sensors and detectors

Biologically Inspired Sensor Webs and Other Systems

Creating safer, more reliable, and self-managing complex systems

NASA Goddard Space Flight Center invites companies to license space-program technologies designed to increase the functionality of sensor webs and other autonomous and autonomic (self-directing and self-managing) systems. Inspired by biological systems, Goddard's innovations enable rapid, efficient communication among sensors and/or other elements in a system. Such communication improvements enable real-time monitoring, rapid alerting, and automatic quiescence (self-sleep/standby) and apoptosis (self-destruction) in a wide range of applications involving large, complex systems.

Benefits

These technologies greatly improve sensor webs and other systems:

- **Increased and more efficient communication**: Reduced complexity of the data signal results in better communication among sensors.

- **Fewer system interruptions**: Grouping all data and sending it out to the sensor web/system as one signal minimizes interruptions in processing.

- **Enhanced autonomy**: Monitoring of the operational status of each sensor/device enhances the system's ability to be self-directing and self-managing.

- **Faster response times**: Simultaneous and universal communication among sensors/devices provides real-time alerts to an incident or fault.

- **Safer, more reliable systems**: Improved fault detection makes the sensor web/system more robust.

technology▪opportunity

Technology Details

The suite of technologies developed at NASA Goddard is designed to make sensor webs and other autonomous and autonomic systems more self-directing and self-managing without compromising their security, safety, reliability, or effectiveness.

How it works

The technologies are based upon biologically inspired systems. For example, one set of technologies (GSC-14968 and GSC-15176) uses the cell apoptosis model to enable self-destruct or self-sleep/standby actions. This benefits sensors, computer systems, spacecraft, and other systems that require "stay-alive" notifications to ensure safe and correct operation over time. Withdrawal of the stay-alive signal can put the system into a self-destruct or self-sleep mode.

A second set of technologies (GSC-15038 and GSC-15179) uses the heartbeat as a model for efficiently transferring data within a system without disrupting processes. By exploiting the double beat of the pulse ("lub-dub"), the approach allows one signal to carry many pieces of data, such as self-health/urgency information and environmental-health/urgency information. Combining the information results in a less complex signal, which reduces the number and length of internal processing interruptions for each device to receive information.

Why it is better

The suite offers significant enhancements to self-directing and self-managing systems. Providing a self-sleep/standby option in addition to the self-destruct option provides greater flexibility for systems. For example, military drones are often "killed off" when they present a hazard; Goddard's technology provides another set of options in disabling such systems.

The enhanced communication also is highly beneficial. Currently, delays occur when external information is received by an individual sensor/device. Specifically, the receiving device must stop processing its own data, receive the external signal, respond or process the signal, and then return to its original task. Goddard's technology reduces the time needed to receive the signal, thereby reducing interruptions and increasing processing time.

The result is better self-monitoring. For example, Goddard's technology allows a faulty sensor/device in the web/system to be identified by another, which then signals the rest of the sensors/devices of the fault universally and simultaneously. This seamless interaction and communication enhances self-monitoring without slowing down the system with too many requests.

Patents

NASA Goddard Space Flight Center is currently pursuing patent protection for the technologies in this suite.

Licensing and Partnering Opportunities

These technologies are part of NASA's Innovative Partnerships Program (IPP), which seeks to transfer technology into and out of NASA to benefit the space program and U.S. industry. NASA invites companies to consider licensing technologies in the Autonomic Systems suite (reference GSC-14968, GSC-15176, GSC-15038, and GSC-15179) for commercial applications. For information and forms related to technology licensing, please visit the Licensing and Partnering page on Goddard's IPP Office Web site (http://ipp.gsfc.nasa.gov/lic-partnerships.html)

For More Information

If you would like more information or want to pursue transfer of this technology, please contact:

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