abstract

Collaboration between biologists and engineers has resulted in a new generation of bio-inspired robots. Drawing inspiration from the locomotion of small animals, these robots are faster, more versatile, more robust and easier to control than their predecessors. The design process begins with identifying exemplars from nature that excel at a particular task, such as running rapidly over rough terrain or climbing vertical surfaces. The next step is to hypothesize design principles that underlie the animals’ success. These design principles represent an abstraction of the complex structures and behaviors observed in animal models. They guide the development of small robots, which take advantage of recent developments in rapid prototyping technology to create tuned multi-material structures with embedded sensors and actuators that exhibit the desired characteristics and behavior. Testing and evaluating the robots reveals where the design principles should be refined or augmented. The resulting insights are valuable to both roboticists and biologists to deepen their understanding about what is important, and why.

The bio-inspired design process will be illustrated with several running and climbing robots that have grown out of collaborations between researchers in robotics and integrative biology.

biosketch

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