks; gap-to-track ratio; and override or block-out of requirements. The scheduling models now include conflict identification for SOA (start of activity), BOT (beginning of track), RFI (radio frequency interference), and equipment constraints. This software will search through all possible allocations while providing a best-effort solution at any time.

The engine reschedules to accommodate individual emergency tracks in 0.2 second, and emergency antenna downtime in 0.2 second. The software handles doubling of one mission's track requests over one week (to 42 total) in 2.7 seconds. Further tests will be performed in the context of actual schedules.

This program was written by Bradley Clement, Mark Johnston, Allan Wax, and Caroline Chouinard of Caltech for NASA's Jet Propulsion Laboratory.

This software is available for commercial licensing. Please contact Karina Edmonds of the California Institute of Technology at (626) 395-2322. Refer to NPO-44346.

Replacement Sequence of Events Generator

The soeWINDOW program automates the generation of an ITAR (International Traffic in Arms Regulations)-compliant sub-RSOE (Replacement Sequence of Events) by extracting a specified temporal window from an RSOE while maintaining page header information. RSOEs contain a significant amount of information that is not ITAR-compliant, yet that foreign partners need to see for command details to their instrument, as well as the surrounding commands that provide context for validation. soeWINDOW can serve as an example of how command support products can be made ITAR-compliant for future missions.

This software is a Perl script intended for use in the mission operations UNIX environment. It is designed for use to support the MRO (Mars Reconnaissance Orbiter) instrument team. The tool also provides automated DOM (Distributed Object Manager) storage into the special ITAR-okay DOM collection, and can be used for creating focused RSOEs for product review by any of the MRO teams.

This program was written by Forest Fisher, Daniel Wenkert Roy Gladden, and Teerapat Khanampornpan of Caltech for NASA's Jet Propulsion Laboratory.

This software is available for commercial licensing. Please contact Karina Edmonds of the California Institute of Technology at (626) 395-2322. Refer to NPO-44392.

Force-Control Algorithm for Surface Sampling

A G-FCON algorithm is designed for small-body surface sampling. It has a linearization component and a feedback component to enhance performance. The algorithm regulates the contact force between the tip of a robotic arm attached to a spacecraft and a surface during sampling. The control algorithm is insensitive to the surface properties, enabling it to maintain the right contact force for a wide range of surface compliance properties.

The objective of the algorithm is to bring the sampler in contact with the small body surface, and maintain a desired contact force for a prescribed duration of time for sampling. Once the sampling period is over, the control algorithm guides the spacecraft safely away from the surface.

This work was done by Behçet Açikmeşe, Marco B. Quadrelli, and Linh Phan of Caltech for NASA's Jet Propulsion Laboratory.

The software used in this innovation is available for commercial licensing. Please contact Karina Edmonds of the California Institute of Technology at (626) 395-2322. Refer to NPO-44377.

Tool for Merging Proposals Into DSN Schedules

A Practical Extraction and Reporting Language (Perl) script called "merge7da" has been developed to facilitate determination, by a project scheduler in NASA's Deep Space Network, of whether a proposal for use of the DSN could create a conflict with the current DSN schedule. Prior to the development of merge7da, there was no way to quickly identify potential schedule conflicts: it was necessary to submit a proposal and wait a day or two for a response from a DSN scheduling facility. By using merge7da to detect and eliminate potential schedule conflicts before submitting a proposal, a project scheduler saves time and gains assurance that the proposal will probably be accepted. merge7da accepts two input files, one of which contains the current DSN schedule and is in a DSN-standard format called "7da."

The other input file contains the proposal and is in another DSN-standard format called "C1/C2." merge7da processes the two input files to produce a merged 7da-format output file that represents the DSN schedule as it would be if the proposal were to be adopted. This 7da output file can be loaded into various DSN scheduling software tools now in use.

This program was written by Teerapat Khanampornpan, John Kwok, and Jared Call of Caltech for NASA's Jet Propulsion Laboratory.

This software is available for commercial licensing. Please contact Karina Edmonds of the California Institute of Technology at (626) 395-2322. Refer to NPO-44582.