



IN THE NEWS

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Where's My Personal Robot?

Mark Ingebretsen

Maybe it was a sign of the times. The much-hyped Bruce Willis movie *Surrogates*, about a world in which robots handle virtually all human chores, amassed just over \$30 million after 17 days in theaters, only about a third what the computer-animated feature *Cloudy with a Chance of Meatballs* earned during the period.

As with the movies, the market outlook for real-life personal robots has likewise been lagging. NextGen Research, based in Oyster Bay, New York, predicts 2009 sales of personal robots will reach \$1.28 billion. That translates into 9 million units sold, and NextGen projects sales in the \$5 billion range by 2015. Although this growth rate seems impressive, these estimates represent a considerable negative revision to the \$15 billion in 2015 sales NextGen forecast just two years ago.

Gloomier still, current-year sales estimates might appear even smaller when you consider the diverse range of products encompassed by the personal-robot category. NextGen defines personal robots as devices that possess a degree of intelligence and

use sensors to interface with the environment, allowing them to perform specific tasks. Those tasks might include entertainment, education, or security. Thus, examples of personal robots would include everything from Roomba floor sweepers and their offshoots, made by iRobot of Bedford, Massachusetts, to high-volume hit toys like the mechanical T-Rex Roboraptor from Hong Kong's Wow-Wee Group and Denmark toymaker Lego's popular Mindstorms robot kit. Yet another example of a personal robot would be in the nascent yet much-watched category of elder-care assistants, such as the CareBot being developed by Gecko Systems of Conyers, Georgia.

Roborecession

Much of blame for the personal robot's sales slump rests with the

recession. "The ultimate barrier is the price tag," says Larry Fisher, research director at NextGen, who oversaw the group's study. "Personal robots have to be sufficiently inexpensive that consumers will buy them."

Indeed, hard times have prompted consumers everywhere to shun luxury items. Even in robot-crazed Japan, the sluggish economy forced Sony to close its robotics division in 2006, and the company has ceased production of its cybercanine, Aibo.

Before it was scrapped, some believed Aibo heralded a new generation of intelligent toys that could become real-life family companions. Some 150,000 Aibos had been sold since the robot's debut in 1999, according to the consumer electronics news site, CNET. In Japan's often cramped homes, Aibo, which could understand and respond to human commands, was a viable alternative to an actual dog.

The problem is that even such rudimentary intelligence carries a high price tag; Aibo sold for US\$2,000. NextGen's Fisher explained, "If you use a sophisticated microprocessor to guide robot operations, the robot will be too expensive for most consumers. Also, you have to recoup your software development expenses,

which can add to the end-user pricing as well; if those are too high, they can put the robot out of consumers' reach."

Task Bots and Telepresence

Open source robot software could greatly reduce developer costs, of course. But so far there's no clear winner among the competing operating systems. Lego's Mindstorms is the only platform that has built a sizeable community of developers who come up with new applications. But the modular bot has yet to become more than a hobbyist's toy.

Meanwhile, many manufacturers have focused on single-purpose task robots, such as iRobot's Roomba. Their advantage, NextGen's Fisher observes, is that they're easier and less expensive to make. Indeed, growth in the segment remains impressive, despite the downturn. Last year, roughly 940,000 vacuum-cleaning robots were sold, a nearly 50 percent gain over 2007, according to World Robotics, an international trade group based in Germany. Last year also saw sales of 21,000 lawn-mowing robots, the group says.

According to NextGen, another still-evolving growth area in personal robotics centers on telepresence, the ability to project oneself into a different environment via a semi-autonomous device. The remotely controlled drones used in the military are perhaps the best-known example. As the *Economist* noted recently, drone use by US armed forces has expanded exponentially, from roughly 35,000 flight hours in Iraq and Afghanistan during 2003 to more than 800,000 hours in 2008. The London research firm Visiongain forecasts the global market for drones will grow by 10 percent this year, with the bulk of that coming from the US, where the Department of Defense plans to spend

US\$22 billion through 2013 to build, operate, and refine its drone fleet.

Advances in drone technology will inevitably spill over to the civilian sector. Already the market is seeing a growing number of products such as Rovio, the Wi-Fi controlled roaming Webcam device from WowWee that prowls a house to check for intruders and weather damage.

The Killer App?

Products such as Rovio will no doubt improve and even save lives. But do they represent a killer app that will transform personal robots into must-have products?

Fisher at NextGen isn't so sure. Comparing the evolution of personal robots to the development of personal computers over the decades, he says that business applications for robots will likely precede consumer use. "Business applications such as spreadsheet programs drove businesses to start buying PCs, rather than just typewriters or specialized word processors," he says. "If that paradigm holds, the next big 'consumer' robots may be those adopted by businesses for applications that could include security, maintenance, or even telepresence."

