

Scanning the field for ideas
 Edited by Stephen Mraz

Snake-arm robot slithers past obstacles

A common challenge for most robotic technologies is access: being able to get in and out of tight spaces quickly, easily, and repeatedly. With that in mind, **Ocrobotics**, in the U.K. (www.ocrobotics.com), developed snake-arm robots. They are constructed out of several flexible and hollow segments joined together into an arm and mounted on a drive unit. The arm can carry a tool or deliver fuel, air, or high-pressure water for cutting. Each segment connects to the drive unit by three guide wires. Actuators control the wires' length, thereby determining the segment's shape. Operators use a joystick and tip-mounted camera to maneuver the tip of the arm along almost any path to where it is needed. The computer calculates how much each segments' guide wires should be pushed and pulled to get the tip to follow operator commands. The computer stores the 3D route in memory, so operators can easily make the snake arm and tip reverse along the same convoluted path.

Robotic arms can be self-supporting or rely on their surroundings for support. The company has built self-supporting arms that carry 110-lb payloads, and is working on one that carries 1,100 lb. They've also built a 20-segment version with 40 degrees of freedom. The arm, the least-expensive component in the robot, connects to the drive unit by a quick-release mechanism. This lets companies use several arms, each designed for specific tasks, with one driver. The developer envisions the arm finding applications in aerospace, surgery, nuclear power plants, and defense.

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Ocrobotics built a five-segment snake arm as a technology demonstrator.

Length (m)	Diameter (mm)	Payload	Total curvature
0.5	6	10 g	180°
2	70	2 kg	450°
3.5	120	50 kg	270°
10	120	2 kg	720°

MACHINE DESIGN 58 • JUNE 19, 2003 www.machinedesign.com

Machine Design
 19th June 2003