

Service Robots: Rise of the Machines (Again)

U.S. companies chase the fast-growing market for service bots

by Brian Bremner

In 1961, just after America's Sputnik moment, the world's first industrial robot debuted at a General Motors ([GM](#)) assembly plant in Trenton, N.J. A company called Unimation had created the machine, a hulk with a four-ton arm that could work with heated die castings and perform welding. The company's founder, an American engineer named Joseph Engelberger, now considered the father of modern robotics, hoped to revolutionize U.S. manufacturing. Yet by the late 1980s overseas rivals had blown past Unimation, as well as much of the U.S. robotics industry. "The U.S. is nearly out of the industrial robot business," a U.S. Commerce Dept. national security assessment warned in 1991.



Five decades after Unimation's debut, just as President Barack Obama has declared another Sputnik moment to spur U.S. competitiveness, the nation's robotics industry is enjoying a revival. When global robotics executives gather in Chicago from Mar. 21-24 for Automate 2011, their annual industry convention, a healthy delegation of U.S. companies will be strutting their stuff alongside Germans, Japanese, and South Koreans.



True, big multinationals such as Swiss-based ABB ([ABB](#)) and Fanuc of Japan still dominate the global market for industrial, or manufacturing, robots, now worth \$12 billion, according to the Frankfurt-based International Federation of Robotics (IFR). But leadership of the larger and faster-growing market for service robots, a sector IFR pegs at \$13 billion worldwide, is up for grabs. This business encompasses robotic applications for industries such as defense, space, health care, business logistics, and consumer products, among other markets. And U.S. companies clustered in Boston, Pittsburgh, and Silicon Valley are very much in contention.

The service bot market is expected to double in size by 2013, and of the 200 or so top companies, nearly 70 are in the U.S., twice as many as are in Germany or Japan, according to IFR. "We are world leaders in service robots," says Colin Angle, chief executive officer of Bedford (Mass.)-based iRobot, which makes the Roomba and Scooba floor cleaning machines and the PackBot, a robot that can search caves and help with bomb-disposal missions.

Big defense budgets during the 2000s financed the deployment of thousands of robots, including unmanned aerial and underwater vehicles, to Iraq and Afghanistan and helped revive the industry. (The Roomba is derived from iRobot research in mine-detection bots financed by the military.) The Pentagon's fascination with robots hasn't waned.

In 2010, the Defense Advanced Research Projects Agency (Darpa) budgeted \$23 million on three in-house programs heavily focused on robotics, funding projects including the development of a creepy-looking quadrupedal pack robot from Boston Dynamics called the Legged Squad Support System (LS3). On Feb. 23, Darpa awarded the Waltham (Mass.)

company \$1.6 million to begin work on a prototype human-like robot called the Atlas that can walk upright and use its hands for balance to squeeze through narrow passages on surveillance or emergency rescue missions.

The other funded robot design, the cat-like Cheetah, will be able to clock speeds up to 40 mph to check out, say, enemy positions, says Boston Dynamics President Marc Raibert. Robotic cheetahs may seem indulgent in these austere times, but Raibert says the mechanics and software needed to develop the fast cats will pay off militarily and be useful in civilian applications such as emergency response and fire-fighting. "Progress is just dollars away," he says.

Last decade's big increases in computing power and falling prices for laser scanners, motion sensors, software, chips, and other electronic components have made all manner of robots far more intelligent and flexible. That, plus a steady flow of \$1.2 billion in venture capital from 2000 to 2010, according to the National Venture Capital Assn., opened the arena to new players. "Something like a laser scanner five years ago would cost double" what it does today, says Aldo Zini, president and chief executive of Pittsburgh-based Aethon, founded in 2001. Backed by venture funds including Trident Capital and Pacific Venture Group, Aethon now makes a mobile robot called the TUG that automates the movement of medications, equipment, and meals in more than 100 hospitals.

In the operating room, the da Vinci robotic surgical system developed by Intuitive Surgical in Sunnyvale, Calif., allows surgeons to view their patients from a high-def, 3D camera and (ideally) make more precise incisions by manipulating robotic arms. That can mean less invasive surgery and quicker recovery. "In the health care field, you have clearly seen a revolution," says Henrik I. Christensen, the chairman of robotics at Georgia Institute of Technology's College of Computing.

What could mess up the comeback? Christensen and others worry that the European Union, Japan, and South Korea, all of which have sophisticated robotics industries, are spending big on research to undercut the current U.S. advantage in service robots. (To inspire future engineers, South Korea is building a \$607 million robot-theme amusement park slated to open in Incheon in 2014.) "That's a big potential threat in the future," says Mitch Rosenberg, vice-president for marketing at Kiva Systems, which makes mobile robots designed to move goods and fulfill orders at e-tailers.

Government funding matters, but there is one unique advantage that may give U.S. tech companies an edge over foreign rivals, says Thomas Kalil, a deputy director with the White House Office of Science and Technology Policy. "The U.S. companies have a lot of experience creating ecosystems with third-party developers," says Kalil, who points to Apple's success with the iPhone. Kalil thinks free software developed by Microsoft (MSFT) and Willow Garage for robotic applications will accelerate innovation in the field. Willow Garage gives away a robot operating system to researchers and encourages them to develop applications for it. (It also sells a mobile research robot.) That openness, plus U.S. expertise in software and deep capital markets, says Kalil, gives American companies an edge.

The bottom line: U.S. robotic companies have regained their strength, but face tough Asian and European rivals in the service robot market.

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