

Control Mechanism of Insect Flight

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【Outline of survey】

Insects have reliable and excellent flight control mechanisms, which have been completed through long history of three hundred million years. The flight control behaviors are summations of each of conditioned reflection corresponding with an external stimulus, and insects performs excellent flight even in the strong gust. The neuron connections controlling flight behaviors are quite rigid, and the similar response to the similar stimulus always appears. The flight control has the larger priority in comparison with other behaviors, and it is easy to observe the control mechanism. These characteristics of the flight control mechanism of insects fit well to that of the micro aerial vehicles (MAV), which gathered much interest in these days. In this research program, we will give a stimulus to an insect, such as, visual stimulus, wind, or acceleration of the body, and will measure the variation of force generated by the insect wings. We will identify the relation between the stimulus and the variation of force. Finally, we will produce a MAV with the same size as an insect. We will equip the control mechanism derived from the insect control system with the vehicle, and will make clear the flight performance in the gust.

【Expected results】

- A) We will develop a new research field of "flight dynamics of insects".
- B) We will clarify the control mechanism of insect beating wings.
- C) We will obtain the gust responses of insect flight as well as MAV flight.
- D) We will clarify the role of insect flight performance when escaping from the predator.
- E) We will establish a design standard for flight control of MAV.

【References by the principal researcher】

- S.Sunada and K.Kawachi, Effects of Reynolds number on characteristics of fixed and rotary wings. Journal of Aircraft, Vol.41,No.1,189-192,2004

【Term of project】 FY2006 - 2010

【Budget allocation】 20,500,000 yen

【Homepage address】

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