
Hyperspectral Imager-Tracker

John F. Kennedy Space Center, Florida

The Hyperspectral Imager-Tracker (HIT) is a technique for visualization and tracking of low-contrast, fast-moving objects. The HIT architecture is based on an innovative and only recently developed concept in imaging optics. This innovative architecture will give the Light Prescriptions Innovators (LPI) HIT the possibility of simultaneously collecting the spectral band images (hyperspectral cube), IR images, and to operate with high-light-gathering power and high magnification for multiple fast-moving objects. Adaptive Spectral Filtering algorithms will efficiently increase the contrast of low-contrast scenes.

The most hazardous parts of a space mission are the first stage of a launch and the last 10 kilometers of the landing trajectory.

In general, a close watch on spacecraft operation is required at distances up to 70 km. Tracking at such distances is usually associated with the use of radar, but its milliradian angular resolution translates to 100-m spatial resolution at 70-km distance. With sufficient power, radar can track a spacecraft as a whole object, but will not provide detail in the case of an accident, particularly for small debris in the one-meter range, which can only be achieved optically. It will be important to track the debris, which could disintegrate further into more debris, all the way to the ground. Such fragmentation could cause ballistic predictions, based on observations using high-resolution but narrow-field optics for only the first few seconds of the event, to be inaccurate. No optical imager architecture

exists to satisfy NASA requirements.

The HIT was developed for space vehicle tracking, in-flight inspection, and in the case of an accident, a detailed recording of the event. The system is a combination of five subsystems: (1) a “roving fovea” telescope with a wide 30° field of regard; (2) narrow, high-resolution “fovea” field optics; (3) a “Coude” optics system for telescope output beam stabilization; (4) a hyperspectral-mutispectral imaging assembly; and (5) image analysis software with effective adaptive spectral filtering algorithm for real-time contrast enhancement.

This work was done by Ilya Agurok of Prescriptions Innovators, LLC for Kennedy Space Center. Further information is contained in a TSP (see page 1). KSC-13234

Web Application Software for Ground Operations Planning Database (GOPDb) Management

John F. Kennedy Space Center, Florida

A Web application facilitates collaborative development of the ground operations planning document. This will reduce costs and development time for new programs by incorporating the data governance, access control, and revision tracking of the ground operations planning data.

Ground Operations Planning requires the creation and maintenance of detailed timelines and documentation. The GOPDb Web application was created using state-of-the-art Web 2.0 technologies, and was deployed as SaaS (Software as a Service), with an emphasis on data governance and security needs. Application access is managed using two-factor authentication, with data write permis-

sions tied to user roles and responsibilities. Multiple instances of the application can be deployed on a Web server to meet the robust needs for multiple, future programs with minimal additional cost.

This innovation features high availability and scalability, with no additional software that needs to be bought or installed. For data governance and security (data quality, management, business process management, and risk management for data handling), the software uses NAMS. No local copy/cloning of data is permitted. Data change log/tracking is addressed, as well as collaboration, work flow, and process standardization. The software provides on-

line documentation and detailed Web-based help.

There are multiple ways that this software can be deployed on a Web server to meet ground operations planning needs for future programs. The software could be used to support commercial crew ground operations planning, as well as commercial payload/satellite ground operations planning. The application source code and database schema are owned by NASA.

This work was done by Clifton Lanham of Kennedy Space Center, and Pravinkumar Asar, Shawn Kallner, and Jeffrey Germand of SAIC. Further information is contained in a TSP (see page 1). KSC-13621