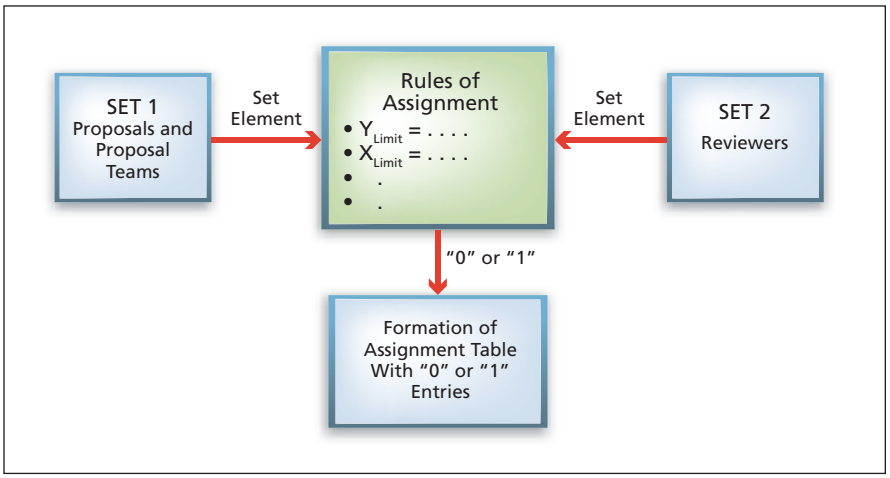
Automated Assignment of Proposals to Reviewers

NASA's Jet Propulsion Laboratory, Pasadena, California

A computer program automates the process of selecting unbiased peer reviewers of research proposals submitted to NASA. Heretofore, such selection has been performed by manual searching of two large databases subject to a set of assignment rules. One database lists proposals and proposers; the other database lists potential reviewers. The manual search takes an average of several weeks per proposal. In contrast, the present software can perform the selection in seconds. The program begins by selecting one entry from each database, then applying the assignment rules to this pair of entries. If and only if all the assignment rules are satisfied, the chosen reviewer is assigned to the chosen proposal. The assignment rules enforced by the program are (1) a maximum allowable number of proposals assigned to a single reviewer; (2) a maximum allowable number of reviewers assigned to a single proposal; (3) if the proposing team includes a member affiliated with an industry, then the reviewer must not be affiliated with any industry; and (4) the reviewer must not be a member of the proposing team or affiliated with the same institution as that of a member of the proposing team.



The **Assignment Process** begins with selection of an element from Set 1 and from Set 2 and follows a set of rules to avoid biases and other problems in proposal reviews.

This program was written Faiza Lansing and Anil Kantak of Caltech for **NASA's Jet Propulsion Laboratory.** *Further information is contained in a TSP (see page 1).*

This software is available for commercial licensing. Please contact Karina Edmonds of the California Institute of Technology at (626) 395-2322. Refer to NPO-40902.

Array-Pattern-Match Compiler for Opportunistic Data Analysis

NASA's Jet Propulsion Laboratory, Pasadena, California

A computer program has been written to facilitate real-time sifting of scientific data as they are acquired to find data patterns deemed to warrant further analysis. The patterns in question are of a type denoted array patterns, which are specified by nested parenthetical expressions. [One example of an array pattern is ((>3) 0 (≠1)): this pattern matches a vector of at least three elements, the first of which exceeds 3, the second of which is 0, and the third of which does not equal 1.] This program accepts a high-level description of a static array pattern and compiles a highly optimal and compact other program to determine whether any given instance of any data array matches that pattern. The compiler implemented by this program is independent of the target language, so that as new languages are used to write code that processes scientific data, they can easily be adapted to this compiler. This program runs on a variety of different computing platforms. It must be run in conjunction with any one of a number of Lisp compilers that are available commercially or as shareware.

This program was written by Mark James of Caltech for **NASA's Jet Propulsion Laboratory**. *Further information is contained in a TSP (see page 1).*

This software is available for commercial licensing. Please contact Karina Edmonds of the California Institute of Technology at (626) 395-2322. Refer to NPO-42096.

Pre-Processor for Compression of Multispectral Image Data

NASA's Jet Propulsion Laboratory, Pasadena, California

A computer program that preprocesses multispectral image data has been developed to provide the Mars Exploration Rover (MER) mission with a means of exploiting the additional correlation present in such data without appreciably increasing the complexity of compressing the data. When used in conjunction with ICER, a previously developed image-data-compression program, this program enables improved compression of multispectral images, compared to that achievable by use of ICER alone. As such, it is a straightforward means of achieving much of the gain possible from exploiting spectral correlation. This preprocessor software accommodates up to seven images that are different spectral bands of the same scene. The software performs an approximate discrete cosine transform (DCT) pixelwise across the spectral bands. The software is written for speed; in particular the DCT operation performs only inte-

ger operations (producing integer output) and uses multiplications sparingly. Separate code is used for each possible number of spectral bands, including numbers for which fast DCT functions are not normally implemented. The DCT output is scaled so that, if the original images have a bit depth of at most 12, the transformed images are guaranteed to have a dynamic range appropriate for compression by the ICER software on the MER rovers. The resulting transformed bands are compressed individually by ICER. To reconstruct the images, the transformed images are first decompressed by use of the decompressor for ICER, then the resulting reconstructed images are passed to an inverse-DCT subprogram, which reconstructs the various spectral bands.

