Robot with rapid motor adaptation able to traverse multiple types of terrain

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A group of researchers from Carnegie Mellon and UC Berkeley working with a team at Facebook AI has developed a new type of reactive locomotive system for robots. Called rapid motor adaptation, it allows a robot to traverse a variety of terrain types by learning from past experiences. The group has written a paper describing their new technology and how well it worked when tested and have posted it on the

arXiv preprint server.

The robot, built by Chinese startup Unitree, has four legs, walks like a dog and has no ability to see where it is going. Instead, it makes its way forward by adjusting to the unique characteristics of a surface it is traversing. The researchers designed the software as a self-learning system. They then put a simulated version of the robot from Unitree through a variety of simulated environments. Training the robot virtually first greatly reduced learning times. The robot was then released on a host of different surfaces in a wide variety of environments in the real world. In one scenario, the robot picked its way across a rocky beach; in another, it stepped down a small ridge, instantly reacting to the sudden downhill plunge. The team also had it walk across oiled plastic to test its abilities on slippery surfaces. And they tested its ability to react to unexpected setbacks, such as having a heavy object tossed onto its back.

The researchers note that their new training technique is based entirely on trial and error. Their approach allows for much more subtle reactions than other learnings systems. They note, for example, that the robot was able to change its gait when stepping onto sand—each step had to be taken in a new way based on the cushiness of the surface beneath its feet. They claim theirs is the first learning-based system for a four-legged robot that is entirely experience-based.

They also suggest that their technology could prove useful in search and rescue operations in which terrain is notoriously unpredictable. They note that their robot successfully navigated a hiking trail 70 percent of the time, and was 80 percent successful when walking across piles of cement and piles of pebbles.

More information: RMA: Rapid Motor Adaptation for Legged Robot: ashish-kmr.github.io/rma-legged-robots/