RESOURCES

PROGRESS

Summaries of Research and Inventions from Science and Technology Journals

Getting a Bee in Genetic Algorithms

CREATORS OF GENETIC algorithms—those that, over time, move to an optimal solution by randomly mutating or intermixing the data they operate on—want to reach the best solutions as fast as possible. A Hansung University (Seoul, South Korea) researcher decided this might be better achieved by having the data breed only with the best, and reproduce like bees rather than birds. Just as the queen bee is the only bee in a hive that breeds with the others, the best solution in the pool of solutions is selected to crossbreed with a random set of others. Thus the algorithm aims to retain the best solutions in the "gene pool," and achieve a better answer. This differs from the traditional approach, which selects both parents randomly from the whole pool.

- **Queen-Bee Evolution for Genetic Algorithms**, by S.H. Jung, *IEE Electronic Letters*, 20 March 2003, pp. 575-76.

Predicting a Storm In the Brain

AN INTERDISCIPLINARY TEAM of scientists and engineers from the University of Florida (Gainesville) and Arizona State University (Tempe) have built the first real-time system that can forecast an epileptic seizure from measured brain activity. The new system is built around an algorithm that analyzes changes in the pattern and properties of brain activity during the hours before a seizure, as measured by electrodes surgically implanted in the brain at 28 to 32 sites. The key to the system is that the algorithm can determine, on the fly, which electrodes are measuring relevant signals. In five very ill epilepsy patients, the system predicted 82 percent of the seizures they had over 18 days. It warned of a seizure over 70 minutes on average before it happened, plenty of time for doctors or some future automated therapy to intervene.

- **Adaptive Epileptic Seizure Prediction System** , by L.D. Iasemidis et al., *IEEE Transactions on Biomedical Engineering*, May 2003, pp. 616-27.

The Transistor Vanishes

INVISIBLE OXIDES LIKE INDIUM TIN OXIDE are already used as conductive wires in flat-panel displays. So, with visions of see-through electronics and displays such as speedometers built into car windshields, researchers have been fashioning invisible semiconducting oxides into transistors. Now researchers at Japan Science and Technology Corp. (Kawasaki) and the Tokyo Institute of Technology have fabricated the fastest transparent oxide-based transistor yet. Earlier oxide transistors were made of amorphous films in which charge could not move quickly, making the transistor switch slowly. But the Japanese refined a technique called reactive solid-phase epitaxy to grow thin films of single-crystal semiconductor rather than the amorphous type. Charge moves through the new crystalline transistor many times faster, though the device is much more costly to construct.

- **Thin-Film Transistor Fabricated in Single-Crystalline Transparent Oxide Semiconductor**, by K. Nomura et al., *Science*, May 2003, pp. 1269-72.

New Wave

A PAIR OF RESEARCHERS from Imperial College (London) and the Swiss Federal Institute of Technology (Lausanne) has developed a way to boost the power of the wavelet transform, a mathematical trick for representing and manipulating signals that's making waves in many branches of engineering. They developed an efficient method—called footprints—to store the wavelet coefficients, which in turn store the signal after a wavelet transformation is performed. Footprints are better than ordinary wavelets for signals that consist of sequences of smooth curves, which may or may not be continuous. In particular, the pair found footprints made a big difference when used in algorithms for removing noise and compressing signals.

- **Wavelet Footprints: Theory, Algorithms, and Applications**, by P.L. Dragotti and M. Vetterli, *IEEE Transactions on Signal Processing*, May 2003, pp. 1306-23.

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