

Limber mini cheetah robot delivers impressive backflip performance

4 March 2019, by Nancy Cohen



MIT's new mini cheetah robot is springy, light on its feet, and weighs in at just 20 pounds. Credit: Bryce Vickmark

The MIT Biomimetic Robotics Laboratory has been getting its share of "seriously cute" with the most recent video of its Mini Cheetah, but the truth is that this four-legged robot is also seriously agile. Team members Ben Katz, Jared Di Carlo and Sangbae Kim have been working on this MIT wonder.

One of the numerous reasons to watch their video is to see the [robot's](#) backflip. MIT said it's the first *four-legged* robot to do so.

(*MIT News* said that Katz and Di Carlo were inspired by a class they took and set about programming the mini [cheetah](#) to perform the backflip.)

The Mini Cheetah, note, has family. The Biomimetic Robotics Lab actually has a Cheetah project for which this Mini is a "smaller, stripped down version" of the Cheetah, said *MIT News*. The robot is 20 pounds (9 kg). The team has designed a whole bag of tricks that the robot can perform, not just the backflip.

"Limber" may be an understatement.

(1) The quadruped can bend and swing its legs wide (2) can walk right side up or upside down and, here is where the cheetah inspiration kicks in (3) can trot over uneven terrain about twice as fast as an average person's walking speed. In detail, the robot can run at up to 2.45 m/s.

Shane McGlaun, *HotHardware*: "Mini Cheetah can run at up to 2.45 m/s with Convex MPC and needs only [half](#) its available actuator torque to do so." MPC stands for model predictive control. A definition from the MathWorks site: "[MPC](#) uses a model of the system to make predictions about the system's future behavior."

Kicking, pushing, the robot, the testers show off its balance and orientation control functions. The cheetah robot manages easily to get upright after a hearty kick causing it to land on its back. Actually, as entertaining it is to watch the backflip, the control features appeared to impress video viewers the most.

Comments on *HotHardware*: A viewer said the backflip was impressive, but the robot's ability to roll over and get up after being knocked down might have been more so. Another viewer acknowledged the [backflip](#) as a neat trick but found the balance and orientation to be the most impressive features.

So, was this robot very costly to make? Apparently not. *MIT News* said that "Each of the robot's legs is powered by three identical, low-cost electric motors that the researchers engineered using off-the-shelf parts. Each motor can easily be swapped out for a new one."

How can the Mini version be applied in the real world? Lucy Black in *I-Programmer*: "While the Mini Cheetah [resembles](#) its big brother in many respects, it lacks commercial pretensions and is intended for [robotics research](#) and education."

Black added that "Even if Mini Cheetah isn't a robot that we will be able to buy it does seem to have a worthwhile role in research, with the aim of allowing robots to go where only animals have been able to go before."

Kim, an associate professor, said that in "loaning mini cheetahs out to other research groups" engineers could get an opportunity to test novel algorithms and maneuvers on a dynamic robot to which they might not otherwise have access.

What's next: *MIT News* said the researchers intend to present the mini cheetah's design in May at the International Conference on Robotics and Automation.

More information:

[news.mit.edu/2019/mit-mini-che ... bot-to-backflip-0304](https://news.mit.edu/2019/mit-mini-cheetah-robot-backflip-0304)

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APA citation: Limber mini cheetah robot delivers impressive backflip performance (2019, March 4) retrieved 17 September 2021 from <https://techxplore.com/news/2019-03-limber-mini-cheetah-robot-backflip.html>

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