

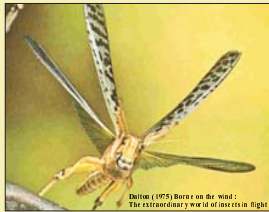


Virtual Reality for Insects: How do they Fly?

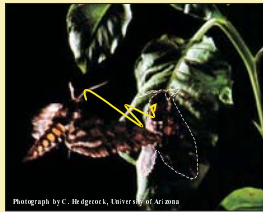
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Interesting Aspects of Insect Flight



Collision avoidance
i.e. How to not fly into things

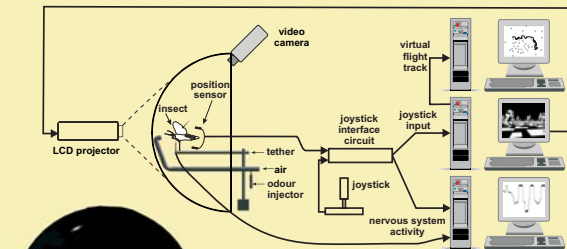


Odour-guided flight
i.e. How to find a mate

Why Study Insect Flight?

- Flying insects, like all other animals, must contend with a multitude of environmental factors.
- Insects have a "simple" nervous system, i.e. few neurons but produce complex behaviours.
- Excellent model systems for studying general principles of neural control of behaviour as well as biologically-inspired Micro Air Vehicles (MAVs).
- Economic importance i.e. understand what they respond to and how. Pest control?

Flight Simulator Design



moth's-eye view

The joystick interface circuit (above) receives a signal from the position sensor that monitors movements of the insect's abdomen. The output feeds into the joystick port, controlling the virtual environment, which is projected onto the dome screen. A second computer records the virtual flight track from above and a third aligns movements of the environment with nervous system activity. A moth's eye view (left) shows the setup from the insect's perspective.

Applications for the Flight Simulator

- Neural control of locomotion - how does the nervous system produce and coordinate appropriate behaviours?
- Development of biologically-inspired algorithms for MAV guidance systems.
- Testing behavioural and neuronal responses to potential control strategies e.g. disruption of pheromone-guided mating flights of pest insects.

Acknowledgements

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A Virtual Reality Flight Simulator for Insects



The dome opens to reveal the working chamber

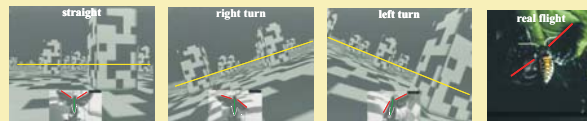
The dome is closed and the "environment" is projected



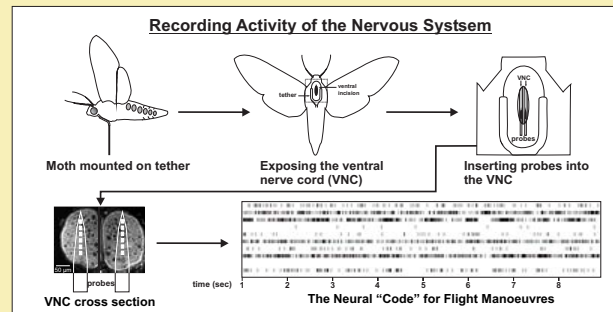
A tethered locust induced to "fly"

A rear view of the locust responding to an approaching threat (the bird)

Flight Simulator in Action



A moth responds to movements of the virtual environment. A "left turn" response is similar to what occurs in real flight.



Video Projection Screen