This work was done by Matthew Klimesh and Aaron Kiely of Caltech for **NASA's Jet Propulsion Laboratory**. *Further information is contained in a TSP (see page 1).*

This software is available for commercial licensing. Please contact Karina Edmonds of the California Institute of Technology at (626) 395-2322. Refer to NPO-40835.

Compressing Image Data While Limiting the Effects of Data Losses

NASA's Jet Propulsion Laboratory, Pasadena, California

ICER is computer software that can perform both lossless and lossy compression and decompression of gray-scale-image data using discrete wavelet transforms. Designed for primary use in transmitting scientific image data from distant spacecraft to Earth, ICER incorporates an error-containment scheme that limits the adverse effects of loss of data and is well suited to the data packets transmitted by deep-space probes. The error-containment scheme includes utilization of the algorithm described in "Partitioning a Gridded Rectangle Into Smaller Rectangles" (NPO-30479), *NASA Tech Briefs*, Vol. 28, No. 7 (July 2004), page 56. ICER has performed well in onboard compression of thousands of images transmitted from the Mars Exploration Rovers.

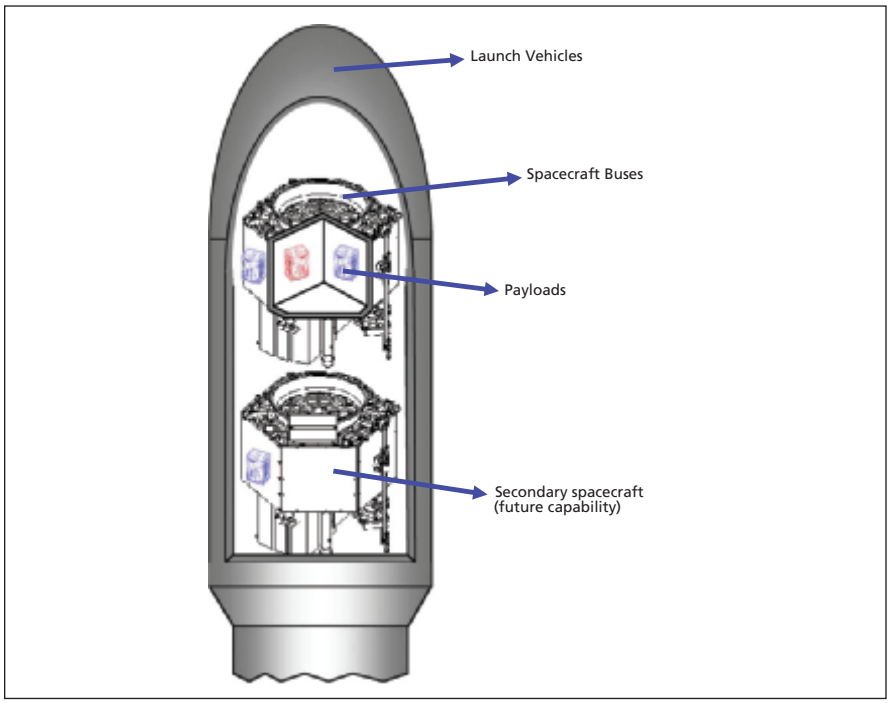
This program was written by Aaron Kiely and Matthew Klimesh of Caltech for **NASA's Jet Propulsion Laboratory**. *Further information is contained in a TSP (see page 1).*

This software is available for commercial licensing. Please contact Karina Edmonds of the California Institute of Technology at (626) 395-2322. Refer to NPO-40982.

Flight Operations Analysis Tool

NASA's Jet Propulsion Laboratory, Pasadena, California

Flight Operations Analysis Tool (FLOAT) is a computer program that partly automates the process of assessing the benefits of planning spacecraft missions to incorporate various combinations of launch vehicles and payloads (see figure). Designed primarily for use by an experienced systems engineer, FLOAT makes it possible to perform a preliminary analysis of trade-offs and costs of a proposed mission in days, whereas previously, such an analysis typically lasted months. FLOAT surveys a variety of prior missions by querying data from authoritative NASA sources pertaining to 20 to 30 mission and interface parameters that define space missions. FLOAT provides automated, flexible means for comparing the parameters to determine compatibility or the lack thereof among payloads, spacecraft, and launch vehicles, and for displaying the results of such comparisons. Sparseness, typical of the data available for analysis, does not confound this software. FLOAT effects an iterative process that identifies modifications of parameters that could render compatible an otherwise incompatible mission set.



The **Database Overview** shows current and future capabilities.

This program was written by Robert Easter, Linda Herrell, Richard Pomphrey, James Chase, Julie Wertz Chen, Jeffrey Smith, and Rebecca Carter of Caltech for **NASA's Jet Propulsion Laboratory**. *Further information is contained in a TSP (see page 1).*

This software is available for commercial licensing. Please contact Karina Edmonds of the California Institute of Technology at (626) 395-2322. Refer to NPO-42306.