

Morphing Mechanism of Honeybee's Abdomen and Its Application in Morphing Aerospace Vehicle

Abstract,

Aerospace vehicle is a new style of plane designed to accomplish re-entry missions. Mimicking the morphing structure of flying insects is an effective way of developing the structure which can reconfigure the aerodynamic profile of the vehicle autonomously. Here we research the morphing mechanism of honeybee's abdomen. Combined with the methods of the mechanism alienation and topological merging, a new morphing bionic structure is proposed and applied to the design of morphing aerospace vehicle.

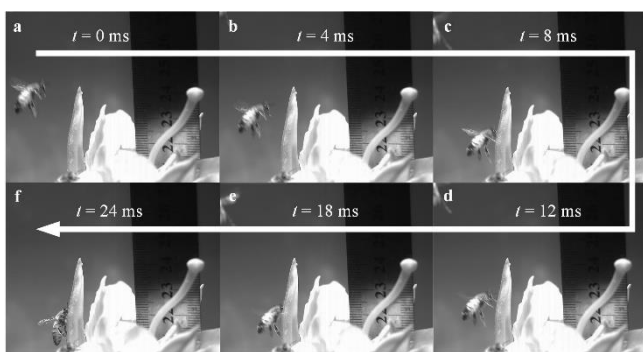
Methods, Results and Conclusions Combining experimental analysis and theoretical demonstration, a unidirectional bending mechanism of honeybee abdomen was revealed. Through this finding, a new perspective for aerospace vehicle design can be imitated.

X-ray Imaging and Biomedical Application Beamline (BL13W1)



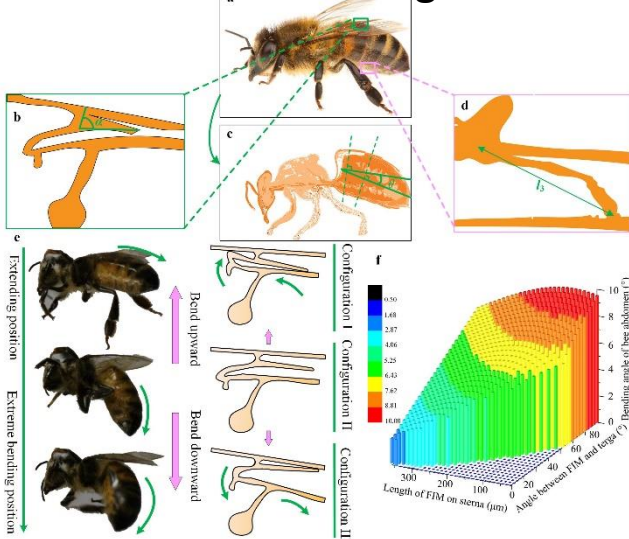
Curling of honeybee abdomen

The unidirectional abdominal deformation in free flying honeybee was observed by a high-speed video camera.

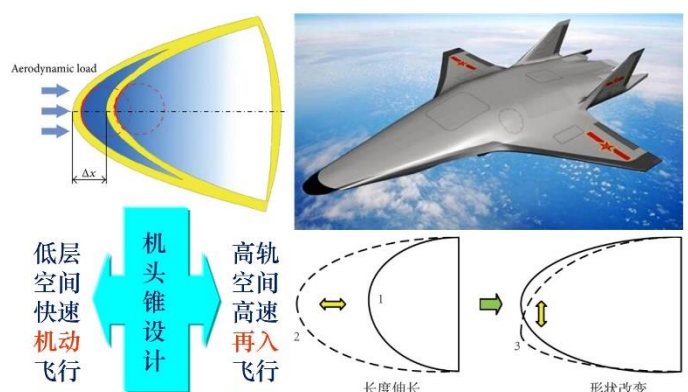


Unidirectional bending mechanism

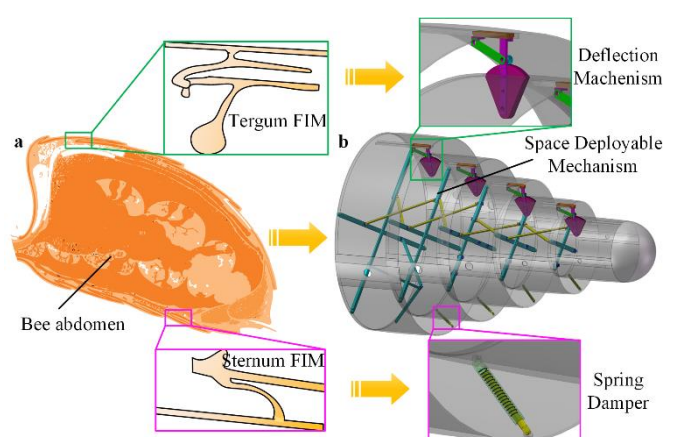
The special structure of FIM led to the function of locking.



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Biomimetic nose cone for morphing of aerospace vehicle



We take inspiration from variant structure of honeybee's abdomen to design a morphing nose cone of aerospace vehicle. Mechanical design and simulation analysis are conducted to optimize the geometric structural parameters of the morphing nose cone.

Anonymous publications, patents or related scientific rewards can be listed.

Design and analysis of biomimetic nose cone for morphing of aerospace vehicle. *J Bionic Eng*, 2017, 14, 317-326.

Critical structure for telescopic movement of honeybee abdomen: folded intersegmental membrane. *J Insect Sci*, 2016, 16: 79.

Movement Analysis of Flexion and Extension of Honeybee Abdomen Based on an Adaptive Segmented Structure. *J Insect Sci*, 2015, 15: 109.