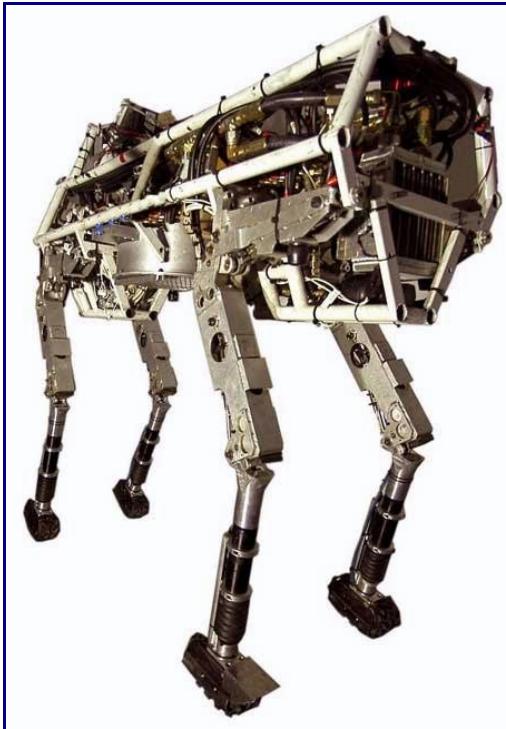


- **Source:** <http://www.newscientist.com/article.ns?id=dn8802&print=true>

## Robotic 'pack mule' displays stunning reflexes

- 18:14 03 March 2006
- NewScientist.com news service
- David Hambling



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A robotic beast of burden, BigDog can carry upwards of 40 kilograms – perfect to take the weight off a tired soldier (Image: Boston Dynamics)

A nimble, four-legged robot is so surefooted it can recover its balance even after being given a hefty kick. The machine, which moves like a cross between a goat and a pantomime horse, is being developed as a robotic pack mule for the US military.

BigDog is described by its developers Boston Dynamics as “the most advanced quadruped robot on Earth”. The company have released a new video of the robot negotiating steep slopes, crossing rocky ground and dealing with the sharp kick. View the impressive clip [here](#) (28MB Windows media file).

“Internal force sensors detect the ground variations and compensate for them,” says company president and project manager Marc Raibert. “And BigDog’s active balance allows it to maintain stability when we disturb it.”

This active balance is maintained by four legs, each with three joints powered by actuators and a fourth

"springy" joint. All the joints are controlled by an onboard PC processor.

### **Robotic pack mule**

The project is sponsored by the US Defense Advanced Research Projects Agency (DARPA), who want the robotic pack mule to assist soldiers in terrain too tough for vehicles. Ground-based soldiers often need to carry 40 kilograms of equipment.

Raibert says the latest version of BigDog can handle slopes of 35° – a steeper gradient than one in two. The hydraulics are driven by a two-stroke single-cylinder petrol engine, and it can carry over 40 kg, about 30% of its bodyweight. The robot can follow a simple path on its own, or can be remotely controlled.

### **Kerb climbing**

"They seem to have done a good job with adaptive dynamics and fast reflexes to deal with terrain variation and disturbances," says Barbara Webb, at Edinburgh University's Mobile Robotics Research Group in the UK. "These are hard problems." But she notes BigDog is not shown negotiating higher obstacles such as kerbs, which may pose difficulties.

Roboticist Darwin Caldwell, at the University of Salford, UK, adds: "It certainly looks very impressive - fast moving, highly reactive, autonomous both in power and possible intelligence and looking fairly robust. I have seen none that would be better. But there must always be a certain caution from videos."

The legs on the next version of BigDog, V3, will each have an additional powered joint and will be able to take on even steeper slopes and rougher terrain at higher speed, its makers say.

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### **Weblinks**

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