AI Today and Tomorrow

Although some people think that artificial intelligence (AI) has just faded away, it's actually much more pervasive than you would suspect. Expert systems and robotics are everywhere—vacuuming our living rooms and recognizing faces in secure locations. And the two research paths taken—software/expert systems and hardware/neural networks—have led researchers into woods impenetrable to the average person. So, how close are we to true machine intelligence? One computer architect, Jeff Hawkins, believes, "Now is the turning point."

The year 2005 produced two fascinating books on the subject. Jeff Hawkins's *On Intelligence* received *Wired's* Rave Award for Best Book of the Year, and Ray Kurzweil's *The Singularity Is Near* has impressed and disturbed many. Both men have earned credibility as computing pioneers with their past inventions and designs.

It's difficult to summarize Kurzweil's vision presented in his 600-page speculation, but it goes something like this: In the future, submicro agents called nanobots will be injected into our bloodstreams to monitor and maintain chemical and biological balances. One type of these agents will patrol the brain. These will be able to upload every stored neural pattern and synapse into a supercomputer that will recreate a software version of ourselves—memory, emotions, instincts, and thoughts. Like other software, this program will be portable to other machines/bodies. This uploading/downloading medical regimen will grant a kind of immortality to the very complex expert system that you call, and are aware of, as "your self."

Hawkins's vision is a little closer to home—he's interested in creating machines that work the way we do. Most of his *On Intelligence* is an examination of exactly how the brain works (204 pages of the book's 260 total). He shows how we depend on memory and prediction to produce intelligence. Along with feedback, these two capabilities create a hierarchical structure out of the reality that surrounds us. The process satisfies our desire for patterns, and it takes place mostly in the neocortex—the six-layer covering over the interior "old" brain.

Machines, Hawkins believes, can be created with the same memory capacity—hook up several computers in a parallel series. To this hierarchical memory system add "a set of senses to extract patterns from the world," including the normal light/sound/touch sensitivities as well as additional machine senses such as sonar, radar, and infrared. Connectivity will be a problem in the machine, for although the electrical transference in silicon chips is faster than in neurons, a single cell in a real brain can connect up to 5,000 or 10,000 other cells. "A lot of engineering will be necessary to solve this problem," he explains, "but we know the basics of how it will be solved."

And when will this mind-machine be possible? Hawkins points out, "It took fifty years to go from room-size computers to ones that fit in your pocket. But because we are starting from an advanced technological position, the same transition for intelligent machines should go much faster." Perhaps within 10 years. Should we do this? Hawkins is convinced that thinking machines will be "one of the least dangerous, most beneficial technologies we have ever developed." ■