

Robots are narrowing the gap with humans

22 April 2009, By Robert S. Boyd

Robots are gaining on us humans. Thanks to exponential increases in computer power -- which is roughly doubling every two years -- robots are getting smarter, more capable, more like flesh-and-blood people.

Matching human skills and intelligence, however, is an enormously difficult -- perhaps impossible -- challenge.

Nevertheless, robots guided by their own computer "brains" now can pick up and peel bananas, land jumbo jets, steer cars through city traffic, search human DNA for cancer genes, play soccer or the violin, find earthquake victims or explore craters on Mars.

At a "Robobusiness" conference in Boston last week, companies demonstrated a [robot](#) firefighter, gardener, receptionist, tour guide and security guard.

You name it, a high-tech wizard somewhere is trying to make a robot do it.

A Japanese housekeeping robot can move chairs, sweep the floor, load a tray of dirty dishes in a dishwasher and put dirty clothes in a washing machine.

Intel, the worldwide computer-chip maker, headquartered in Santa Clara, Calif., has developed a self-controlled mobile robot called Herb, the Home Exploring Robotic Butler. Herb can recognize faces and carry out generalized commands such as "please clean this mess," according to Justin Rattner, Intel's chief technology officer.

In a talk last year titled "Crossing the Chasm Between Humans and Machines: the Next 40 Years," the widely respected Rattner lent some credibility to the often-ridiculed effort to make machines as smart as people.

"The industry has taken much greater strides than

anyone ever imagined 40 years ago," Rattner said. It's conceivable, he added, that "machines could even overtake humans in their ability to reason in the not-so-distant future."

Programming a robot to perform household chores without breaking dishes or bumping into walls is hard enough, but creating a truly intelligent machine still remains far beyond human ability.

[Artificial intelligence](#) researchers have struggled for half a century to imitate the staggering complexity of the brain, even in creatures as lowly as a cockroach or fruit fly. Although computers can process data at lightning speeds, the trillions of ever-changing connections between animal and human brain cells surpass the capacity of even the largest supercomputers.

"One day we will create a human-level artificial intelligence," wrote Rodney Brooks, a robot designer at the Massachusetts Institute of Technology, in Cambridge, Mass. "But how and when we will get there -- and what will happen after we do -- are now the subjects of fierce debate."

"We're in a slow retreat in the face of the steady advance of our mind's children," agreed Paul Saffo, a technology forecaster at Stanford University in Stanford, Calif. "Eventually, we're going to reach the point where everybody's going to say, 'Of course machines are smarter than we are.'"

"The truly interesting question is what happens after if we have truly intelligent robots," Saffo said. "If we're very lucky, they'll treat us as pets. If not, they'll treat us as food."

Some far-out futurists, such as Ray Kurzweil, an inventor and technology evangelist in Wellesley Hills, a Boston suburb, predict that robots will match human intelligence by 2029, only 20 years from now. Other experts think that Kurzweil is wildly over-optimistic.

According to Kurzweil, robots will prove their

cleverness by passing the so-called "Turing test." In the test, devised by British computing pioneer Alan Turing in 1950, a human judge chats casually with a concealed human and a hidden machine. If the judge can't tell which responses come from the human and which from the machine, the machine is said to show human-level intelligence.

"We can expect computers to pass the Turing test, indicating intelligence indistinguishable from that of biological humans, by the end of the 2020s," Kurzweil wrote in his 2005 book, "The Singularity Is Near."

To Kurzweil, the "singularity" is when a machine equals or exceeds human intelligence. It won't come in "one great leap," he said, "but lots of little steps to get us from here to there."

Kurzweil has made a movie, also titled "The Singularity Is Near: A True Story About the Future," that's due in theaters this summer.

Intel's Rattner is more conservative. He said that it would take at least until 2050 to close the mental gap between people and machines. Others say that it will take centuries, if it ever happens.

Some eminent thinkers, such as Steven Pinker, a Harvard cognitive scientist, Gordon Moore, a co-founder of Intel, and Mitch Kapor, a leading computer scientist in San Francisco, doubt that a robot can ever successfully impersonate a human being.

It's "extremely difficult even to imagine what it would mean for a computer to perform a successful impersonation," Kapor said. "While it is possible to imagine a machine obtaining a perfect score on the SAT or winning 'Jeopardy' -- since these rely on retained facts and the ability to recall them -- it seems far less possible that a machine can weave things together in new ways or ... have true imagination in a way that matches everything people can do."

Nevertheless, roboticists are working to make their mechanical creatures seem more human. The Japanese are particularly fascinated with "humanoid" robots, with faces, movements and

voices resembling their human masters. A fetching female robot model from the National Institute of Advanced Industrial Science and Technology lab in Tsukuba, Japan, sashays down a runway, turns and bows when "she" meets a real girl.

"People become emotionally attached" to robots, Saffo said. Two-thirds of the people who own Roombas, the humble floor-sweeping robots, give them names, he said. One-third take their Roombas on vacation.

At a technology conference last October in San Jose, Calif., Cynthia Breazeal, an MIT robot developer, demonstrated her attempts to build robots that mimic human and social skills. She showed off "Leonardo," a rabbit-like creature that reacts appropriately when a person smiles or scowls.

"Robot sidekicks are coming," Breazeal said. "We already can see the first distant cousins of R2-D2," the sociable little robot in the "Star Wars" movies.

Other MIT researchers have developed an autonomous wheelchair that understands and responds to commands to "go to my room" or "take me to the cafeteria."

So far, most robots are used primarily in factories, repeatedly performing single tasks. The Robotics Institute of America estimates that more than 186,000 industrial robots are being used in the United States, second only to Japan. It's estimated that more than a million robots are being used worldwide, with China and India rapidly expanding their investments in robotics.

ON THE WEB

Video of Herb, the Home Exploring Robotic Butler: personalrobotics.intel-research.com/projects/herb.php

Videos of Japanese housekeeping robots: www.physorg.com/news153079697.html

Video of Cynthia Breazeal demonstrating her sociable robots: [singinst.org/media/singularity ...2008/cynthiabreazeal](http://singinst.org/media/singularity...2008/cynthiabreazeal)

Video of Rodney Brooks discussing obstacles to robot intelligence: tinyurl.com/d3vnrs

Video of Ray Kurzweil lecture on machines matching [human](#) intelligence: tinyurl.com/dk4cxc

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