

Angular observation of joints of geckos moving on horizontal and vertical surfaces

November 19 2008

New research shows that gecko's joints rotated more quickly the greater the speed, and the swinging scope of forelimbs stayed nearly at 59 degrees when swinging forward. The lifting angle of forelimbs was always positive to keep the center of mass close to the surface when moving up vertical surfaces. Alternative gaits had little effect on the swing angle of hind limbs of the geckos moving on both horizontal and vertical surfaces.

Scholars in the Institute of Bio-inspired Structure and Surface Engineering (IBSS), Nanjing University of Aeronautics and Astronautics (NUAA) used a three-dimensional locomotion video-recording and measuring system to observe and measure the angular rotation of joints in gecko's limbs when they were running on horizontal floor and climbing on vertical wall. This work helps us to understand gecko's locomotion from the view point of angle change of joints and to provide a direct reference to plan the gait of gecko-robots.

This research was published in *Chinese Science Bulletin*, Volume 53, Issue 22, 2008 and was performed by Li Hongkai, Dai Zhendong, Shi Aiju, Zhang Hao, Sun Jiurong.

Geckos have excellent locomotion abilities to move on various surfaces. The ability is highly desired by the robot moving in unstructured environments, especially legged robots. But the stability, agility, robustness, environmental adaptability, and energy efficiency of modern robots lag far behind that of correspondent animals. This research

provides an insight into how geckos coordinate the joint angles on limbs and meet the requirements of moving on various surfaces.

The angular observation was performed to describe the difference between the locomotion on horizontal and vertical surfaces. The data collected from huge video recording and long vapid processing reveal the spatio-temporal rotation trajectory, extrema, ranges of each joint in forelimb and hind limb, the phase diagram of limb angles. Results of the experiments provide a direct intuitionistic presentation about the gait of gecko moving on horizontal and vertical surfaces with different speed.

Source: Science in China Press

Citation: Angular observation of joints of geckos moving on horizontal and vertical surfaces (2008, November 19) retrieved 24 April 2024 from <https://phys.org/news/2008-11-angular-joints-geckos-horizontal-vertical.html>

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