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Two-Legged Robot is Fastest Yet

By Tracy Staedter, Discovery News

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May 2, 2006— Using a program that mimics the way human neurons control reflexes, a robot has achieved the fastest gait yet of a two-legged machine.

The biologically inspired computer models not only give the so-called RunBot a stable gait, but also reinforce its learning to achieve faster speeds.

Developed by Tao Geng at the University of Stirling in Scotland, the 9-inch (23-centimeter) tall machine can't run yet, but it is able to speed up from a slow lumber to a fast clip in less than three minutes and achieve a gait comparable to the fastest relative speed of a person walking.

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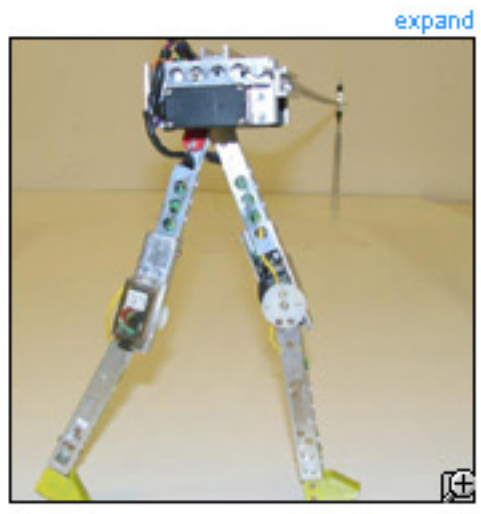

RunBot in Action

Unlike most other bipedal robots, RunBot doesn't provide a computer with intensive feedback on its stability and motion.

Instead, RunBot has just a handful of sensors in its feet and hips, as well as software-driven motor neurons, which initiate reflexes according to information gathered by the sensors.

It does not have movement in its ankles, but the bottoms of its feet are curved, with only one point touching the ground.

As soon as a foot touches the ground, a neuron initiates a reflex in the hips and the knee joint of the opposite leg, bending it and swinging it forward.

A sensor in the hip measures the angle of the forward-swinging leg and causes it to straighten out in time to hit the ground.

"You coordinate these reflexes so they produce oscillations. the one leg touches the ground, the robot falls forward onto the other leg. It's like clockwork," said Florentin WÃ¶rgötter of the University of Göttingen, Germany.

WÃ¶rgötter, along with professor Bernd Porr of the University of Glasgow, contribute to the research and serve as Geng's advisors.

Software that mimics neuronal control allows RunBot to optimize two parameters: knee bending and hip swinging. When the machine begins walking, it starts out slowly, more obviously bending its knees, which is what humans do, said WÃ¶rgötter.

The neuronal control allows the robot to try different things. So as it goes faster, it may do something like avoid bending its knees to swing the leg forward faster. By learning how to adjust the stride to the pace, RunBot keeps its balance.

"The robot's learning does not involve falling, which is a frequent problem in bipeds. One could imagine other quantities being improved, such as energy efficiency, with a similar approach," said Jessy Grizzle of the University of Michigan.

Grizzle is part of team that developed a bipedal robot that could run a couple of steps.

The downside of Geng's approach, said Grizzle, is that its control algorithm is not guaranteed to work right off the bat.

"To understand what I am getting at, imagine how you would feel about a car that you had to drive around for a few weeks before it ran well," said Grizzle.

WÃ¶rgötter said that walking isn't so much the issue as the robot's ability to learn and adapt.

He and his team are looking ahead to adding sensors, such as range finders, to make the robot more aware of obstacles and to make RunBot actually run.

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Picture: Courtesy of Tao Geng |
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