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## Robots gear up for life outside the lab

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SANTA CLARA, Calif. — Phil Mass hasn't launched his second effort at a consumer robot yet, and he is already thinking about a third.

The designer's passion for all things robotic mingled at the RoboNexus conference last week with more sober questions about how robots can step out of the lab and the classroom and into broader commercial markets.

Element Products, Inc. (Broomfield, Colo.), co-founded by Mass last August, plans to launch next year the Scribbler, a \$100 programmable robotic car aimed at students and researchers. As the name suggests, the salad-plate-sized car can wield a pen to make drawings, and it sports light and infrared sensors so it can follow printed lines or navigate blocks based either on a user's BASIC program or programs that come with the device.

"Right out of the box you can do eight different things with it so there's instant gratification. Beyond that you can make it do anything you want," said Mass, demo-ing the Robot in a conference hallway.

The Scribbler faces the same design hurdle that even human-sized robots at the event cannot yet surmount—the high cost of sensors. "Even a simple camera and a CPU powerful enough to run it are expensive enough to push them out of use in the consumer robot area," said Mass, who regularly trolls Home Depot seeking new mass-market technologies he can leverage.

The problem is magnified a thousand-fold for Tadahiro Kawada who hopes to develop within two years a humanoid robot robust enough to literally walk out of the lab and operate in indoor and outdoor workplaces. Unlike its predecessor that walked and talked to the amazement of show-goers here, HRP-3 will be dust and water resistant and capable of moving across irregular and slippery outdoor surfaces.

The five-foot, 127-pound HRP-2 shown at RoboNexus builds in at least eight sensors including a 3D stereo camera, three-axis accelerometer and six-axis gyro, in addition to all-custom electronics tailored for the robot's human-like frame. The HRP-2 can walk at 1.2 mph, lie down on the floor and get up again and even squat to brace itself from an unexpected fall backwards. Kawada Industries Inc. (Tokyo) leases the robot on a five-year contract to researchers for \$700,000.

"That's the best we can do with the cost of everything inside it, and even at that price we are losing money," said Kawada, managing director for the company. He estimates it could be ten years before humanoid robots are can handle real useful work.

The consumer electronics sector could take a lesson from the [iRobot](#) experience, said Neena Buck, a vice president and robotics analyst at Strategy Analytics (Newton, Mass.).

"Except for iRobot, this has been a hobbyist market of Heath Kit makers, but over time there is much more opportunity here," said Buck. "I think the CE companies need to step back and think about ways to make their devices learn about their users instead of the other way around," she said.

For instance, cellphones could be vastly better devices if they became more aware of where they are located, who is using them and the context of that use. "What we are most limited by is our ability to see new possibilities." Buck said.

Consumer companies such as Sony have been pushing the concept of entertainment robots like its trainable Aibo that sells for just under \$2,000. Such products make sense for Japanese apartment dwellers who face a \$2,500 deposit if they







want to buy a real dog or cat, said one observer, but others disagreed.

"That's not where I am putting my oomph, but I have been wrong before," said Brooks of MIT and iRobot.

Over a box lunch on a stairwell at the conference, Mass of Element Products said his next project is still in the brainstorm stage. "We're in the phase where we are trying to figure out what we do," now that that the Scribbler is moving into manufacturing, said Mass who wrote some of the original code for the iRobot Roomba before forming his own company.

"We are interested in all sorts of sensor and robotic technologies, but we'd love to make another consumer robot," he said.

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