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Space-age vacuum cleaner senses dirt, potential disasters

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Whirling under the couch like a growly pet, the Roomba Red makes humble dreams come true.
Though theaveragepersonmaybeawestruck by a robot that plays soccer, or one that patrols like a stiff and silent guard, or clears a landmine thereby saving human lives, it is the so-called domestic applications of robots that make the average heart race with anticipation.
Yes, a robot that can vacuum while you do something else — drink a glass of wine, take a shower, perch in the centre of the kitchen table and watch — is now available at that most unspace-age of locations: Canadian Tire.
Not much bigger than a medium-sized pizza, RoombaRed uses robotic technology to readits environment, sensingdirtand thepotentialdisaster of stairs without so much as a nudge by you.

Of course, the urge to nudge the Roomba Red is nonetheless powerful.

"Don't touch it. It's a ROBOT," I shrieked at my husband when he poked an idle toe at the new labour-saving device that threatened to veer off into a part of the room it had already cleaned.

DevelopedbyanAmericancompany that also makes lightweight robots for search-and-surveillance,hostagerescueandother missions essential to the neighbourhood SWAT team, the Roomba Red has been in the domestic market for more than a year in the U.S. and has sold more than one million units.

The CEO of iRobot, Colin Angle, says the robotic vacuumcleaner uses sensors and"powerfulartificialintelligence software" to figure out the size of a room andhow toavoidgetting stuckbetween the coffee table and the armchair.

"Many people, when they think of a robot, believe it's like (the Star Wars character)CP30,ahumanoid," says Angle."...If you wanted tobuilda vacuumcleaning robot that was anandroid, you could, but it would cost $200,000, and it's a complicated and challenging program. Practical home robots are not going to work like R2D2 or CP30."

What makes Roomba a robot is that it gathers information from its environment andmakes decisions about where to go and what to do. It sells for $250.

The Roomba Red is just one among a growing group of robotic solutions for life's little inconveniences.

Robots that efficiently cut the lawn or help cars to parallel park themselves — one has already been created by Toyota for its Prius at an extra cost of $2200 U.S. — are proving to be a step up on human capabilities.

'Killer application' for robots

These projects and more are just part of the push to come up with the next "killer application" for robots, touse the words of computer science Prof. Hong Zhang, a member of the University of Alberta's Robocup project — a robotic soccer-playing initiative.

A "killer application" would be something comparable to the use of robotics inautomobilemanufacturing, which revolutionized that industry several decades ago.

Zhang says cleaning devices like Roomba Red may well take off, but the real promise for domestic robots is in healthcare, where therearenot enough humans to do the work required.

In Japan, with an aging population that strains health-care resources, extensive researchon robots that can work in hospitals or in the homes of the elderly is going on.

Robots that couldfollow patients with Alzheimer's to make sure they don't get lost,or remindpeople totake their medication, are just two options.

"There is a lot of research into making robots more personal, so people feel more comfortable with them," says ChrisParker,aUofA PhD student on the Robocup research team.

Robocup is an international venture that began in 1999. The goal of the group, made up of scientists in more than two dozen countries, is to create a soccer team of robots that could play human beings — and win — by 2050. The University of Alberta is the only Canadian university to have a team qualify for the competition, and has attended four years running, most recently in Portugal in July.

The U of A's team plays in the "smallsizeleague," made upofcompetitors no bigger thananicecreampail that golidto-lidonafield the sizeof twoping-pong tables. Two digital cameras mounted atop the field transmit images to a computer. An artificial intelligence system sends commands to the robots via wireless radio.

"A lot of time is spent trying to get the ball unjammed," says Zhangof thepace of robo-play.

Another group of scientists in Robocup competes in the "humanoid league" made upofhuman-scale robots, who are very slow, awkward and limited in their playing capacity.

It's only a matter of time, however, before robots exert their physical supremacy over humans, says Zhang. Robots,after all,canbemade tofly or have 360-degree vision.Thebigchallengefor robots, though, is to reason, figure out plays and work as a team.

Japan leads in robot use

Zhang saysRobocupcanbecompared to theefforts to send thefirst man to the moon — the journey is as important as the destination.

"Whether they accomplish the goal is irrelevant," says Zhang. "The technology they develop along the way is more interesting than playing the event."

And robot technology is booming. New applications have led to a 28-percent growth in robotics use in North America, according to a just-released study by the United Nations Economic Commission.

The study says Japan leads in robot use, with 350,000 of the 800,000 industrial units planet-wide found in that country. In 2003, so-called professional robots — used for surveillance, demolition and medical purposes — totalled 21,000 units around the world.

Working with robots, says David Kastelan, a graduate student in the U of A's Autonomous Vehicle Robot Program, makes scientists appreciate how marvellous the human being really is.

"It's reallycomplicated todesignamachine to perform a task a person can do every day without even thinking about it," says Kastelan.

Robots, he says, are still sharply limited by the easy availability of a lightweight power source.

People, on the other hand, carry their own power and can convert a wide range of materials into fuel.

Robotic delivery systems, which have been used tocarrymailin somelargeoffice buildings and even operate an elevator, can be confused by a lot of movement or variable lighting. Most people handle crowds well, although they can be distracted by

conversation.

Robots are expensive. People, at least people who do housework, are not. Which means we're probably not going to see a Roomba Red in the near future that makes supper. But Angle says a robot that folds laundry is not out of the question.His company has 45engineers workingon suchproducts for thehome.

"Each one of these products, done well, is about as complex as an automobile," says Angle. "It's a very sophisticated device ... in the future, people will have a choice of doing housework or pushing a button and doing a very competent job of that task."

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SHAUGHN BUTTS, THE JOURNAL

The Roomba Red vacuum cleaner, developed by an American company that also makes lightweight robots for search-and-surveillance and hostage rescue, sells for about $250. Cat not included.