

Announcer: Welcome to Tram Talks, a little taste of Deakin University here in the world's first mobile lecture theatre. You've chosen to listen to podcast number 9, 'Robotics in Australia'. Dr. James Mullins from the Centre for Intelligent Systems Research discusses where Australian robotics has been and what the future holds.

Dr. Mullins: I've been told that I wanted to build robots from when I was about seven years old, which is strange because I grew up in the country and had never really seen a robot. I guess I was already mechanically minded. Fifteen years later, I graduated as the first class of robotics engineering from Deakin University with a robotics engineering degree. I now work for the Centre for Intelligent Systems Research. We're a team of 70 people working on real-world problems, so 70 people passionate about developing technologies, ranging from software engineers, programmers, electronic and electrical engineers, mechanical engineers, machinists, people that can take an idea and really build upon it to develop something that looks really cool at the end.

CISR works in two main areas: modelling and simulation, which looks at complex manufacturing optimisation problems and saving industry lots and lots of money, and my area, which is robotics and haptics. Some of the robots we're building these days are really, really advanced and really cool. When people think of robots, they generally think of those big, orange machines in factories that build cars or possibly the cat that cruises around on top of the robot vacuum cleaner in the YouTube videos. The robots I work on are a little different. Our team builds robots for police and military, for bomb disposal and hostage negotiation, and working with these people is really, really interesting because we're learning a lot about their field and their way of life and the problems they experience. And we get to work on some cutting-edge technologies and, I believe, build things that really make a difference.

We often hear that Australians are innovators and I certainly believe this is true. I've travelled the world with Deakin and, from what I see, our mindset is a little bit different. We approach problems differently, and it's really interesting to see that, traveling around other countries around the world, the fact that they seem to pigeonhole their ideas, whereas we're more broad and diverse and we can come up with solutions a little bit differently.

Back in the 1980s, which was when I was a young kid, Australia built all of their own robots for police and military, so these are the robots that go in and pull apart bombs and things like that, and they were really, really well-built robots. In 2000, when those robots were getting a little bit long in the tooth, we made the decision to import our robots from Europe and the U.S., and those robots weren't built for Australian conditions, so they experienced quite a few

problems. In around 2004, we were approached by police to look at building robots that meet Australian conditions, and as a result, we developed our OzBot series of bomb disposal robots.

These robots are pretty small but very, very powerful. I always wanted to build a robot that could tow a car, and these robots can certainly do that, and they can drive you around, as well, so I can stand on this robot and surf the OzBot, and certainly politicians like to come down and surf the OzBot from time to time. They carry things like gas detectors, X-rays, robot arms and they can drive downrange, pull things apart and make a real difference compared to putting someone in a suit and sending them down to have a look at it.

I mentioned haptics before, which is the other focus on our centre. Most people hadn't heard the term, and I certainly hadn't when we started working this space, and haptics is all to do with touch and forced feedback. So our robots have integrated this haptic technology, so imagine being able to put your hand inside a glove, send a robot downrange, and whatever you do with your hand, the robot arm does. And whatever the robot arm feels, you can feel. So being able to pick up an egg, feel how hard you're squeezing it. The analogy I use is being able to pick up a can of Coke at a kilometre. If we send a robot downrange, we can grab this can of Coke, we can feel how hard we're squeezing it, we can pick it up and feel how heavy it is. So if we squeeze it too hard, we can feel the aluminium crinkle, if we pick it up and move it from side to side, we feel the liquid sloshing around. That's the real benefit of haptics.

This technology is world-leading and it's a sense of pride to say that we're developing this technology in Australia. So a soldier with minimal training can pick up an egg or brush sand off a land mine. We combine this haptic technology with a 3D headset similar to an Oculus Rift that's being released soon. And it enables a soldier to be immersed in that environment, so they can feel as if they're in front of a bomb, pulling it apart with their bare hands, even though they're a safe distance away inside a military vehicle.

We've developed haptic technology to enable trainee surgeons to be able to cut into soft tissue and feel what it feels like. Haptic technology can be used to train optometrists how to cut into the surface of the eye without risk of damage to the patient. We can train nurses and doctors how to perform epidural lumbar puncture injections, and this is what haptics can do. It's a real game changer, we believe.

We continue to develop bigger and better robots to support our emergency services and have diversified into firefighting as well. I'm a firefighter myself and I guess sending robots into burning buildings to do a search and rescue is a

little bit easier than going in ourselves, because robots can be shielded for heat and obviously don't breathe air, so they can be in operating for a lot longer period of time. These robots can go in, grab people, pull them out but they can also go in and drag a hose line in as well, and that's some of the technology that we're working on in this space.

So where does the future lie for robotics in Australia? Well, I believe we're going to see some pretty interesting things happen over the next decade. As we introduce our broadband infrastructure in Australia, we're going to see a lot more telerobotics and robots operating remotely. So imagine being able to perform remote diagnosis of tumours or remote physiotherapy for the elderly, perhaps, using robots. In a nursing home, perhaps, you might have a doctor attend and talk to the patients remotely.

Manufacturing in Australia is certainly not dead. We're going to see an increase in mass customisation, and this is where we're providing products that are tailor-made for the end user, rather than mass-producing millions of one product. We're going to see these products customised for specifically what people want.

We're a clever country, we have clever people. We need to remember this and back ourselves to create the next generation of products that the world needs.

Announcer: Thanks to Dr. James Mullins. This has been another Tram Talk from the world's first mobile lecture theatre. Just a small sample of what's available at Deakin University. Visit study.deakin.edu.au to learn more.