In the Spotlight

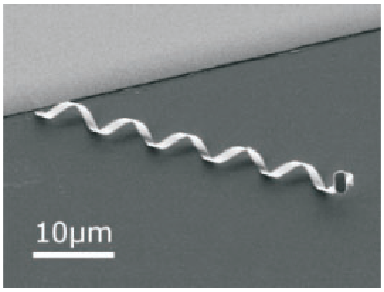
Sensor-based robot control in real-time with industrial robots from Mitsubichi Electric

Sensor-based control enables direct interactive control of robot movements in applications. Mitsubishi Electric offers a standard real-time control interface for all the company's SCARA and articulated-arm robots. The new CRD series of robot controllers come with a real-time PC communications interface as standard equipment. The position data is calculated by the PC on the basis of the sensor signals and then transmitted to the robot controller at high speeds, typically in the space of 1-10 milliseconds. The robot controller analyses the output from the sensors, which can include ultrasonic, infrared and laser proximity sensors, cameras and force/torque sensors, and then plans the robot movements accordingly.

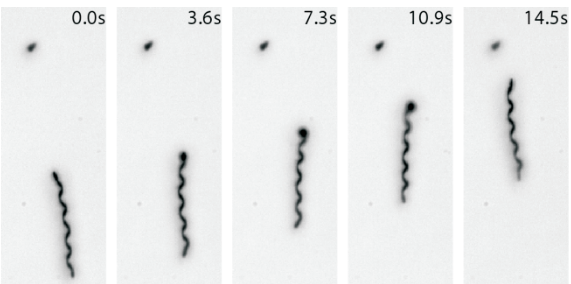
This real-time control capability is available in all Mitsubishi Electric SCARA and articulated-arm robots with payload ratings of 6-18 kg and 3-12 kg and reaches of up to 850 mm and 1,385 mm, respectively. Sensor-based real-time control also enables robots to follow complex contours of workpieces in processes like welding, adhesive applications, deburring, drilling and milling. Manual teaching of position data and move-ment paths is also easy with this type of robot control system.

Based on information from http://www.mitsubishi-automation.co.uk/

Untethered Helical Swimming Microrobot



Inspired by the flagellar motion of bacteria such as *Escherichia Coli*, a research group led by Bradley Nelsonfrom from ETH Zurich developed artificial bacterial flagella (ABF). According to its creators, ABF represent the first demon-stration of wireless swimming microrobots similar in size and geometry to natural bacterial flagella, and are many orders of magnitude smaller than existing artificial helical swimmers.The micro-robot consists of two parts: a helical tail and a soft-magnetic metal head. The tails are 27 to 42 μm thick, less than 2 μm wide, and coil into diameters smaller than three microns. The fabrication of ABF is based on a self-scrolling technique from which the spiral-shaped ABFs are constructed. ABFs are fabricated by vapor-depositing several ultra-thin layers of the elements indium, gallium, arsenic and chromium onto a sub-strate in a particular sequence. They are then patterned from it by means of lithography and etching.



This forms super-thin, very long narrow ribbons that curl themselves into a spiral shape as soon as they are detached from the substrate, because of the unequal molecular lattice structures of the various layers. Depending on the deposited layer thickness and composition, a spiral is formed with different sizes which can be precisely defined by the researchers. BAF are propelled and steered precisely in water by a low-strength (1-2 mT), rotating magnetic field. By adjusting the rotating speed and direction of the magnetic field, the velocity and direction of motion of the helical swimmer can be tuned in a controlled fashion. The average velocity is approximately 5μm/s at 470 rpm. By inverting the rotating magnetic field, the swimmer turns in the opposite direction, and the linear motion is reversed.The ABFs are intended to help cure diseases in the future. They could carry medicines to predetermined targets in the body, remove plaque deposits in the arteries or help biologists to modify cellular structures that are too small for direct manipulation by researchers. The plan is for the ABFs themselves to become even faster and smaller.

Based on information from http://www.iris.ethz.ch/msrl/research/micro/helical_swimmers/

Real-time control of wheelchairs with brain waves

The BSI-Toyota Collaboration Center (BTCC) has developed an advanced wheelchair control system. which utilizes one of the fastest technologies in the world, controlling a wheelchair using brain waves in as little as 125 milliseconds (one millisecond, or ms, is equal to 1/1000 seconds). BTCC was established in 2007 by RIKEN, an independent administrative institution as a collaborative project with Toyota Motor Corporation, Toyota Central R&D Labs and Genesis Research Institute.

BTCC's new system fuses RIKEN's blind signal separation and space-time-frequency filtering technology to allow brain-wave analysis in as little as 125 ms, as compared to several seconds required by conventional methods. Brain-wave analysis data are displayed on a screen in real time, giving neuro-feedback to the driver for efficient operation. The system has the capacity to adjust itself to the characteristics of each individual driver, and thereby is able to improve the efficiency with which it senses the driver's commands. Thus the driver is able to get the system to learn his/her commands (forward/right/left) quickly and efficiently. The new system has succeeded in having drivers correctly give commands to their wheelchairs. An accuracy rate of 95% was achieved, one of the highest in the world. New technology is expected to be useful in the field of rehabilitation, and for physical and psychological support of wheelchair drivers.

More information at http://www.toyota.co.jp
Video presentation available at http://www.riken.jp/r-world/info/release/press/2009/090629/press_090629.asx