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).

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**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

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**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 run-
ning the algorithm in parallel across
several processors.

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

A programming interface distributes
data processing for a PhaseCam interfer-
ometer across a Windows computing
cluster. A scriptable controller program
coordinates data acquisition from the in-
terferometer, 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 al-
tered to fit a customer’s needs.

This work was done by Shanti R. Rao of Cal-
tech for NASA’s Jet Propulsion Laboratory. For
more information, contact iaoffice@jpl.nasa.gov.

This software is available for commercial li-
censing. Please contact Daniel Broderick of
the California Institute of Technology at
danielb@caltech.edu. Refer to NPO-47384.