

# Self-righting robot proves it's anything but a pushover

Oliver Moody Science Correspondent

The hexapod gets knocked down, but it gets up again. You're never going to keep it down.

A new breed of robots that can learn to walk again after suffering heavy damage will be sent into war zones, earthquake ground zeros and broken nuclear power stations, French inventors have predicted.

At first glance, the six-legged Mini Creadapt robot is not much to look at. Hesitant and cumbersome, with a top speed of 0.7mph, it appears unlikely to enslave the human race.

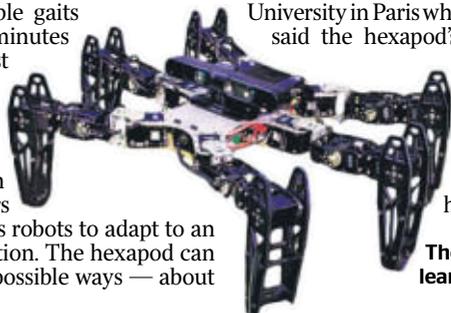
What marks it out, however, is its

extraordinary capacity for "learning" to walk, even when two of its six legs are cut off. Just as animals work out how best to limp on a wounded limb through trial and error, the French robot maps out possible gaits and within two minutes chooses the most effective.

If this sounds slow, it is an exponential improvement on the several hours it normally takes robots to adapt to an unfamiliar situation. The hexapod can reduce the  $10^{47}$  possible ways — about

as many as there are molecules on the Earth — of walking across a given space to only 13,000.

Antoine Cully, the doctoral candidate at the Pierre and Marie Curie University in Paris who led the research, said the hexapod's recovery speed was dramatically improved because it went through a "simulated childhood" in which it learnt how to move.



The Mini Creadapt learns like a child

"Until now, nearly all approaches for having robots learn took many hours, which is why videos of robots doing anything are often extremely sped up," he said. "Watching them learn in real time was excruciating, much like watching grass grow. Now we can see robots learning in real time, much like you would watch a dog or child learn a skill."

The same "intelligent trial and error" algorithms could be used in any kind of robot or robotic limb, their inventors wrote in the journal *Nature*.

The software is likely to attract the attention of national defence agencies and private arms companies, with the United States military already funding

development of the Cheetah, a four-legged robot that can run faster than Usain Bolt. A newer model, the Wild-Cat, could reach 50mph.

Jean-Baptiste Mouret, who supervised the Paris research, said the French government's defence procurement agency had partly funded the study. "Overall, we would love to see our algorithms used in impressive robots like the WildCat," he said.

Although the robots can rapidly cope with injuries, it will be some time before they can repair themselves. "The robot would need to understand the damage — that is, look at itself — and have all the tools needed," Dr Mouret said.

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## Murder mystery waiting to be solved 430,000 years on

Oliver Moody

Agatha Christie's murder mystery play *The Mousetrap* has been running continuously for more than 62 years. It has nothing, however, on a fathomless riddle that is now emerging from the depths of a Spanish cave system.

Some time about 430,000 years ago, the body of a young Neanderthal adult was hurled 13 metres (43ft) down a shaft into a chamber buried deep in the Atapuerca mountains near Burgos. About an inch above the left eyebrow are two holes that appear to have been punched through the skull with the same weapon. This is by far the oldest unsolved murder known to palaeontology, according to a study published in the journal *Plos One*.

The nameless proto-Neanderthal, probably belonging to a Middle Pleistocene human ancestor species called *Homo heidelbergensis*, was found in a burial site known as Sima de los Huesos (the Pit of Bones), which contains the remains of at least 27 other bodies. The skull was found in 52 fragments among a pile of human remains at its bottom, and painstakingly reassembled by archaeologists.

Nohemi Sala of the Complutense University of Madrid, the lead researcher, said that it appeared to be the clearest case of murder so far back in human prehistory.

"We prefer to err on the side of caution and not speculate too much about

murder in the fossil record," she said. "We have a clear case in the Sima de los Huesos, but other evidence of lethal interpersonal violence is very scant in the human fossil record. Obviously, it did occur, and our analysis has shown that this is an ancient human behaviour."

Dr Sala suggested that the puncture wounds were consistent with a spear or an axe. "We have interpreted the fractures, relying on modern forensic criteria, as evidence of blunt force trauma which occurred around the time of death of the individual," she said. "We are not sure what the object was. However, possibilities include a wooden spear or a stone hand axe."

There is only vague evidence of fatal human-on-human violence dating back further than 50,000 years. In 1958 a 150,000-year-old skull was found in a cave near Maba in the south of China that appeared to have been fractured with some variety of missile but healed afterwards, suggesting that its owner survived the fracas.

Archaeologists claim to have found the jawbones of a new species of human ancestor that would have lived alongside "Lucy" in Ethiopia more than 3 million years ago. The tentatively named *Australopithecus deyiremeda* had smaller teeth than Lucy's species but was excavated only 22 miles away from her in what may be the first evidence of early hominins coexisting, the researchers wrote in *Nature*.

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