

Insect-machine Hybrid System: Locomotion control of living insects

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Abstract

Insect-machine hybrid system, also known as cyborg insect or insect biobot is a fusion of a living insect platform and a miniature control backpack mounted on its body. Using living insect as platform helps us to bypass complicated design and fabrication process for robot structure and actuators as well as complex controller for locomotion planning. It can easily adapt to any complex terrain due to the benefit of living structure such as soft interface, self-balance, and self-adaptation inherited from the living insect. Electrical stimulation of the insect's mechanoreceptors enables us to control the insect locomotion on the ground while stimulating the insect's direct flight muscles help to control its steering and body orientation in flight. By Implementing a simple feedback control system, we can control the insect to follow predetermined paths or approach targets precisely. The small size of the insect along with its agile locomotion would enable it to penetrate rubbles of collapsed building, thus, makes it a strong candidate for search and rescue missions when equipped with environmental sensors. Furthermore, such a hybrid system can also be used to study insect structure and function, insect behaviour and neural circuit of insect locomotion and navigation.

