A robot in every home? (Robot Special part 3)

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Field marshal' for your home-bots. Picture source: Orebro University Sweden

(PhysOrg.com) -- Observers like Bill Gates believe that by 2025 we could have robots in every home. In labs across Europe, researchers are creating designs that could become the robo-butler of the future.

Bill Gates likens the current state of robotics research to the earliest days of personal computing history when he formed the then fledging company Microsoft. Like the 1970s personal computer market, robotics designs and breakthroughs are following one another rapidly, and consumers are beginning to take an interest, too.

In Europe, as the rest of the world, there is s surge in robotics research, reflected in part by the European Network of Robotic Research (EURON), an EU-funded network of excellence that completed its work in May 2008.

It was an important network. The dozens of research programmes united by EURON (see related articles) represent a state-of-the-art in robotics, and a tantalising glimpse of the future.

That glimpse shows that researchers across Europe are creating new designs and tackling fundamental problems that eventually could lead to a world standard for domestic robots. Already enthusiasts are buying kits, making and programming their own robots.

In Japan, every year sees a new toy robot, while in the USA commercial robot vacuums like the Roomba are readily available.

But what will the robot butler of 2025 look like? Bruno Silciliano, a European robotics researcher and dissemination officer for EURON, believes there will be many different types of robots adapted to different purposes.

“In robotics, we have a whole taxonomy of robotics, differentiating field, service and industrial robots, and in the future there will be many designs for each of these domains,” he says.

In the domestic sphere, robot designs will range from the discreet vacuum cleaner that hides under a chair until required, to the fully realised mechanical maid. Current European research reflects this variety.

For example, the TASER created by the ‘informatics’ department of Hamburg University is an unwieldy but powerful creation that is helping researchers to develop robots that can grasp objects, operate light switches or open a door.

“One of the most interesting aspects of the TASER is that it coordinates mobility with two moving arms. With most robots, either the whole

platform moves or their arms move, not both at once. But the TASER robot can move itself and its arms at the same time. This is a non-trivial problem and their work is very interesting," explains Siciliano.

Quirl the windows please

The Quirl is a precursor of the robotic appliance. It looks nothing like a robot that one would imagine. Like the Roomba vacuum robot it is a simple, flat device that moves in a two dimensional world.

But it moves vertically, along glass, and cleans the windows as it goes along. It may not look like C3P0, but it indicates just how useful robots could be in the home or office of the future, particularly given the fact that, for example, solar panels work much more effectively when they are clean.

The Quirl is truly a breakthrough for the designers, the Fraunhofer Institute for Manufacturing Engineering and Automation IPA in Stuttgart. When they began the quest for a window-cleaning robot, their first design weighed 6.5kg and was A3 in size. But the Quirl is the size of a postcard and weighs an incredible 600g. And it still cleans windows effectively.

With Quirls, Roombas and lawn-cutting robots multiplying, there will be a need to organise the mechanical workforce, and the Applied Autonomous Sensor Systems Lab at the Orebro University Sweden is working on an Ecology of Physically Embedded Intelligent Systems (PEIS).

The PEIS ecology coordinates a wide variety of robots, whether it is artificial intelligence in a refrigerator or a roaming butler. That researchers are already working on a 'field marshal' for the mechanical workforce is an indication of how rapidly domestic robotics is

developing in every direction.

James the robot

James is a robot butler that looks like a mechanical version of 'the hand' from the movie and TV series of the Adams Family, but it can negotiate its way around obstacles and can grasp objects. It could lead to the development of assistive robots for the tetraplegic, for example.

Robots that work with and around humans will need to obey Asimov's laws of robotics, and European researchers are working toward that end. The Kuka lightweight robotic arm is the first robot to obey Asimov's first law of robotics: A robot may not injure a human being or, through inaction, allow a human being to come to harm.

The Kuka is safe in several respects. It is incredibly lightweight for its power, it weighs just 13kg, and it can lift its own weight. "Normally a robot arm that can lift 13kg would weigh 100 kilos or more," explains Siciliano. So the Kuka is passively safe, in that it does not have the mass that usually causes injuries.

But the Kuka goes further; it carefully tracks its motion, using sensors in its joints. Finally, if the robot comes into contact with an object or person, its motors immediately start reversing direction, an impressive active safety system.

Systems like these will be absolutely essential if robots are to acquire the safety and reliability needed for widespread acceptance in the domestic sphere. Fortunately, European researchers are turning their attention to every aspect of domestic robotics.

Many of these robots have been funded through a variety of EU programmes. All of them benefited from networking.

This is part three of a special series of features exploring European robotics research, from humanoids friends, to functional home help, to just plain odd-bots.

Part 2: www.physorg.com/news141398086.html
Part 1: www.physorg.com/news141047800.html

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