Access Grid, New Spectrometer, High-Resolution Mammography System Win R&D 100 awards

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Researchers at the U.S. Department of Energy's Argonne National Laboratory devised three of the world's top 100 scientific and technological innovations during 2006, as judged by R&D magazine.

Argonne scientists are consistent winners of the R&D 100 awards, having garnered 98 of the prizes since the magazine introduced them in 1964.

“Once again, DOE's labs are at the cutting edge of innovation with new technology developments to enhance America's economic and national security,” said U.S. Secretary of Energy Samuel Bodman. “My heartiest congratulations to the DOE researchers and scientists that have won R&D Magazine's prestigious awards this year.”

This year's winners from Argonne are:

-- Access Grid, a piece of open-source teleconferencing software.
-- A passive millimeter-wave spectrometer that can detect chemical signatures at distances of up to a few kilometers.
-- An ultra-high-resolution mammography system, which will provide a low-cost computerized alternative to current mammographic techniques.

Access Grid

Access Grid 3 software enables groups of people to collaborate using open-source standards and Internet technology. The Access Grid is designed to provide a natural virtual environment, where users can see and hear one another, projected on a large display wall. More than just videoconferencing, the Access Grid enables participants to share and interact with files and applications. The open nature of the Access Grid software has attracted thousands of users from around the world and has encouraged numerous commercial and research institutions to adopt the software for their purposes.

Access Grid has been used by college professors to teach students in distant locations, by international communities of scientists and experimental facilities working on fusion power, and by groups of doctors and specialists who want to examine patient scans simultaneously at multiple sites, enriching diagnostics. For example, a modified version of the Access Grid enabled epidemiologists and immunologists to treat patients without exposing others to infection during the SARS epidemic in 2003.

Developers are Argonne Senior Software Developers Ivan R. Judson and Thomas D. Uram, Research Manager Michael E. Papka, Associate Laboratory Director for Computer and Life Sciences Rick L. Stevens and University of Chicago Software Developers Susanne Lefvert and Eric C. Olson.

Passive Millimeter-Wave Spectroscopy

Passive millimeter-wave spectroscopy (PmmWS) provides a new and potentially vital tool for fighting the war on terror. Unlike traditional chemical gas detectors, which operate by transmitting a signal and then processing the reflected response, PmmWS works similarly to an infrared camera, as it emits no signal but merely captures emitted radiation from a gas plume.

Using their spectroscope, the researchers were able to detect nitric oxide releases from the Nevada test site at a concentration of around one part per thousand from a distance of 600 m, with a potential for tenfold increase in sensitivity. No previous attempt at detecting terrestrial chemical gases had surpassed this measure of performance and with less susceptibility to cloud and other atmospheric interference. Nitric oxide is a common byproduct of nuclear fuel reprocessing operations.

Such remote-sensing capabilities will allow watchdog agencies or national security organizations to covertly or overtly monitor the signatures of chemicals emitted from “suspect” processing facilities, and may help to prevent additional nuclear proliferation. The technology also has environmental and biomedical applications.

Developers are Argonne Senior Electrical Engineer Sami Gopalsami, Electrical Engineer Sasan Bakhtiari, Department Manager Paul Raptis, Special Term Appointee Thomas W. Elmer and Senior Technician Ronald N. Lanham.

Ultra-High-Resolution Mammography System

The Ultra-High-Resolution Mammography System (UHRMS) equips doctors with a low-cost, high-quality alternative to digital radiography, which is now the most popular mammographic technology at leading hospitals. UHRMS represents a form of computed radiographic technology, which means that instead of using traditional X-ray film to capture images, doctors can use a glass-ceramic imaging plate, which then can be fed into a computer and digitized.

The Ultra-High Resolution Mammography System offers several notable improvements over common X-ray films and scintillating screens, including reusability, wide dynamic range and direct digitization.

Developers are Argonne scientist Jacqueline Anne Johnson, SUNY-Stony Brook Research Assistant Professor Anthony R. Lubinsky and University of Paderborn (Germany) Scientific Employee Stefan Schweizer.

Source: Argonne National Laboratory