BMDO-FUNDED ALGORITHM ENHANCES ENVIRONMENTAL FORECASTS

Can You Imagine . . .

. . . an algorithm that simplifies data from computers and sensors so the paths of groundwater contaminants can be predicted.

Predicting environmental contamination is important today because groundwater contaminants can leach into the earth's aquifers and then appear in drinking water. At weapons facilities, highly toxic materials for weapons manufacturing and chlorinated hydrocarbons for equipment cleaning pose costly cleanup questions for environmental engineers: Where will contaminants end up next? To what extent is the environment at risk? The answers to such questions can help engineers determine the extent of contamination and the best strategy for effective remediation.

Coleman Research Corporation (Columbia, MD) developed a technology that can predict the paths of groundwater contaminants. The company's technology, Data Fusion Modeling (DFM), helps scientists assess the environmental impact in at-risk sites. Like modern weather-prediction techniques, DFM analyzes vast amounts of computer and sensor inputs, information that normally requires a supercomputer to process. But an algorithm developed for BMDO simplifies the data so that a Unix-based system or high-end personal computer can process them.

CRC'S TECHNOLOGY HAS ALREADY HELPED SCIENTISTS ASSESS THE ENVIRONMENTAL IMPACT IN AT-RISK SITES.

CRC successfully applied its DFM software and services to several hydrogeological projects, such as site characterization and remediation at the Hanford and Savannah River weapons facilities. At the Savannah River weapons site, the software accurately predicted the movement of tritium leaching from a hazardous materials burial ground into the groundwater.

Fossil-fuel power plants can also use aspects of this technology for nonlinear model predictive control (NMPC), a system that predicts the plant's response to control actuators. Simulation results at two of Southern California Edison's El Segundo units demonstrated many of its benefits. For example, the system changed the power output of the simulated plant about six times faster than conventional means, and it produced higher performance and better fuel efficiency. In particular, thermal efficiency improved almost 1 percent, saving the plant roughly $480,000 each year.

■ In addition to its environmental uses, CRC's technology can be used to control plant processes.

In addition to environmental applications, DFM can be used with medical imaging to track electrical activity in the brain. This application of the technology could lead to better treatments for patients with epilepsy. DFM also could apply to spacecraft guidance and control. CRC originally developed the algorithm for a BMDO missile defense system to help computers and sensors track targets and decoys.

ABOUT THE TECHNOLOGY

The CRC algorithm optimizes computer and sensor resources, combining redundant data and reducing the number of calculations that a processing system must handle. Most automated prediction and control systems receive information from many sensors and compare the data from each sensor. This process eliminates faulty data that result from sensor misalignment and random signal variations; however, it produces redundant data that tie up a computer. The CRC algorithm eliminates these redundant data, thus lowering the computational demands on the predictive control system. As a result, a system that previously required supercomputer monitoring can now use a Unix-based workstation or high-end personal computer.