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[**inside**view]



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DISCERNING ROBOTS ARE THE PICK OF THE CROP

Robots from the Queensland University of Technology (QUT) are set to help retailers, farmers, and other industry players save time and money. One of the university's leading roboticists, **PETER CORKE**, explains how



Peter Corke is a professor of robotic vision at Queensland University of Technology and director of the Australian Centre for Robotic Vision. Prior to joining QUT, he was a senior principal scientist and a founder of the Autonomous Systems Laboratory at the CSIRO ICT Centre. He has authored hundreds of publications on robotics and has held visiting positions at the University of Pennsylvania, the University of Illinois at Urbana-Champaign, the Carnegie-Mellon University Robotics Institute and Oxford University. QUT has given him the title distinguished professor. And in 2017, he was named the Australian University Teacher of the Year by the Australian government.

How did you become interested in robotics?

When I was a kid, my parents gave me a *How and Why Wonder Book* about robots. In the 1960s, there was a lot of enthusiasm about technology and what it could do, and this was quite a good book. I still have it! My first job was in a university control systems lab, and for the open day one year I bought a little robot, connected it to a computer and got it to play draughts. Later, I saw a newspaper ad for a roboticist at Australia's national research organization, CSIRO. I applied and got the job and stayed there for 25 years.

Last year, your Australian Centre for Robotic Vision (ACRV) team won the top prize at the Amazon Robotics Challenge for your Cartman robot, which can identify and pick up specific products from a bin of merchandise. How did you do it?

To win the competition, you have to bring together a smart mechanism, a robot and a good perception of the world. At ACRV, we are striving to imbue robots with a sense of perception approaching that of humans. The robot has to know how to recognize a toilet brush, a coffee cup, or something like that. A child can do that, but it's

really at the cutting edge of computer vision to be able to reliably recognize objects in a confusing environment where they're all mixed up. We were hitting a brick wall in the past, but deep learning has revolutionized the perception side of robotics. Robots are now getting pretty good at perceiving what's going on in the world.

Have you continued to develop Cartman?

We lashed a lot of research results together to make Cartman work. But then we got thinking about how robots pick things up, and that sparked a new research theme in our centre. We're now looking much more at grasping. "Robots that see and pick things up" would be a good slogan for our centre's T-shirts, because in some ways it's a baseline definition of intelligence. This combination of skills is vital for robots that interact with people.

How can robot solutions help other industries?

Let's talk about agriculture for a moment. One is a robot for weeding in what we call broadacre agricultural systems, large-scale cropping, like wheat, oats or sorghum. You plant the crop, control the weeds as

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it's growing and then harvest it. Weeds are currently mainly controlled by spraying chemicals, which is inefficient — a large proportion of the herbicide gets blown away, which is both wasteful and damaging to the environment. Also, several weed species have developed resistance to these chemicals.

We have built a robot that straddles a number of crop rows. As it goes along with cameras facing down, it can classify plants as either crop or weed. For weeds, it can give a targeted application of herbicide or, if the weed is a resistant species, it can mechanically dig the weed out of the ground.

QUT is hosting the International Conference on Robotics and Automation (ICRA) this May in Brisbane. What's your role?

ICRA has been going since 1984, and it gets bigger every year. A colleague and I lobbied for it to come to Brisbane. It's never come to the southern hemisphere, so

we're chuffed about getting it. Australia has a pretty good record in robotics, with strong groups at QUT, CSIRO, and the University of Sydney. The country has a good reputation for robotics in interesting application areas that other people don't think about, like agriculture and mining. I'm the programme chair for the conference, and we're going to present a record number of papers.

Where do you see robotics going and what do you want to focus on?

Our team wants to capitalize on our success over the last four years by continuing to do high-level science and by creating robots that do manifestly useful things. I think we can now create machines that are useful enough to do things in homes, offices and so on. Not perfect, but useful. Robotic vision will progress enormously in the next five to ten years, and the sensor of choice for robots will be cameras.



My best friend is a robot.

Marine life on Australia's Great Barrier Reef is under threat from the devastating effects of climate change and other localised threats. But a robot is coming to the rescue.

Researchers at QUT's Institute for Future Environments have joined forces with the Great Barrier Reef Foundation, with funding from Google, to develop RangerBot, an autonomous underwater vehicle that will enable reef monitoring and pest control on a scale not possible until now.

With its innovative on-board vision system, RangerBot will provide reef managers, researchers and community groups with the real-time data capabilities they need to monitor crown-of-thorns starfish outbreaks, water quality and coral bleaching and help manage these threats.

RangerBot – an autonomous, affordable reef protector.

Find out more at qut.edu.au/research

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