



## Visualizing a Life with Robots

A robot hub is leveraging partnerships to design smart machines that will be able help out in a rapidly changing society.

by Tim Hornyak

**W**hen you step out of the very ordinary elevator in a very ordinary building in the western suburbs of Tokyo, you'll get a very extraordinary greeting: visitors are met by about a dozen service robots, ranging from pint-sized droids with iPhone faces to smart scooters for seniors on the go. Welcome to serBOTinQ, where some unique intelligent machines are being born.

SerBOTinQ, which stands for “service robots (or “serbots” for short) incubation hub”, was launched in March 2016 as part of Tokyo Metropolitan University's Graduate School of System Design. A service robot can be thought of as any intelligent machine that helps humans with burdensome tasks such as housecleaning, but not including manufacturing. According to the International Federation of Robotics, service robots are already big business, with about 6.7 million in use worldwide for personal and domestic purposes in 2016, an increase of 24 percent from 2015. Japan is especially keen on developing service robots because of its technological prowess and shrinking workforce.

This area is home to many small businesses and industrial parks, and is fertile ground for collaborations. “We have been working with SMEs (small and medium-sized enterprises) in the area and with other universities to foster new, innovative businesses,” says Naoyuki Kubota, a professor in the university's Graduate School of System Design and member of serBOTinQ. “We aim to use robot technology to deal with the issues of the declining birthrate and aging society.”



Service robots greet visitors to the lab (opposite), where researchers (above) are collaborating with companies and other universities on robot development.

Professor Keiko Kasamatsu, also of the Graduate School of System Design, points to a prototype smart door as an example. From the outside, it looks like a fairly standard, if slickly designed, front door, with no hint of its concealed sensors for touch, motion and distance or its voice recognition unit. On the inside, it features a large touch-screen panel that can display contents such as daily schedules.

Equipped with a cloud data service, the door can show who's knocking, track those going in and out and help protect residents—not by force, but with calming words. The door could even query residents about where they're going and report potential problems to caregivers. “It could serve as a communication function to help reduce incidents of nighttime wanderings, for example,” says Professor Kubota.

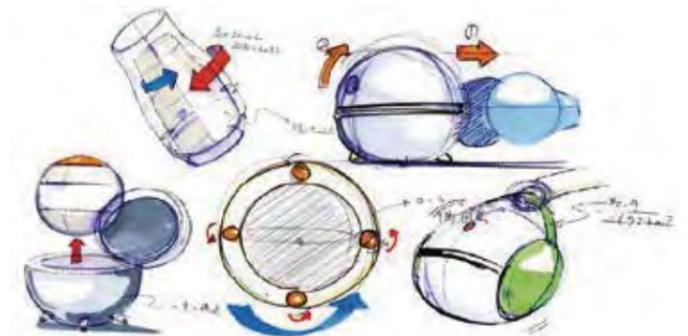
SerBOTinQ is built on the concept of balancing design philosophy, communications design, workshops and agile prototyping, for which it has tools such as laser cutters and 3D printers. As one example of the many early designs in this workshop, Kubota shows off a shoebox-sized sensor array with scanning rangefinders on each corner. When he activates it, a linked laptop screen lights up with a 3D representation of the room and its occupants, each of whom is outlined by a constellation of dots. Its spatial perception could assist the navigation system of a mobile robot or act as a tool to help out at home.

The serBOTinQ hub is all about collaborating—within the university, with companies and anyone who has ideas about making new products; homebuilders, zoos and computer manufacturers have been some of the partners. Working with Taiwan's National University of Tainan, students are developing a humanoid robot system that can instantly translate between Chinese, Japanese and English; they hope to deploy it at the Olympic and Paralympic Games Tokyo 2020.

Meanwhile, in a recent industry-academia seminar initiated by Kasamatsu, 50 students worked alongside 10 staff from an electronics manufacturer to develop new product



Pakuhako (above), a trash bin that automatically opens, and prototype design sketches of some new ideas.



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ideas. One project featured in the event was Pakuhako, a garbage bin with an ultrasonic sensor and an iris-like lid that automatically opens when you hold a piece of trash over it. The fruit of robotics and design students working together, Pakuhako was featured in an online video that was retweeted 46,000 times in just three days.

SerBOTinQ is home to Japanese and foreign researchers and hosts several dozen students, including those from overseas. Foreign students take the same graduate courses as their Japanese peers in addition to language classes. While working on their graduate theses, the students also spend time at partner corporations and develop research projects.

“We are also interested in the concept of robots as life hubs, just as Steve Jobs proposed Macs as digital hubs in 2001,” says Kubota. “People can communicate through robots and share information, enhancing their quality of life.”

As AI grows in sophistication, robots are being developed to better understand the world and perform useful tasks such as delivering hot meals, as well as washing and even folding clothes. We may not have imagined that robotic caregivers will watch over us in our old age, but with serBOTinQ's focus on usability with a human touch, its droids are bringing the stuff of sci-fi fantasy to the real world.