TECHNOLOGY FACT SHEET

Adelaide Insect Vision Group

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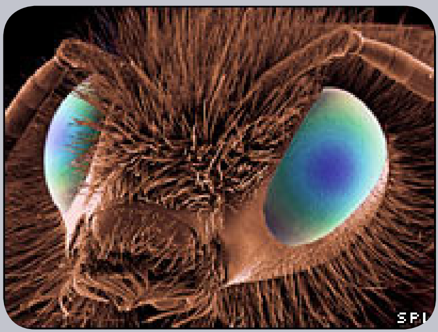
Adelaide Research & Innovation



Description of Technology

The Vision Laboratory's research investigates how the brain makes sense of the world viewed by the eye. Insects are ideal for tackling this problem at theoretical, physiological and behavioural levels. With a visual system that accounts for as much as 30% of the lifted mass, some flying insects invest more in vision than any other animal. What happens to the abundance of information collected by such large eyes? How has the brain evolved to optimally extract the features from scenes that are most relevant to the behaviour adopted?

Among other discoveries, this lab has shown that the insect visual system employs processing strategies similar to those in the mammalian cortex, and that insects see many of the same visual illusions that humans do. Much of our present work is focused at understanding these illusions at a neurophysiological level using in-vivo recordings on intact insects, focussing particularly on physiological processes underlying adaptation and short-term plasticity. We are also collaborating with industry to develop robust models for adaptive motion detectors, based on insect vision, for implementation in silicon hardware.

Commercial Applications

A large part of our current effort is directed at understanding and modelling neurons involved in detection of moving features and 'optical flow' patterns induced by movement by an animal through its habitat. Much of our work uses 'natural' stimuli - images that we derive from the outside world, and computer animations of those images. We record responses of neurons to these moving patterns and then study the connections between the neurons using intracellular labelling with fluoroescent dye. We are also collaborating with Industry to develop robust models for adaptive motion detectors, based on insect vision, for implementation in silicon hardware.

Applications for this technology include the aerospace industry, guidance systems for miniature autonomous vehicles and for embedded collision avoidance sensors that can be incorporated into future motor vehicles. There may also be commercial camera applications.

Summary

This program is a world-first in that it seeks to combine a number of important areas:

- insect neurophysiological experiments to form accurate models,
- algorithm development
- hardware implementation of algorithms (primarily in analog VLSI)
- study of stochastic resonance to improve neural models,
- algorithm extension to colour vision to exploit redundancy/ error checking
- implementation with millimetre-wave front end for all-weather outdoor performance.

Key People

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Website

www.adelaide.edu.au/mbs/research/insect_vision/

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