

Robot uses gecko power to climb walls

31 October 2011

Inspired by the gecko, scientists have developed a tank-like robot that can scale vertical walls and crawl over ledges without using suction cups, glue or other liquid bonds to adhere to the surface.

The 240-gramme (6.9-ounce) beast has tracks that are covered with dry microfibres modelled on the toe hairs of the gecko, which can famously zip up windows and along walls almost without effort. The lizard does the trick thanks to millions of ultra-fine hairs called setae, which interact with the climbing surface to create a molecular attraction known as the van der Waals force.

Described on Tuesday in the British research journal *Smart Materials and Structure*, the robot's tracks are studded with mushroom-shaped caps of polymer microfibres just 0.017 millimetres (0.00067 inches) wide and 0.01mm (0.0004 inches) high. By comparison, the human hair is around 0.1 mm (0.004 inches) thick.

"While van der Waals forces are considered to be relatively weak, the thin, flexible overhang provided by the mushroom cap ensures that the area of contact between the robot and the surface is maximised," said researcher Jeff Krahn of the Simon Fraser University at Burnaby, in Canada's British Columbia province. "The adhesive pads on geckos follow this same principle by utilising a large number of fibres, each with a very small tip. The more fibres a gecko has in contact, the greater attachment force it has on a surface."

The tank-bot has a fore and aft section, each with two tracks, and an articulated joint in the middle to help it move from flat surfaces to corners. The video shows it being put through its paces, climbing at speeds of up to 3.4 centimetres (1.4 inches) per second. The gadget weighs 240g (eight ounces) but tests show that it could take an additional load of 110 grammes (3.14 ounces).

Still a small experimental design, the robot is attached to an umbilical cord providing power and control signals, but eventually will be kitted out with a battery and a computer brain to give it more autonomy, says the team. If all goes well, dozens of applications lie ahead.

Wall-climbing robots could be used to clean windows, inspect buildings, crawl up pipes and help in search-and-rescue operations.

A team at Stanford University in California has been adopting a different approach, using gecko-like fibres on feet, rather than tracks, to help its robot climb. But tracks, driven by belts, are likely to have the advantage because they have a simpler mechanical design, says Krahn.

Track power can be easily expanded -- like adding a locomotive to a train -- when a bigger load has to be taken, he adds. "We unfortunately haven't as of yet calculated a cost for achieving a practical gecko robot as we are still in the prototyping stage," Krahn said in an email exchange.

Source: [Breitbart](#) .