systems and computers having 16 GB or more RAM). The advantage of the hard-drive-based analysis is one can work with essentially unlimited-sized data sets.

Separate windows are spawned for the unwrapped/re-sliced data view and any image processing interactive capability. Individual unwrapped images and unwrapped image series can be saved in common image formats.

More information is available at http://www.grc.nasa.gov/WWW/OptInstr/NDE_CT_CylinderUnwrapper.html.

This work was done by Don J. Roth of Glenn Research Center. Further information is contained in a TSP (see page 1).

Inquiries concerning rights for the commercial use of this invention should be addressed to NASA Glenn Research Center, Innovative Partnerships Office, Attn: Steven Fedor, Mail Stop 4–8, 21000 Brookpark Road, Cleveland, Ohio 44135. Refer to LEW-18808-1.

Discrete Data Qualification System and Method Comprising Noise Series Fault Detection

Noise fault detector detects an unreasonably high or low variance or standard deviation.

John H. Glenn Research Center, Cleveland, Ohio

A Sensor Data Qualification (SDQ) function has been developed that allows the onboard flight computers on NASA's launch vehicles to determine the validity of sensor data to ensure that critical safety and operational decisions are not based on faulty sensor data. This SDQ function includes a novel noise series fault detection algorithm for qualification of the output data from LO_2 and LH_2 low-level liquid sensors. These sensors are positioned in a launch vehicle's propellant tanks in order to detect propellant depletion during a rocket engine's boost operating phase. This detection capability can prevent the catastrophic situation where the engine operates without propellant. The output from each LO_2 and LH_2 low-level liquid sensor is a discrete valued signal that is expected to be in either of two states, depending on whether the sensor is immersed (wet) or exposed (dry). Conventional methods for sensor data qualification, such as threshold limit checking, are not effective for this type of signal due to its discrete binary-state nature.

To address this data qualification challenge, a noise computation and evaluation method, also known as a noise fault detector, was developed to detect unreasonable statistical characteristics in the discrete data stream. The method operates on a time series of discrete data observations over a moving window of data points and performs a continuous examination of the resulting observation stream to identify the presence of anomalous characteristics. If the method determines the existence of anomalous results, the data from the sensor is disqualified for use by other monitoring or control functions.

This work was done by Christopher Fulton, Edmond Wong, and Kevin Melcher of Glenn Research Center; and Randall Bickford of Expert Microsystems, Inc. For more information, contact kimberly.a.dalgleish@nasa.gov.

Inquiries concerning rights for the commercial use of this invention should be addressed to NASA Glenn Research Center, Innovative Partnerships Office, Attn: Steven Fedor, Mail Stop 4–8, 21000 Brookpark Road, Cleveland, Ohio 44135. Refer to LEW-18694-1.

Simple Laser Communications Terminal for Downlink From Earth Orbit at Rates Exceeding 10 Gb/s

Implementation of this technology will surpass the spectrum-allocation and bandwidth limitations of current RF systems.

NASA's Jet Propulsion Laboratory, Pasadena, California

A compact, low-cost laser communications transceiver was prototyped for downlinking data at 10 Gb/s from Earth-orbiting spacecraft. The design can be implemented using flight-grade parts. With emphasis on simplicity, compactness, and light weight of the flight transceiver, the reduced-complexity design and development approach involves:

1. A high-bandwidth coarse wavelength division multiplexed (CWDM) (4×2.5 or 10-Gb/s data-rate) downlink transmitter. To simplify the system, emphasis is on the downlink. Optical uplink data rate is modest (due to existing and adequate RF uplink capability).
2. Highly simplified and compact 5-cm-diameter clear aperture optics assembly is configured to single transmit and receive aperture laser signals. About 2 W of 4-channel multiplexed (1,540 to 1,555 nm) optically amplified laser power is coupled to the optical assembly through a fiber optic cable. It contains a highly compact, precision-pointing capability two-axis gimbal assembly to coarse point the optics assembly. A fast steering mirror, built into the optical path of the optical assembly, is used to remove residual pointing disturbances from the gimbal. Acquisition, pointing, and tracking are assisted by a beacon laser transmitted from the ground and received by the optical assembly, which will allow transmission of a laser beam.
3. Shifting the link burden to the ground by relying on direct detection optical receivers retrofitted to 1-m-diameter ground telescopes.
4. Favored mass and volume reduction over power-consumption reduction. The two major variables that are avail-