



.Tuesday, May 02, 2006

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### Turn turtle

A robotic turtle could help engineers build better autonomous underwater vehicles and answer fundamental questions about how prehistoric beasts swam. The robot, called Madeleine, is already helping researchers understand when it is best to swim with four flippers and when to use two.

Madeleine is measuring 80 centimetres by 30 cm and weighing 24 kilograms. The robot also has a comparable power output, between five and 10 watts per kilogram, depending on how hard it is working.

The robot's polyurethane flippers have the same stiffness as a real turtle's, but are operated by electric motors connected to an onboard computer. These motors rotate each flipper so that its back lifts up, before rapidly sweeping it down again to generate propulsion. The robot is controlled remotely but has several sensors including video cameras, sonar and altimeter and accelerometer. By imitating the design of a turtle, the researchers hope to build more efficient ocean robots, with flippers. "The thinking is that if nature did it, it must be good," explains John Long, one of Madeleine's makers from Vassar College, in New York.

But Madeleine could also help scientists understand why animals use their flippers in different ways. Sea turtles, sea lions and penguins, for example, all rely on one pair of flippers to propel themselves through the water, and use the other pair to steer. But the plesiosaurs and giant turtles that dominated Mesozoic seas - between 251 and 65 million years ago - apparently used all four flippers for power instead. "Evolution has come up with different ways to use flippers, and we don't really know why," Long says. "It would be nice to know, and it could also tell us when a flippered robot should use four or two flippers to propel themselves."

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