is resistance futile?

Robotics visionary Hans Moravec seeks to bridge the gap between machines and humans.

BY CHIP WALTER

In the late 1980s, Hans Moravec quietly wrote a book at Carnegie Mellon University that predicted the demise of the human race. Titled *Mind Children*, this was not a dystopian view of the future, one in which we would destroy ourselves with nuclear weapons or by way of rampant, self-inflicted diseases. Instead, he predicted, we would invent ourselves right out of our job as rulers of the earth, and robots would be the technology of choice.

In a subsequent book (*Robot*), Moravec explained that this would all happen one technological generation at a time, and pretty much would end by the middle of the 21st century. It would happen this way: We would boost robots up the evolutionary ladder, making them smarter, more mobile, more like us, until, in time, we would find ourselves no longer the planet's most adept and adaptive species. We would, in effect, forsake the clumsy ladders of DNA and catapult intelligent life beyond our own fragile, carbon-based bodies toward a new creature: assembled digitally, and, in a supreme irony, by our own hands. Moravec did not necessarily see this as a horrific alien invasion, just the natural course of evolution in which the enhanced machines we created would move onto bigger and better things even as they took care of us,

illustration by Tim Lee

just as loving children attend to their parents in their dotage.

Now Moravec, and Scott Friedman, a local physician, have created a company, Seegrid Corp., which may actually begin the process he predicted. Seegrid will be in the business of creating the first generation of "universal robots" Moravec foresaw: stage one in the rise of intelligent machines. At the outset, these will resemble us only marginally, but they will possess, if Moravec is right, the potential to evolve, rapidly, in our direction.

This, technologically speaking, is no small feat. The art of successful robot creation has been frustratingly elusive. Robots have enjoyed terrific fictional careers, but they've had a much harder time in the real world. True, we've managed to build some exotic machines designed to ploddingly explore the surface of Mars, the craters of volcanoes, even the atom-blasted innards of Three Mile Island. And industrial robots have been at work on assembly lines since the 1960s. But true universal robots, ones that can do pretty much whatever you ask them to do, on their own—well, such machines simply don't exist.

But after 30 years of tinkering, experimenting and thinking outrageous thoughts, Moravec has now hacked code never before hacked to create a system for machines that enables them to see nearly as well as we can and, more important, use that information to develop their own private sense of the world. This is finally possible because silicon chips have become so powerful and cheap and vanishingly small that machines can now marshal the computational horsepower needed to perform at least ghostly imitations of humanlike activities. Not that this means you'll be holding philosophical, dinnertime conversations any time soon with the latest robot to come off the assembly line, but the beginnings of all creatures are lowly, and you have to start somewhere.

Seegrid's first robots will never be mistaken for anything like human. They are pragmatic machines—basically small, very smart trucks with no more personality than a forklift. They are designed to move goods around warehouses and loading docks tirelessly and with resolute efficiency. The intelligence needed to manage this doesn't much exceed that of a lizard. But this still makes them elite machines, capable of being trained to operate in an

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unpredictable world without supervision—something machines generally struggle with mightily. But if Seegrid's robots run into an obstacle, they will simply look over the situation (literally), resolve the problem and move on.

Call it sensory robotics, but this ability to process the world's chaos into something useful is what makes Seegrid's robots an attractive business proposition. It also makes them something like alive, and that liveliness is the bedrock of the next three evolutionary stages robots could undergo. If his scenario holds, you can count on a kind of explosion of robotic "species," with breeds of machines trundling and rolling and scuttling on the streets, at work, in your home, common as cats and dogs, handling everything from cleaning up the dishes to delivering UPS shipments. One stage at a time, the proliferating contraptions will grow increasingly mobile and dexterous, progressing from the intelligence of lizards to mice, then monkeys and on to humans, until finally one day, you will, in fact, find yourself having that conversation at dinner with robot X2-R7.

Thinking of all of this boggles my carbon-based brain. The long habit of our inventiveness has, it seems, placed us in a pickle. Pundits will say that we will never innovate our way onto the endangered species list, but I could see it happening. After all, from the very moment we've existed, we've been bringing new technologies into the world. From the stone ax to the silicon chip, it's been a 2 million-year struggle to reduce drudgery. And we've been remarkably proficient, as the wheel, plow and steam engine, cars, computers and indoor plumbing illustrate. Indeed, the difference between the sodden, brutally short lives of medieval serfs and the average middle-class American today owes a good deal to the inventions we've midwifed. So why wouldn't we create robots that, without a complaint, reduce our workload?

Yet the more technology we conjure, the more complex the world becomes and, it seems, the more we need continuing doses of technology to handle it all. Even now, we are writing computer code to manage the complex systems that earlier computer code created in the first place. We are developing systems to allow other systems to unknot the mounting challenges of still-other spiraling systems. When you think about it, this is, in a nutshell, the story of evolution. More complexity makes for a world that requires increasingly sophisticated creatures. The upshot is—and this is always the upshot with evolution—we are creating a world fundamentally different from the one that made us possible in the first place. One, perhaps, in which we will no longer be fit to survive.

If that day comes, then Moravec's robots, or something like them, might not seem so extreme. For my money, the enhanced "creatures" we bring into the world to help support and deal with the rain-forest's worth of technologies we create will be diverse beyond imagination: sometimes mechanical, sometimes pure software, mostly hidden and ubiquitous, shuttling information at light speed all around us in an invisible blizzard of bits. We will, because the complexity of it all will surely outstrip the plodding processing power of our own brains, endow these creatures with impressive intelligence. Inevitably, we will even encourage them to go off to solve the problems we face without much intervention from us. When they do, having developed minds of their own, I could imagine them coming to a few of their own conclusions.

Where this leaves us is worth some serious thought while we're still doing the thinking. Because some evening you may find yourself at the dinner table debating with your robot, vociferously arguing that she is not as smart as you are. But what happens if you lose the argument? ○