

## Mechanical serpent to fix aeroplanes?

A robot 'snake' developed by a Bristol engineering company could save the aerospace industry millions of pounds.

OC robotics claims that its 'snake robot' could be used for servicing jet engines while they're still hot. It says that the robot could be guided through the fan blades to the centre of the engine to carry out inspection and maintenance. The alternative is to demount the engine, which results in an average downtime cost of about £1m.

At first glance, the 'snake robot' looks like an endoscope. The crucial difference is that the operator has control over the whole of the device and not just the head.

The arm consists of a number of independent segments that can be controlled in a coordinated way. With the aid of a joystick and a tip-mounted camera, a user can guide the snake in such a way that the body follows the head's exact path.

While tip vision is the standard tool, the company is investigating a host of other devices that could be fitted to the snake: these include water jet cutting, laser welding and ultrasonic devices.

Dr Rob Buckingham, MD of OC robotics, and inventor of the snake robot, is evasive about the specifics of the design, but spoke to DE about the robot's impressive capabilities.

Although the number of segments can be varied according to the application, OC's current machine has 5 segments and 10 degrees of freedom. 'Each segment comprises a number of links and the design of a link defines the overall range of motion of a segment', says Buckingham. 'For instance,' he adds, 'with 10 links each having a bend angle of 15° you get 150° per segment.'

Control of the robot presented particular problems 'We are concentrating on spatial devices - controlling position and orientation in 3D' says Buckingham. 'Building an arm is only part of the challenge. The software required to control these mechanisms is quite different

from the code implemented in a standard 6 joint industrial arm. The challenge is to move from task co-ordinate space (typically cartesian space) through joint space and then finally into actuator space. Going the other way is relatively straightforward.'

The proprietary drive unit consists of the actuator systems that make the arm move and a computer that calculates how to make it follow the desired path.

Whilst discussion with Bae systems and Rolls Royce indicate that the company is most excited about



the aerospace industry, the robot's application is by no means limited to this area. Another suggested application is for defusing unexploded bombs, and the device would have obvious uses in the medical world.

As for the future, Buckingham talks of the importance of small, innovative companies maintaining momentum. 'Our hope and expectation' he says, 'is that this technology will be adopted by the UK and Europe, rather than going across the pond, hence our discussions with local aerospace companies - being Bristol based has many advantages.'

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