transmitted only through the right-CMBF and is blocked by the left-CMBF. This continues over other wavelength bands as well.

So, it can be seen that the image sensors at the focal plane are measuring light intensities of alternately transmitted light from the two CMBFs. At the end of one complete illumination cycle, six images will have been collected. Then the images from R1, G1, and B1 become the primary colors for the left side of the stereo image, and R2, G2, and B2 become that of the right side of the stereo image. Two stereo images have been time-multiplexed on the same imaging chip. This intensity data is stored as an array from which the 3D stereoscopic color image is constructed by applying processing and reconstruction algorithms.

This work was done by Youngsam Bae, Harish Manohara, Victor E. White, and Kirill V. Shcheglov of Caltech and Hrayr Shahinian of Skull Base Institute for NASA's Jet Propulsion Laboratory. Further information is contained in a TSP (see page 1).

Early Oscillation Detection Technique for Hybrid DC/DC Converters

Potential users include commercial and military power supply manufacturers, and high-reliability electronic product companies.

Goddard Space Flight Center, Greenbelt, Maryland

Oscillation or instability is a situation that must be avoided for reliable hybrid DC/DC converters. A real-time electronics measurement technique was developed to detect catastrophic oscillations at early stages for hybrid DC/DC converters. It is capable of identifying low-level oscillation and determining the degree of the oscillation at a unique frequency for every individual model of the converters without disturbing their normal operations. This technique is specially developed for space-used hybrid DC/DC converters, but it is also suitable for most of commercial and military switching-mode power supplies.

This is a weak-electronic-signal detection technique to detect hybrid DC/DC converter oscillation presented as a specific noise signal at power input pins. It is based on principles of feedback control loop oscillation and RF signal modulations, and is realized by using signal power spectral analysis. On the power spectrum, a channel power amplitude at characteristic frequency (CP_{cf}) and a channel power amplitude at switching frequency (CP_{sw}) are chosen as oscillation level indicators. If the converter is stable, the CP_{cf} is a very small pulse and the CP_{sw} is a larger, clear, single pulse. At early stage of oscillation, the CP_{cf} increases to a certain level and the CP_{sw} shows a small pair of sideband pulses around it. If the converter oscillates, the CP_{cf} reaches to a higher level and the CP_{sw} shows more high-level sideband pulses. A comprehensive stability index (CSI) is adopted as a quantitative measure to accurately assign a degree of stability to a specific DC/DC converter. The CSI is a ratio of normal and abnormal power spectral density, and can be calculated using specified and measured CP_{cf} and CP_{sw} data.

The novel and unique feature of this technique is the use of power channel amplitudes at characteristic frequency and switching frequency to evaluate stability and identify oscillations at an early stage without interfering with a DC/DC converter's normal operation. This technique eliminates the probing problem of a gain/phase margin method by connecting the power input to a spectral analyzer. Therefore, it is able to evaluate stability for all kinds of hybrid DC/DC converters with or without remote sense pins, and is suitable for real-time and in-circuit testing. This frequency-domain technique is more sensitive to detect oscillation at early stage than the time-domain method using an oscilloscope.

This work was done by Bright L. Wang of Goddard Space Flight Center. Further information is contained in a TSP (see page 1). GSC-15777-1

Parallel Wavefront Analysis for a 4D Interferometer

NASA's Jet Propulsion Laboratory, Pasadena, California

This software provides a programming interface for automating data collection with a PhaseCam interferometer from 4D Technology, and distributing the image-processing algorithm across a cluster of general-purpose computers.

Multiple instances of 4Sight (4D Technology's proprietary software) run on a networked cluster of computers. Each connects to a single server (the controller) and waits for instructions. The controller directs the interferometer to several images, then assigns each image to a different computer for processing. When the image processing is finished, the server directs one of the computers to collate and combine the processed images, saving the resulting measurement in a file on a disk.

The available software captures approximately 100 images and analyzes them immediately. This software separates the capture and analysis processes, so that analysis can be done

at a different time and faster by running the algorithm in parallel across several processors.

The PhaseCam family of interferometers can measure an optical system in milliseconds, but it takes many seconds to process the data so that it is usable. In characterizing an adaptive optics system, like the next generation of astronomical observatories, thousands of measurements are required, and the processing time quickly becomes excessive.

A programming interface distributes data processing for a PhaseCam interferometer across a Windows computing cluster. A scriptable controller program coordinates data acquisition from the interferometer, storage on networked hard disks, and parallel processing. Idle time of the interferometer is minimized.

This architecture is implemented in Python and JavaScript, and may be altered to fit a customer's needs.