

Bio-Mimetic Foot Design for Legged Locomotion over Unstructured Terrain

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Abstract : The hooves of goats and other ruminants, or the family Ruminantia, are uniquely structured to adapt to rough terrain. Their hooves possess a hard outer shell and a soft interior that allow them to both conform to uneven surfaces and hook onto prominent features. In an effort to apply this unique mechanism to a robotics context, artificial feet for a hexapedal robot have been designed based on the hooves of ruminants to improve the robot's ability to traverse unstructured environments such as those found on a rocky planet or asteroid, as well as in earth-based environments such as rubble, caves, and mountainous regions. The feet were manufactured using a combination of 3D printing and polyurethane casting techniques and attached to a commercially available hexapedal robot. The robot was programmed with a terrain-adaptive gait and proved capable of traversing a variety of uneven surfaces and inclines. This development of more adaptable robotic feet allows legged robots to operate in a wider range of environments and expands their possible applications.

Keywords : biomimicry, legged locomotion, robotic foot design, ruminant feet, unstructured terrain navigation

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