

## Sensible solutions

Remote-controlled snake-shaped robots could be improved by sensors on their skin

UK ROBOTICS SPECIALIST OC Robotics is working with Airbus as part of a consortium to develop artificial skin for the UK firm's 'snake-arm' robots. The research into a sensor-packed skin for the robots will make these innovative devices even more sensitive and able to provide far more information about the environment in which they work.

As well as its ongoing partnership with Airbus, OC Robotics is also working with bomb disposal specialists Remotec and with Swisstell, a technical textiles company.

OC Robotics designs and manufactures snake-arm robots that can operate in a variety of difficult environments, ranging from inside jet engines and collapsed buildings right through to space telescopes, avalanches, and even inside the human body. The snake-shaped robots are operated by remote control with software used to make sure the rest of the articulated body follows the robot's 'head'.

'So far all of our snakes have been relatively dumb, they don't know that much about their environment,' said OC Robotics' founder and managing director Rob Buckingham. 'When you look at a human's ability to search for space you often have to use touch or other senses rather than just vision to work out what's going on around you.'

### Research funding

OC Robotics has received an Industrial Case Award with the University of Bath from the EPSRC, as well as almost £1m in DTI funding for its snake-skin research. The Industrial Case Award will fund a PhD at the university into developing the skin and was obtained with the help of the Electronics Enabled Products Knowledge Transfer Network (KTN). The research aims to create an artificial skin that can be attached to one of the snakes and is lightweight and flexible and yet robust enough to protect the robot from any harsh environment, such as in the heart of a nuclear reactor. Such a skin could also help protect the environment from the snake, particularly in surgical applications where grease from the snake's mechanism could cause dangerous contamination.

According to Buckingham, although it is relatively simple to create a robust skin, it is much harder to create one that is also extremely sensitive and does not affect the way the robot works. At the moment the research is focused on developing sensors that could be integrated — including temperature, pressure and chemical sensors — but that do not make the skin so prohibitively expensive that no one will buy it.

'The skin will cover the whole of the snake, so that would mean on a 2m snake there would be about half a square metre of sensing area packed with many hundreds of thousands of sensors,' said Buckingham.

In a parallel research project, OC Robotics is working with Airbus with the aim of automating much of the manufacturing as well as the maintenance, repair and overhaul (MRO) of its aeroplanes' wings.

### Health implications

Current assembly methods mean that engineers are still required to climb inside parts of the wing during final assembly to install components and to do routine checks, much of which is time-consuming and has health and safety implications. It is hoped that the snake-arm robots could help automate much of this process.

Prototype snake-arms specifically designed for this purpose will be demonstrated at the end of the year. However, Airbus is also extremely interested in the idea of the intelligent skin, said Buckingham.

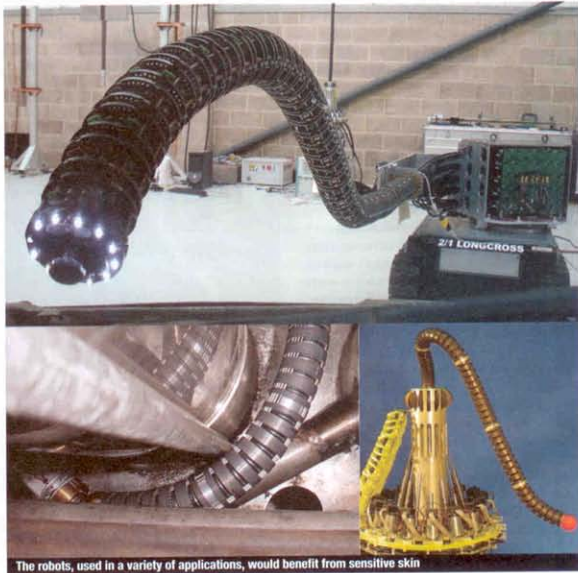
An intelligent skin for the robots could also be useful in bomb disposal applications and OC Robotics has been working closely with Remotec — a defence contractor for the MoD — in using a snake-arm robot alongside the firm's more conventional Wheelbarrow bomb disposal devices.

'The issue when you are looking to deal with bombs — when you are remote from a situation — is that you want as much information as possible from the device. If you can have sensors on a snake-arm robot you could learn a lot about the environment around you,' said Buckingham.

He added that there are two fundamental challenges to developing the skin. 'It is about finding the right basic physics; what will respond the best,' he said. 'We also want to collect a lot of data, so we need to work on large-scale signal processing and analysis without it becoming hugely expensive.'

A working prototype of an artificial snake skin is likely to be ready in approximately two years' time.

Niall Firth



The robots, used in a variety of applications, would benefit from sensitive skin