Unlike ordinary (continuous-tone) images, a classification map typically contains a relatively small number of pixel values. Also, unlike in continuous-tone images, numerically close pixel values do not necessarily represent similar content. These properties make the problem of compressing classification-map-data differ from the problem of compressing data from ordinary images.

Prediction is commonly used in lossless-compression schemes. In predictive compression, pixels or other samples are encoded sequentially on the basis of a probability distribution estimated from previously encoded samples. Context modeling is often used in conjunction with predictive compression. In context modeling, each pixel or other sample to be encoded is classified into one of several contexts based on previously encoded samples. A context-modeling algorithm maintains separate statistics for each context and uses these statistics to estimate and encode samples more effectively. Ideally, contexts are defined so that different contexts contain sets of pixels or other samples characterized by substantially different statistics.

The present algorithm incorporates a simple adaptive context modeler that feeds into a binary interleaved entropy coder. The algorithm operates on the pixels of a classification map or other image in raster scan order. A sequence of binary decision bits is produced for each pixel to indicate which, if any, neighboring pixel(s) it matches. The encoder maintains probability-of-zero estimates for these bits for each of the contexts. The interleaved entropy coder is bit-wise adaptable, enabling the context modeler to quickly adapt to changing statistics in the image.

In tests, the present algorithm and three prior general-purpose image-data-compression algorithms were applied to five classification maps containing from 4 to 32 different classes. The four-class map is shown in the figure. The results of the tests showed that the volumes of data generated by the present algorithm ranged from 15 to 40 percent below those of the prior algorithms.

This work was done by Hua Xie and Matthew Klimesh 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-45103.

Framework for ReSTful Web Services in OSGi

NASA's Jet Propulsion Laboratory, Pasadena, California

Ensemble ReST is a software system that eases the development, deployment, and maintenance of server-side application programs to perform functions that would otherwise be performed by client software. Ensemble ReST takes advantage of the proven disciplines of ReST (Representational State Transfer — a style of software architecture for such distributed hypermedia systems as the World Wide Web) and OSGi (formerly, Open Services Gateway Initiative — an industry standard for software for connecting such devices as home appliances and security systems to the Internet). ReST leverages the standardized HTTP protocol to enable developers to offer services to a diverse variety of clients: from shell scripts to sophisticated Java application suites.

Ensemble ReST abstracts away complexities associated with development of server-side application programs, enabling programmers to focus more on business logic than on server issues. It is robust, scalable, and secure; capable of serving dynamic as well as static content; and extensible to provide additional functionality. Services can be added, removed, or updated on a server, without restarting the server. Furthermore, the development environment for these services (Eclipse IDE) allows developers to debug the server-side applications side-by-side with the clients. The framework enables rapid prototyping and development of production level ReSTlets that can be deployed to support mission critical applications. The rapid development cycle offered by this framework has enabled the Maestro team to develop and deploy many production server-side applications to MER, Phoenix, and MSL missions.

This program was written by Khawaja S. Shams, Jeffrey S. Norris, Mark W. Powell, Thomas M. Crockett, David S. Mittman, Jason M. Fox, Joseph C. Joswig, Michael N. Wallick, Recaredo J. Torres, and Kenneth Rabe 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-45848.

MAGIC: Model and Graphic Information Converter

John F. Kennedy Space Center, Florida

MAGIC is a software tool capable of converting highly detailed 3D models from an open, standard format, VRML 2.0/97, into the proprietary DTS file format used by the Torque Game Engine from GarageGames. MAGIC is used to convert 3D simulations from authoritative sources into the data needed to run the simulations in NASA's Distributed Observer Network.

The Distributed Observer Network (DON) is a simulation presentation tool built by NASA to facilitate the simulation sharing requirements of the Data Presentation and Visualization effort within the Constellation Program. DON is built on top of the Torque Game Engine (TGE) and has chosen TGE's Dynamix Three Space (DTS) file format to represent 3D objects within simulations.

The DTS file structure is generally intended to contain common game objects, with less than ten thousand polygons each, and if built using the standard methods will break (fail to load or contain corrupted geometry) after that amount.

MAGIC employs techniques to work around the DTS limitations, allowing for much more information to be successfully represented with the DTS file structure (millions of polygons). This ability opens up the Torque Game Engine to be used in applications where such detail is needed.