

# Robots, Robots, Everywhere

Contrary to sci-fi portrayals where robots rule the world, tomorrow's robots will help simplify our daily lives.

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**AIMING TO BRING ROBOTICS** out of the lab and into society, USC has established its first robotics research center, the largest multidisciplinary robotics effort in Southern California.

The Center for Robotics and Embedded Systems, part of USC's School of Engineering, will focus on the technology

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— MAJA MATARIC

and science of robotics, while fostering interdisciplinary collaborations within the university, integrating robotics into local high schools and facilitating partnerships with industrial associates.

CRES members are currently involved in research areas including molecular and nano-robotics, robot teams, humanoid

robotics, human-robot interactions and reconfigurable robotics, among others.

"As robotic technology becomes more and more advanced, this field will have a huge impact on society," said Maja Mataric, CRES founding director and USC associate

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Robots scurry down a corridor under the watchful eyes of a human. "The future looks bright for robotics," said Gaurav Sukhatme, assistant professor of computer science. Sukhatme is one of three associate directors at USC's new robotics center.

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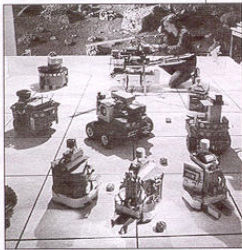
professor of computer science. "Until now, societal pressures and fear of robots in our lives have kept robotics at bay."

**USC CURRENTLY HAS** the second-largest robotics program in the country, right behind Carnegie Mellon University.

"The future looks bright for robotics," said Gaurav Sukhatme, USC assistant professor of computer science and one of three CRES associate directors. "I work in this area because I believe it's a technology that will impact the lives of many in the years to come."

While the fictional, futuristic Jetson family may come to mind when contemplating the notion of living with robots, the concept today is not so far-fetched.

By definition, a "robot" is a machine that senses the physical world, makes decisions and reacts to its surroundings intelligently, said Mataric. Computers embedded in robots make them versatile and capable of many different tasks.



Robots are poised to take over many jobs that humans do now.

Today, a number of machines and gadgets work in collaboration with robotic components, including car parts with embedded "intelligence," washing machines, coffeemakers, microwaves, toys and "smart" houses that autonomously adjust temperature and light levels. Product users often aren't even aware of such a robotic presence.

"The key to fitting robotics into society is gradual change," said Mataric. "Robotic devices are socially acceptable today because they don't stand out.

"People have this strange fear and misconception of robotics based on movie and sci-fi book portrayals," she added. "They see robots as beasts that will attack us, or as hyper-intelligent creatures that will replace us. All of these fears are natural, yet unfounded. The robots of today, and those being developed, are very simple, very practical and very controlled, relative to those of the imagination."

"Robots in homes are where computers were in 1978 and '79," said Rodney Brooks, director of the Artificial Intelligence Laboratory at the Massachusetts Institute of Technology who was the speaker at the CRES inauguration.

Citing recent advances in robotics and medical research, Brooks pointed out that humans are becoming more robotic while robots are becoming more human.

"It is going to become more difficult to make a distinction," he said.

Today, for instance, humans can live with artificial hearts and hips equip-

ped with robotic components, while robots can imitate human sounds and facial expressions and recognize the presence of people.

Furthermore, technological advances have led to robust robots capable of withstanding harsh environments. The military uses reconnaissance robots to scout out

within this century.

"It's difficult to make predictions on a small-time scale like the next 10 years because the field is so fast-changing," she said. "But I definitely see large changes taking place in the next 50 to 100 years."

Innovative robotics research and development could provide us with the means to care for more disabled persons, remotely check in on elderly parents or children home alone or even replace underpaid and overworked factory workers, suggested

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potentially dangerous areas and buildings; archaeologists send robots into Egyptian pyramids to explore areas unseen for the last 2,000 years; robots were deployed during the 9/11 search and rescue efforts; and robots can even assist doctors in complex surgeries.

**A MAJOR CHALLENGE** for researchers in robotics, however, remains the uncertainty of the real world.

"Robots can sense the physical world, but perception is very difficult," said Mataric. "Knowing things like where I am, who that is and what is that object is extremely tricky and largely unsolved."

So the efforts continue.

Mataric said it's difficult to predict the future of robotics, but believes there will be a major convergence of humans and robotics

Mataric.

"Besides the irrational fear, there is also the more rational fear of the economic impact that robotics technology could have, in terms of replacing human labor. If this were to have the proportions that the industrial revolution had, then of course it would be a huge impact that's worthy of careful consideration."

"Often some of the most important applications of technology come about in ways you would have never expected," said Aristides Requiza, USC professor of computer science and CRES associate director. "The work we're doing now could go totally beyond our expectations in the future." ■

For more info on USC's new robotics center, go to <http://robotics.usc.edu/~cres>