Ghostly mirrors

One day we won't need to type instructions into a computer, we'll simply think about it and the machines will respond.

STORY *Michael Dumiak*

GLIMMERS OF IT CAN BE SEEN in the whirring software labs of suburban East Berlin, where a gamer flips between screens using thoughts alone. Glimmers of the ghost in the machine — of a future where man and computer are one.

The surgery undertaken at Reading University, in which Briton Kevin Warwick had advanced microelectrodes grafted into his nervous system, show those glimmers too. And so do the game labs in the rolling hills and sprawling academia of Austin, Texas, where Risto Miikkulainen writes code that improves itself of its own accord.

Algorithms become more powerful, sensors more sensitive, researchers continually more skilled. Machines mirror their users. Ever more effective ways of instructing machines — making them learn over time — promise wonders in medicine and in neuroscience. It also makes machines more precise reflections of their human creators.

One day, you will look to your iPod and your iPod will be you. Hopefully, making your coffee the way you like it.

It's a rainy afternoon in Berlin, and at the Fraunhofer Institute for Computer Architecture and Software Technology, Klaus-Robert Müller steps over the lab dog — Lux really does look like a big rug — into a small room, where two flexible electroencephalogram (EEG) caps sprout tangle-wire stalks. What happens in Müller's lab is that people wear caps and make cursors move across a computer screen with thought-power alone.

It works with computer code that recognises patterns in the brainwave data feed from someone wearing the cap. The trick is, with repetition, to teach the computer to spot consistently the wave which means 'cursor: left' among all the other impulses running simultaneously from cortex to thalamus.

While still in the early stages of its development, this kind of neurotechnology will one day allow quadruplegics to operate computers. The technology is also driving new-generation prosthetics for amputees — U.S. Marine Claudia Mitchell, working with the Rehabilitation Institute of Chicago, recently came to grips with a new arm that she is able to move by mind control. Around the globe, many groups in computing and neurology's best and brightest are taking the first real exciting steps in this field.

But Müller takes a broad view of potential applications. "We're not just looking at rehabilitation," he says. "We're working to see how far we can take this communication." It used to take a single person some 12 numbing days of practice, repeatedly willing a cursor right or left, before pattern recognition would take hold in the computer. It's now down to about 30 minutes — although it doesn't work with everybody, which is a problem: The unsightly EEG cap is another.

One solution is to improve the sensor. The most effective way is 'mainline' — to implant a socket into the user. This raises health risks and ethical problems, as an implant gone wrong in a perfectly healthy person could cause infection or epilepsy. And willing human guinea pigs are tough to find.

Reading University cyberneticist Kevin Warwick got around this by talking surgeons into implanting electrodes in his own arm. It was a wire into his nervous system; he was able to link with his wife when she tapped into a more temporary array. With this equipment, he sent his wife what felt like lightning up her arm — the electricity of Warwick's own movement, patched over a network — and he was also able to control a wheelchair using neural transmissions. He's ready for more.

"Thought communication is within our grasp during my own lifetime," the 52-year-old says. "From a scientific point of view, it's too exciting to sit on my backside."

Warwick is, after all, only one person. There's a long way to go.

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