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Wednesday, 30 August, 2000, 19:55 GMT 20:55 UK

Robot learns to reproduce

Machine designed itself to carry out task

Back in the 1950s, science fiction writers predicted that by now robots would be part of everyday life.

So why doesn't everyone have their own personal R2-D2 beeping around their kitchen? One reason is the time and money it takes to design and build them.

A way round this problem is to let robots develop and construct themselves. And taking a leaf out of evolution's book, Hod Lipson and Jordan Pollack, of Brandeis University in Massachusetts,US, have done just that.

They have developed a computer system that uses natural selection to design and automatically build robots.

"We carefully minimised human intervention in both the design and fabrication stages," said Professor Pollack in the journal Nature.

"The only human work was in informing the simulation about the 'universe' that could be manufactured."

Evolutionary path

The basic design was simple, with no resemblance at all to the sophisticated androids of science fiction.

Instead the research team started with a handful of virtual rods, actuators and cables in a computer.

Using sophisticated software that imitates evolution these basic components were then allowed to "evolve" towards a machine with one goal - moving horizontally.

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Combinations of rods, actuators and cable "nerves" which proved the most mobile were encouraged to thrive and reproduce. Less mobile arrangements - evolutionary dead-ends - were allowed to die out.

Generations

After 600 generations had passed, the most successful mobile virtual robot design was permitted to build a real version of itself in plastic using a prototyping machine.

Research could pave the way for sophisticated robots

From the researchers' point of view, the important thing was that the robot worked in just the way predicted by its virtual ancestor.

Robots have traditionally been designed to be able to operate autonomously.

Now that design and construction have also been automated, self-reproducing machines that might, one day, merit the term "artificial life" are a step closer.

Sophisticated robots like the Terminator are still many years into the future, but scientists working on artificial intelligence have welcomed the experiment as significant.

"This is a long-awaited and necessary step towards the ultimate dream of self-reproducing machines," said Rodney Brooks, director of the Artificial Intelligence Laboratory at the Massachusetts Institute of Technology.

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