Evolution of the shape-shifters

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In, what has been described as an attempt to make a machine as independent as the vengeful shape-shifter in Terminator 2, US Researchers have built a prototype robot that is able to change its shape to suit the job at hand.

Video of the evolved robot "Tetra".

Researchers at Brandeis University, near Boston, are creating a robot for use in planetary exploration or search-and-rescue missions, a machine capable of changing its shape to meet each new challenge in a strange and unpredictable environment, reports this week's *New Scientist*.

The robot developed by Hod Lipson and Jordan Pollack can design itself, assemble itself, and recycle itself in response to specific tasks, relying on a computer that uses a genetic algorithm to 'breed' the best shape robot for the situation.

The computer interfaces with a 3D printer which uses a nozzle to create the robot by building up progressive layers of thermoplastic, creating the structure needed – a technology called 'rapid prototyping' commonly used in the car industry.

To keep things simple, Lipson allowed the algorithm only basic components with which to design the prototype robot: straight plastic bars of varying lengths and electric motors that can extend or shrink the length of a bar.

Close-up of a model of the evolved robot "Tetra" showing its ball and socket joints

Joints are all ball-and-socket designs, as these are easily created by a 3D printer. From these basic parameters a host of complex — sometimes life-like - structures have been evolved.

Some versions push themselves along on one leg, while others produce a hinge-like motion and crawl about like a fish out of water. Yet another moves sideways like a crab.

"The robot is ready to move when it comes out of the printer," says Lipson. At this stage, however, its motor must be inserted by a person.

When the robot has performed its task, it offers itself up to be melted down, so its thermoplastic components can be recycled into another useful droid by the 3D printer.

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The current prototype is very basic and has no sensors, so it is unaware of the world, though sensors could be added at a later design stage.

Further development also depend on 3D printers being much smaller and capable of allowing several materials to be printed, including conductive, nonconductive and even semiconductive materials.

"Wires, motors and logic circuits, as well as structure, could be printed in one pass without the need for assembly," Lipson predicts.

Other researchers comment that truly useful robots will require also the development of stronger plastics and more materials.

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