Software

Using Satellite Data in Weather Forecasting: I

The GOES Product Generation System (GPGS) is a set of computer codes and scripts that enable the assimilation of real-time Geostationary Operational Environmental Satellite (GOES) data into regional-weather-forecasting mathematical models. The GPGS can be used to derive such geophysical parameters as land surface temperature, the amount of precipitable water, the degree of cloud cover, the surface albedo, and the amount of insolation from satellite measurements of radiant energy emitted by the Earth and its atmosphere. GPGS incorporates *a priori* information (initial guesses of thermodynamic parameters of the atmosphere) and radiometric measurements from the geostationary operational environmental satellites along with mathematical models of physical principles that govern the transfer of energy in the atmosphere. GPGS solves the radiative-transfer equation and provides the resulting data products in formats suitable for use by weather-forecasting computer programs. The data-assimilation capability afforded by GPGS offers the potential to improve local weather forecasts ranging from 3 hours to 2 days — especially with respect to temperature, humidity, cloud cover, and the probability of precipitation. The improvements afforded by GPGS could be of interest to news media, utility companies, and other organizations that utilize regional weather forecasts.

This program was written by Gary J. Jedlovec and Ronnie J. Suggs of **Marshall Space Flight Center** *and Juan M. Lecue of the Universities Space Research Association and the Global Hydrology and Climate Center. For further information, contact Sammy Nabors, MSFC Commercializaton Assistance Lead, at sammy.a.nabors@nasa.gov. Refer to MFS-31615.*

Using Dissimilarity Metrics To Identify Interesting Designs

A computer program helps to blend the power of automated-search software, which is able to generate large numbers of design solutions, with the insight of expert designers, who are able to identify preferred designs but do not have time to examine all the solutions. From among the many automated solutions to a given design problem, the program selects a smaller number of solutions that are worthy of scrutiny by the experts in the sense that they are sufficiently dissimilar from each other. The program makes the selection in an interactive process that involves a sequence of data-mining steps interspersed with visual displays of results of these steps to the experts. At crucial points between steps, the experts provide directives to guide the process. The program uses heuristic search techniques to identify nearly optimal design solutions and uses dissimilarity metrics defined by the experts to characterize the degree to which solutions are interestingly different. The search, data-mining, and visualization features of the program were derived from previously developed risk-management software used to support a risk-centric design methodology.

This program was written by Martin Feather of Caltech and James Kiper of Miami University, Oxford, Ohio, 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-40456.

X-Windows PVT Widget Class

The X-Windows Process Validation Table (PVT) Widget Class ("Class" is used here in the object-oriented-programming sense of the word) was devised to simplify the task of implementing network registration services for Information Sharing Protocol (ISP) graphical-user-interface (GUI) computer programs. Heretofore, ISP PVT programming tasks have required many method calls to identify, query, and interpret the connections and messages exchanged between a client and a PVT server. Normally, programmers have utilized direct access to UNIX socket libraries to implement the PVT protocol queries, necessitating the use of many lines of source code to perform frequent tasks. Now, the X-Windows PVT Widget Class encapsulates ISP client server network registration management tasks within the framework of an X Windows widget. Use of the widget framework enables an X Windows GUI program to interact with PVT services in an abstract way and in the same manner as that of other graphical widgets, making it easier to program PVT clients. Wrapping the PVT services inside the widget framework enables a programmer to treat a PVT server interface as though it were a GUI. Moreover, an alternate subclass could implement another service in a widget of the same type.

This program was written by Matthew R. Barry of United Space Alliance for **Johnson Space Center**. *For further information, contact the Johnson Technology Transfer Office at (281) 483-3809.*
MSC-23582

Shuttle Data Center File-Processing Tool in Java

A Java-language computer program has been written to facilitate mining of data in files in the Shuttle Data Center (SDC) archives. This program can be executed on a variety of workstations or via Web-browser programs. This program is partly similar to prior C-language programs used for the same purpose, while differing from those programs in that it exploits the platform-neutrality of Java in implementing several features that are important for analysis of large sets of time-series data. The program supports regular expression queries of SDC archive files, reads the files, interleaves the time-stamped samples according to a chosen output, then transforms the results into that format. A user can choose among a variety of output file formats that are useful for diverse purposes, including plotting, Markov modeling, multivariate density estimation, and wavelet multiresolution analysis, as well as for playback of data in support of simulation and testing.

This program was written by Matthew R. Barry and Walter H. Miller of United Space Alliance for **Johnson Space Center.** *For further information, contact the Johnson Technology Transfer Office at (281) 483-3809.*
MSC-23584

Statistical Evaluation of Utilization of the ISS

PayLoad Utilization Modeler (PLUM) is a statistical-modeling computer program used to evaluate the effectiveness of utilization of the Interna-

tional Space Station (ISS) in terms of the number of research facilities that can be operated within a specified interval of time. PLUM is designed to balance the requirements of research facilities aboard the ISS against the resources available on the ISS. PLUM comprises three parts: an interface for the entry of data on constraints and on required and available resources, a database that stores these data as well as the program output, and a modeler. The modeler comprises two subparts: one that generates tens of thousands of random combinations of research facilities and another that calculates the usage of resources for each of those combinations. The results of these calculations are used to generate graphical and tabular reports to determine which facilities are most likely to be operable on the ISS, to identify which ISS resources are inadequate to satisfy the demands upon them, and to generate other data useful in allocation of and planning of resources.