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Technology Trend: Service Robots Slowly Rising

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Several recent examples show that the research and commercialization of autonomous, mobile service robots are making progress. The world won't be overrun for a long while yet, but planners and strategists should take note of this emerging trend.

ANALYSIS

In these emerging technology trend updates, we continue to highlight advances that are evolving but not yet widely used. The intended audience includes strategists, advanced-technology or emerging-technology groups, investors, business development managers, government agencies, and other promoters of innovation.

In recent months, we have observed several examples of significant progress in robot research and commercialization. This technology remains niche, and we will not see widespread enterprise application during the next three years. However, recent improvements lead us to believe that robotics will become much more widely applicable in the long term. The essence of Gartner's position is best represented by this prediction: By 2015, more than one million mobile robots will be attached to enterprise networks. For more information, see "Predicts 2006: Emerging Trends Drive New Opportunities."

In this prediction, we are particularly referring to autonomous or remote-control, roving robots, aimed at performing service tasks usually requiring a person, in environments that were not designed for the robot's operation. The commitment in Japan to invest in this class of robots is well-known, and we see continuing progress there, but we note interesting developments elsewhere. The diversity of different exploration approaches will likely be beneficial. For more information, see "The Rise of Service Robots From Japan."

On a recent visit to Tokyo, we noticed how mobile robots are moving beyond technology demonstrations and into limited real-world everyday use. Alsok is primarily involved in commercial security and building management services. Since the mid-1990s, it has been developing security patrol robots, and these are being used to protect larger buildings.

The robot shown in Figure 1 is used to patrol a retail floor space when the shopping mall is closed. During the day, it remains at its recharging station. The robot navigates the floors autonomously and can find its own way back to the recharging station. It is equipped with sensors that let it detect movement. It challenges possible intruders verbally and rather politely begins its commands with "sumimasen" (excuse me). It can relay pictures from an onboard camera to human security guards. Like any new application of technology, to succeed it must provide something different from or better than existing ways of solving the problem. In this case, the moderately imposing social presence of the patrolling robot has a psychological effect and can go to the blind spots that fixed camera networks often have. It is not yet clear whether these attributes will add sufficient value for guard robots to become common in security services.

Figure 1. A Security Patrol Robot

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Source: Gartner (December 2005)

Some may be underwhelmed by this wheeled class of security robot, because of its restricted movement and capabilities, but in the laboratories, more-advanced android designs are progressing. Review the latest demonstration videos , recently released by Honda. In particular, notice how its humanoid bipedal Asimo research robot can run and even slalom. Honda shows the robot demonstrating human-style service roles, such as pushing a trolley and serving coffee at a business meeting.

The multimillion-yen research on humanoid-style robots at Honda, Toyota, Sony and others is fascinating, but progress in bipedal robot development has been far more pronounced during the past two years at Kondo Kagaku . Its KHR-1 kit robot, used by hobbyists and academic experimenters, is capable of impressive feats of balance and movement, such as cartwheels, push-ups and kicking a football. Retailing in the Akihabara electrical district of Tokyo and via specialist Web sites for $1,500, this surprisingly advanced robot is programmed by a PC. After all, the first PCs were in the realm of the hobbyist and kit builder, and the word processor and spreadsheet came later.

This market has recently been expanded by the entry of South Korean manufacturer Hitec, with its Robonova hobbyist device. It would be easy to dismiss such developments as toys, but the technology is advanced and the capabilities impressive. Through such evolutionary pathways, generations of engineers can be introduced to technologies that they then seize, adapt and evolve.

Perhaps the most pragmatic of recent commercial robot developments comes from the United States. The late-2005-released Scooba wet-floor-cleaning robot builds on the commercial success of the Roomba vacuum-cleaning robot, which manufacturer i.Robot introduced in 2002. In its first quarter 2006 financial results, the company stated that it sold 129,000 Roomba and Scooba units, up from 64,000 a year ago. It's this type of mobile robot population growth rate that supports our strategic planning assumption. However, these volume examples are from consumers, which leaves an open question about enterprise use. In line with Gartner's consumerization of IT trend, we should see robots such as these slowly cross over into business use. For more information, see "Businesses Need to Explore Consumer Technology Before the Next Internet Revolution Leaves Them Behind."

Put another way, it seems hard to believe that robots will become functional mass consumer products and not transfer to the workplace. At this stage, it is not yet clear how that transfer will come. We can hypothesize some possibilities, for example, the small and midsize business cleaning services sector might start to deploy consumer-grade robots in hotel and office cleaning. However, we probably should see more exploration of possibilities and proliferation of applications and capability levels in the consumer market before the enterprise transition starts to occur.

Every major technology breakthrough requires brave innovators that try different paths, some of which will turn out to be dead ends. (For historical evidence of this, just go to any museum of early aviation.) Success in consumer robots will come more from functional value, rather than attempts at social intelligence and cuteness. If you have to ask what it does, then it's less likely to succeed, no matter how clever it is. This may seem obvious, but Sony's pursuit of the companion robot as a pet substitute seemed very rational a few years ago. Sony's recent decision to exit this market (despite its technology lead) is an important milestone. For more information, see "Sony Terminates Aibo but Japan Remains Serious About Robots."

Socially interactive robot initiatives are not valueless, but they must aim for a specific function and value proposition. For example, Gecko Systems sold a small quantity of its care-giving robot to a care home for elderly residents. Its autonomous mobile Carebot is designed to follow an elderly person around in a cluttered home environment and provide basic care interactions, such as medication and meal reminders.

Another key driver of technology progress throughout history has been warfare. Military research and development investment has led to space exploration, nuclear power and the Internet, so we should expect it to have some input to the development of robots. Many organizations are researching and developing military robots to support human troops in the field and act as substitutes for them. The successful use of remote-control airborne devices for reconnaissance (such as the Predator from General Atomics Aeronautical Systems) and wheeled devices for bomb disposal (such as the Foster-Miller Talon) is well-documented. Attempts are being made to create robots that are more autonomous, walk on legs for difficult terrain and address fighting roles. The complexities of protracted urban warfare are often cited as reasons for this research emphasis. The Defense Advanced Research Projects Agency has been funding research, such as its autonomous ground vehicle Grand Challenge. Less well-known are developments such as the quadruped BigDog mechanical troop support mule prototype, demonstrated by Boston Dynamics in 2005. As with the Asimo, BigDog's walking capabilities are impressive.

Bottom Line

After decades of overoptimistic predictions, genuine progress in autonomous, mobile service robotics is finally occurring. Moore's law, battery improvements and sensor advances are providing the processing, power and navigation capabilities, respectively, that are needed for viable designs. Costs have fallen to the point that mass consumer markets can be addressed. Strategists should rescind the usual default planning assumption that real robots are permanent futurology. During the next decade, gradual mobile service robot proliferation seems likely.

RECOMMENDED READING

The World Market of Industrial Robots

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