ted data than the coarser data acquisition of the prior software.

The data-conditioning module provides a clean data set for the analysis module. For multiple measurements at a given degree, the first measurement is used. For omitted measurements, the missing field is estimated by linear interpolation between the two nearest measurements.

The analysis module was rewritten for the dual rotation, triaxial probe measurement process and now has better moment estimation accuracy, based on the finer one degree of data acquisition resolution. The magnetic moments thus computed are used as an input to summarize the total spacecraft field.

Analyzing Responses of Chemical Sensor Arrays

NASA's Jet Propulsion Laboratory, Pasadena, California

NASA is developing a third-generation electronic nose (ENose) capable of continuous monitoring of the International Space Station's cabin atmosphere for specific, harmful airborne contaminants. Previous generations of the ENose have been described in prior *NASA Tech Briefs* issues.

Sensor selection is critical in both (pre-fabrication) sensor material selection and (post-fabrication) data analysis of the ENose, which detects several analytes that are difficult to detect, or that are at very low concentration ranges. Existing sensor selection approaches usually include limited statistical measures, where selectivity is more important but reliability and sen-

sitivity are not of concern. When reliability and sensitivity can be major limiting factors in detecting target compounds reliably, the existing approach is not able to provide meaningful selection that will actually improve data analysis results.

The approach and software reported here consider more statistical measures (factors) than existing approaches for a similar purpose. The result is a more balanced and robust sensor selection from a less than ideal sensor array. The software offers quick, flexible, optimal sensor selection and weighting for a variety of purposes without a time-consuming, iterative search by performing sensor calibrations to a known linear or nonlin-

ear model, evaluating the individual sensor's statistics, scoring the individual sensor's overall performance, finding the best sensor array size to maximize class separation, finding optimal weights for the remaining sensor array, estimating limits of detection for the target compounds, evaluating fingerprint distance between group pairs, and finding the best event-detecting sensors.

PREDICTS

NASA's Jet Propulsion Laboratory, Pasadena, California

PREDICTS is a computer program that predicts the frequencies, as functions of time, of signals to be received by a radio science receiver — in this case, a special-purpose digital receiver dedicated to analysis of signals received by an antenna in NASA's Deep Space Network (DSN). Unlike other software used in the DSN, PREDICTS does not use interpolation early in the calculations; as a consequence, PREDICTS is more precise and more stable. The precision afforded by

the other DSN software is sufficient for telemetry; the greater precision afforded by PREDICTS is needed for radio-science experiments. In addition to frequencies as a function of time, PREDICTS yields the rates of change and interpolation coefficients for the frequencies and the beginning and ending times of reception, transmission, and occultation.

PREDICTS is applicable to S-, X-, and Ka-band signals and can accommodate the following link configurations: (1)

one-way (spacecraft to ground), (2) two-way (from a ground station to a spacecraft to the same ground station), and (3) three-way (from a ground transmitting station to a spacecraft to a different ground receiving station).

Software Compensates Electronic-Nose Readings for Humidity

NASA's Jet Propulsion Laboratory, Pasadena, California

A computer program corrects for the effects of humidity on the readouts of an array of chemical sensors (an "electronic nose"). To enable the use of this program, the array must incorporate an in-

dependent humidity sensor in addition to sensors designed to detect analytes other than water vapor. The basic principle of the program was described in "Compensating for Effects of Humidity

on Electronic Noses" (NPO-30615), *NASA Tech Briefs*, Vol. 28, No. 6 (June 2004), page 63. To recapitulate: The output of the humidity sensor is used to generate values that are subtracted from