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Last Updated: Friday, 18 February, 2005, 04:07 GMT

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Robots hit stride with human walk

By Paul Rincon

BBC News science reporter, in Washington DC

The latest robots that walk like humans - that familiar staple of science fiction films - have been demonstrated by scientists from the US and Holland.

Three bipedal designs, each built by a different research group, use the same principle to achieve a human-like gait.

Making machines walk like us has proven notoriously difficult to achieve.

The new designs were shown off at the AAAS (American Association for the Advancement of Science) annual meeting held this year in Washington DC.

Though machines like those in the film *I, Robot* are still a long way off, robots using this method of walking could have uses in dangerous space missions or in cleaning up nuclear and toxic waste.

The work could transform the way humanoid robots are built and brings the prospect of robotic replacement limbs a step closer.

The Japanese have already made great progress in humanoid walking robots - machines such as Sony's latest QRIO; and Honda's Asimo, in which motors control much of the movement.

The new machines shown off at the AAAS meeting have less control over their movement and use up less energy than "mainstream" robots, yet they walk in a more human-like manner, their designers claim.

These new robots are based on previous "passive-dynamic" robots that could only walk downhill, powered by gravity.

Some of these previous machines waddled like penguins and some strode like humans. By taking advantage of the natural swinging of limbs, passive-dynamic robots used up gravitational energy relatively slowly.

Now, the three new designs show that two-legged, walking robots can use the same passive-dynamic principles, even on flat surfaces. They simply replace gravity power with small motors.

Buckethead brains

Two of the machines, developed at Cornell University in the US and Delft University in Holland respectively, are built in a very similar way.

But while the Cornell robot is powered by batteries in its arms, the Delft robot uses gas canisters in an attempt to mimic human muscles. It has an empty bucket for a head, to emphasise that it uses no intelligence.

The third robot, developed at the Massachusetts Institute of Technology (MIT), has been nicknamed the Toddler on account of its walking style. It uses neural networks to learn - adapting its movement according to the terrain it is on.



The batteries are in the arms

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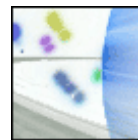
Watch the robots perform their hi-tech toddle

VIDEO

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It is about 43cm (1ft, 4in) tall, weighs 2.8kg (6.2lbs) and has curved feet that look like clogs.

"For the first time, we've demonstrated a robot that learns how to walk without anything in its control system that tells it how to," said Russ Tendra, of the cognitive and brain sciences department at MIT.



The Delft robot (l) uses gas canisters; MIT's (r) is nicknamed the Toddler

"It learns how to walk in about 20 minutes from a blank slate and adjusts itself with every step."

The Toddler transfers its weight from one foot to the other until it gains enough energy to start walking forward. It can start, stop, steer and walk backwards.

The research could have much to tell us about the way humans walk: it suggests passive dynamic movement plays a key role in human locomotion.

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