Possible applications can also be found in medicine; in that field robotic devices such as da Vinci systems from Intuitive Surgical of Sunnyvale, California, which can perform a growing number of surgical procedures, have already garnered widespread acceptance. Similarly, some see a vast potential for personal home-care robots as a more desirable, less expensive substitute for nursing homes. One company, Gecko Systems, is currently seeking funds to further develop its CareBot device, intended for the elderly and handicapped. The CareBot can travel from room to room and perform multiple functions such as

retrieving items and dispensing medicine. "For over 12 years, we have worked to invent and assemble all the required hardware and software technologies, determined by our market research, needed for a truly cost-effective and utilitarian home medical monitoring system, a personal companion robot," says Martin Spencer, Gecko's president and CEO. As millions of baby boomers join the ranks of the elderly, Spencers' company has estimated the potential market for home-care robots at US\$83 billion by 2014.

Tough challenges must be overcome before home-care robots become commonplace, however. Marc Liggio, the NextGen study author, has noted that much work remains to perfect the grippers personal robots use to grasp and manipulate objects. Dexterity would be crucial if a robot were charged with dispensing medications. Likewise, understanding a patient's commands could mean the difference between life and death. Accordingly, Honda researchers are developing ways to give their all-purpose experimental robot Asimo the ability to respond to a user's thoughts.

Robots We Love

Still other researchers are investigating ways to make personal robots more lifelike and our own interaction with them more natural—partly to increase their acceptance and usefulness, but also to boost their wow factor. The anthropomorphically styled Zeno, a robot under development by Hanson Robotics in Richardson, Texas, is designed as a playmate, not a tool. "He has everything he needs to become your friend," the company's Web site says. "He sees, hears, talks, and remembers who you are. He even walks and performs amazing stunts. His face is soft like yours so he can show emotions, just like you..."

Similar work is underway in MIT Media Lab's Personal Robotics Group, where the prototype devices resemble the furry intelligent toys popular in Japan. One MIT prototype, Leonardo, can reportedly mimic expressions as accurately as the computer-generated characters children see in games and films.

Indeed, creating likeable robots could help counteract what is perhaps the biggest obstacle to robot sales: consumer desire. While people in most countries have grown enamored of handheld communications devices, attitudes about robots range widely. The Japanese public has a history of infatuation

with robots, and Mitsubishi's Wakamaru receptionist robot has been a hit with companies and the public. But in Europe, robots are largely viewed as industrial tools and are greeted with indifference. Fisher sees US attitudes falling somewhere between those extremes. "In the US, people often consider robots 'cool,' because of what they've seen in movies and on TV," he says, "and some may invest in a robotic vacuum cleaner just to have a robot to show off to friends."

Toys such as Zeno and Leonardo could go a step further, sparking a love affair with a generation of

children who could carry those warm feelings into adulthood. However, what developers really must deliver to capture consumers' imagination is robots that fulfill the promise of the robots we remember from childhood: the gangly armed robot from *Lost in Space*, for example, or Rosie, the perky maid from the *Jetsons*. But like another long-promised but still undelivered technology, the flying car, an all-purpose companion robot could require decades to perfect. As Fisher says, "I don't think we'll be seeing the *Jetsons'* Rosie or any other robotic 'servants' any time soon."

Wherever You Go, There You Are

Mark Ingebreetsen

Location-based services are mobile computing's killer app. Such services identify and filter information based on where you are, and they're all over the map in terms of the tasks they perform. One soon-to-be launched service in London and San Francisco, called WorkSnug (www.worksnug.com), finds the nearest temporary office space for on-the-road workers. In Barcelona, you can locate bicycles the city lends free for temporary use. Similarly, an iPhone app for Zipcar, the by-the-hour rental-car company (www.zipcar.com/iphone), lets customers locate and unlock the closest available vehicle.

All these services typically require is a GPS-enabled smart phone. But a new Los Angeles-area start-up called Geodelic (www.geodelic.com) adds AI functionality to location awareness, streaming content to users based on where they are. What's more, the free-to-download app, Sherpa—available for Android devices and shortly for the iPhone—learns and

adjusts itself to individual users' specific interests based on their feedback.

Say, for example, you're walking through San Francisco and browsing the content streamed to you from Sherpa. If you pause in front of a Blockbuster movie-rental store, you'll get movie reviews streamed to your mobile device and, perhaps, an ad for a rental.

Alternately, suppose you pause at the door of a clothing chain you dislike. Taking a cue from another highly popular self-learning application, the personalized Web-radio platform Pandora, Sherpa lets you give messages about the place a thumbs down, meaning you wouldn't likely see content from that chain again.

Sherpa's algorithms go a step further by balancing your level of interest with your distance from the places that interest you, giving highest priority to content relevant to locations within 100 feet.

Geodelic calls Sherpa's learning process *passive personalization*. Over time, as a user enters more data, the algorithms become more attuned to his or her tastes, knowing the person's favorite bank, for example, and favorite restaurant.

Sherpa joins another disruptive ad medium, the context-sensitive messages from Google and other networks propagated throughout the Web. But the Geodelic team's addition of specific knowledge about the user's location and interests could translate into a higher ad-impression conversion rate than competing media.

It could also heighten privacy concerns. One blogger compared Sherpa to the location-specific ads in the sci-fi movie *Minority Report*. However, Geodelic's unassuming founder, Rahnul Sonnad, has noted that Sherpa doesn't know the identities of actual users. Moreover, to insure the platform would be foremost a

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