Osaka team fine-tunes quadruped robot Pneupard (w/ Video)

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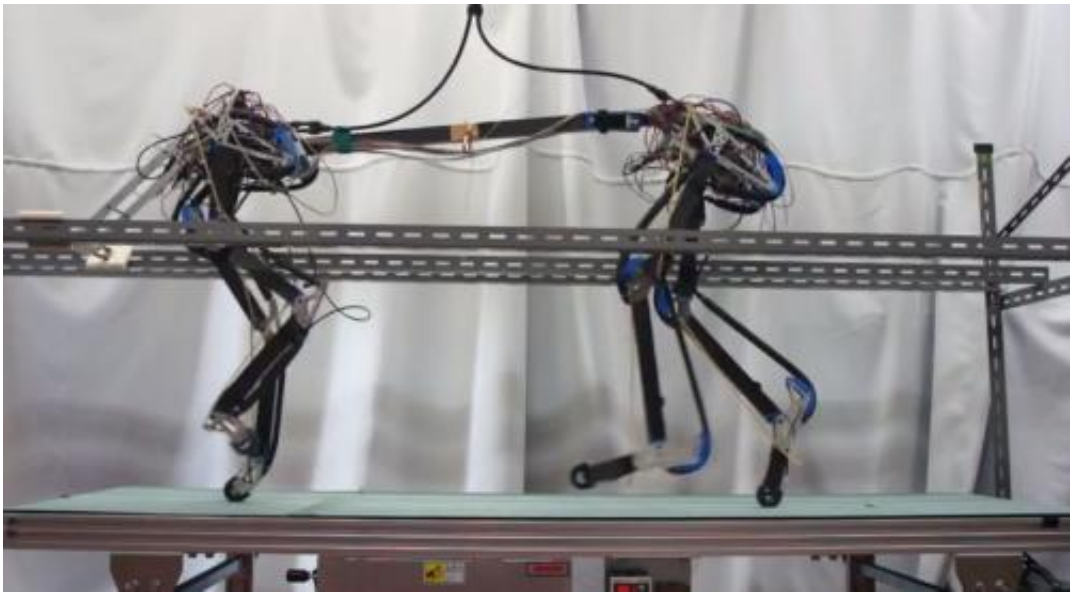

(Phys.org) —Click, clunk, whir, pitter-patter go the footsteps of numerous quadruped robots worldwide, but a recent report focuses on one walking robot, Pneupard, a project from Osaka University. Tuesday's *IEEE Spectrum* said Pneupard, the four-limbed robot powered by pneumatic muscles, has been fine-tuned by its researchers. The original version of Pneupard that the team designed had a lot of pneumatic muscles; controlling the robot became a huge challenge, said the update, and the researchers decided this time around to go lean and mean on the robot's anatomy. The second version has fewer muscles.

This made it easier for control and exploring different gaits.

Last year, *IEEE Spectrum* first introduced the Pneupard as a robot with pneumatic artificial muscles as its primary means of locomotion. Jason Falconer wrote at the time, "Pneumatic artificial muscles may be made from a rubber tube sheathed in nylon, but they contract much like the real thing when filled with air. They can pack a lot of power in short bursts and are also highly flexible and impact-resistant, giving them a lifelike quality that is often missing in robots powered by electric motors."

Distinguishing features include what the robot does not need rather than what it does; it does not require a complex brain, and uses no ground feedback or sensors. *IEEE Spectrum* said it was rather an "open loop" experiment, in control systems parlance. At play is a simple, rhythmic controller called a central pattern generator (CPG).

"There are no external signals telling the limbs how to move," said Ryan Whitwam in *ExtremeTech*, "instead everything is based on the interaction of the pneumatic muscles and skeletal frame, which rhythmically cycle back to their starting positions after each step. A CPG like this is essentially a biological system, so it could make future robots more lifelike."

The team's approach is driven by the wish to explore a more natural approach to walking robots. Andre Rosendo, the project leader, told *IEEE Spectrum* that the team believed "locomotion is created not only by the brain, but also the brainstem, spine, and muscles, which also 'have a say' on how the body moves."

In explaining what the team is up to, Whitwam said, "Basically, the Osaka University team wants to see how locomotion can be offloaded from a centralized robotic brain to the rest of the body. Their approach

takes into account the way a real animal works—it's not all higher brain functions controlling your gait and posture. The feedback of peripheral nerves, the brainstem, spine, and muscles all figure into the way we move."

The Pneupard project takes place at the laboratory of Prof. Koh Hosoda at Osaka University The team includes Andre Rosendo, Shogo Nakatsu, Xiangxiao Liu, and Masahiro Shimizu. The researchers call the 4.8-kilogram robot Pneupard a "biomimetic quadruped robot"—they said the value of these robots is that they allow the study of animal locomotion without experimenting on in animals, recreating them with a constructivist approach.

More information: www.robot.ams.eng.osaka-u.ac.jp/projects-e.html