America

Robots finally learn how to walk but an ant can out-think them

BY MARK HENDERSON

SCIENTISTS have developed robots that mimic the human gait, bringing a shade closer the prospect of machines familiar from science fiction.

The creations of three independent research teams, all much more sophisticated than any previous model, were shown yesterday.

But the machines still have some way to go to match the capabilities of the acrobatic Sonny, which put Will Smith through his paces in I, Robot, or even the clunky C3PO from Star Wars: their computing power barely matches the brain of an ant.

Even so, the advancements suggest that it will eventually be possible to build humanoid robots to perform useful tasks.

The developments should also improve the design of prosthetic arms and legs, and assist efforts to build artificial limbs controlled by the brain.

"These innovations are a platform upon which others will build," said Michael Foster of the US National Science Foundation, who contributed to the research. "This is the foundation for what we may see in robotic control in the future."

The most exciting robot is Toddler, developed at the Massachusetts Institute of Technology (MIT) by a team led by Russ Tedrake.

Toddler learns to walk in similar fashion to a child, but becomes expert rather more quickly, taking about 20 minutes or 600 steps to develop an accomplished gait.

"It is one of the first walking robots to use a learning program, and it is the first to learn to walk without any prior information built into the controller," Dr Tedrake said.

This could eventually allow it to walk over uneven terrain, rather than only flat surfaces.

The second robot, Tad, was built at Cornell University in New York state, and uses much less energy than existing designs. "Already our robot seems to be at least ten times more efficient than anybody else's," said Professor Andy Ruina, who led this research.

The final robot, Denise, was developed by Martijn Wisse of Delft University in the Netherlands. Details of all three are published today in the journal Science. All three designs employ the same principles as toy robots that walk downhill by swaying from side to side.

But each uses a different mechanism on the flat or to move uphill. Tad senses when the forward leg hits the ground, and then tells the backward leg to "push off" using a motor that stretches a spring.

Denise has a similar mechanism controlled by pneumatics, while Toddler uses electric motors that move its ankle joints directly. All have arms sychronised to swing in time with the opposite leg, to provide balance.

Steven Collins, a former member of the Cornell team who now works for the University of Michigan, is applying similar techniques to the development of a powered prosthetic foot for amputees.

Another application is in building robotic arms that can be controlled by the brain. Scientists from the University of Pittsburgh reported yesterday that they have trained a monkey to feed using a robotic arm moved with its brain signals.