A software program provides a Sensorweb architecture for alert-processing, event detection, asset allocation and planning, and visualization (see figure). It automatically tasks and re-tasks various types of assets such as satellites and robotic vehicles in response to alerts (fire, weather) extracted from various data sources, including low-level Webcam data. JPL has adapted considerable Sensorweb infrastructure that had been previously applied to NASA Earth Science applications. This NASA Earth Science Sensorweb has been in operational use since 2003, and has proven reliability of the Sensorweb technologies for robust event detection and autonomous response using space and ground assets.

Unique features of the software include flexibility to a range of detection and tasking methods including those that require aggregation of data over spatial and temporal ranges, generality of the response structure to represent and implement a range of response campaigns, and the ability to respond rapidly.

This work was done by Rebecca Castano, Steve A. Chien, Gregg R. Rabideau, and Benyang Tang of Caltech for NASA’s Jet Propulsion Laboratory. For more information, contact iaoffice@jpl.nasa.gov.

This software is available for commercial licensing. Please contact Daniel Broderick of the California Institute of Technology at danielb@caltech.edu. Refer to NPO-46468.

Support for Systematic Code Reviews With the SCRUB Tool
NASA’s Jet Propulsion Laboratory, Pasadena, California

SCRUB is a code review tool that supports both large, team-based software development efforts (e.g., for mission software) as well as individual tasks. The tool was developed at JPL to support a new, streamlined code review process that combines human-generated review reports with program-generated review reports from a customizable range of state-of-the-art source code analyzers. The leading commercial tools include Codenomicon, Coverity, and Klocwork, each of which can achieve a reasonably low rate of false-positives in the warnings that they generate. The time required to analyze
The Morbiter software numerically averages an osculating orbit’s equations of motion (EOM) to arrive at the mean orbit’s EOMs, which are then numerically propagated to obtain the long-term orbital ephemerides. The long-term evolution characteristics, and stability, of an orbit are best characterized using a mean element propagation of the perturbed, two-body variational equations of motion. The average process eliminates short period terms, leaving only secular and long period effects. Doing this avoids the Fourier series expansions and truncations required by the traditional analytic methods.

The numerical methods require no analytic approximation, and the averaging theory and software implementation work at any solar system body. JPL’s Monte mission analysis and navigation software was used as the underlying trajectory system (to the extent possible) for this innovation. Morbiter is a package of Python scripts that implement the algorithms, and uses Monte for basic astrodynamics constructs and functions such as trajectories, ephemerides, coordinate systems, astrodynamics constants, and, in most cases, the perturbation acceleration methods. Python is an interpreted language that provides an ideal platform for rapid development of algorithms; however, there is a performance penalty for using Python script-based applications. An end-user, future version of Morbiter that is fully compiled will not suffer from this speed penalty; development of this version is planned to begin in late FY ’10. This work was done by Todd A. Ely of Caltech for NASA’s Jet Propulsion Laboratory. Further information is contained in a TSP (see page 1). This software is available for commercial licensing. Please contact Daniel Broderick of the California Institute of Technology at danielb@caltech.edu. Refer to NPO-47212.

SCRUB User Interface is shown when it is opened in local mode.