The display industry is under much long-term pressure to improve LCD performance and manufacturing, in order to compete with other emerging flat-panel technologies such as LED-based types, says Paul Smith, who does LCD research at the Eidgenössische Technische Hochschule (ETH) in Zurich. Philips' result demonstrates a technology that has great promise of making displays cheaper, he says: "It is very elegant work." **–Alexander Hellemans**

The Brain as User Interface

Scientists hijack a rat's brain to robotize the rodent

ROBOTICS • Neuroscientist John Chapin and his colleagues at Downstate Medical Center (New York City), part of the State University of New York (SUNY) in Brooklyn, N.Y., have used a wireless receiver and electrodes implanted in a rat's brain to steer the rodent anywhere they want it to go.

Their research was inspired by the desire to develop brain-controlled prosthetics, where a critical issue is conversion of sensory signals from the prosthetic device into brain signals.

As a first step, Chapin and his colleagues implanted electrodes in a rat's brain to see how well the rat could understand and respond to electronically simulated perceptions. The resulting electro-organic hybrid, popularly dubbed "roborat," beats regular robots by some measures.

Suppose you want to guide a small robotic system through collapsed buildings to search for survivors. In pure robotics, this is a tough job. But remotely guided rats carrying wireless video cameras fit the bill nicely.

The brain implant developed by Chapin and his colleagues lets them instruct a trained rat to turn right, turn left, or move forward according to keystrokes from a laptop as far as 500 meters away. Electrodes are implanted in three areas of the brain: one in the medial forebrain bundle (MFB), which is associated with feelings of pleasure, and one each in the left and right somatosensory cortex, part of the brain that handles the sense of touch. In particular, they implanted the electrodes in the parts of the cortex that sense the rat's whiskers.

The rats were then trained to turn right when the brain cells representing their right whiskers were stimulated, left when the left ones were, and forward when the MFB, sometimes called the pleasure center, was electrically tickled. The training worked because the rats were rewarded with an additional stimulus to the pleasure center whenever they made a correct move.

Robo-hobo: A rat is instructed via a wireless receiver [white box] and brain implants to walk along a railroad track.

Last fall, the instrumented rats were put through their paces at the Southwest Research Institute (San Antonio, Texas), where the project's funder, the Defense Advanced Research Projects Agency (DARPA, Arlington, Va.), evaluates robots. There, the intrepid animals scrambled over and through crumbled blocks of concrete, in addition to climbing a tree, walking along a railroad track, and doing other things lab rats just don't do.

Also among the first tests was seeing if the rats could be distracted from their tasks by people, loud noises, and goodies like cheese. But with enough stimulation to the pleasure center, the rats stayed on the job. "These guys are having too much fun to eat anything—not even chocolate, and rats are chocoholics," says Chapin.

–Samuel K. Moore

A longer version of this story covering related developments can be found at http://www.spectrum.ieee.org/WEBONLY/resource/aug02/brainimplants.html.

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