



Centre for Research in Intelligent Systems (CRIS)

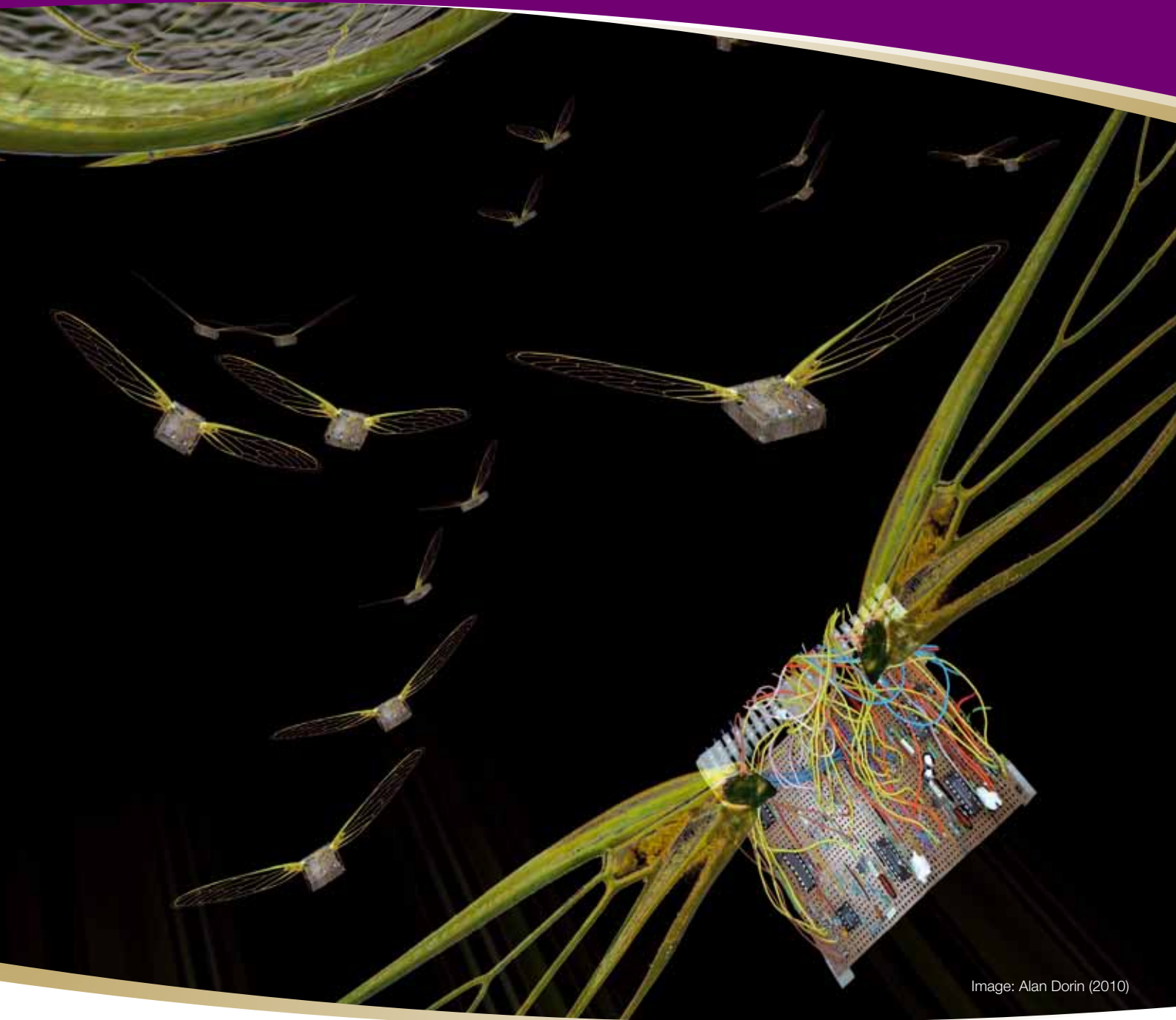


Image: Alan Dorin (2010)

CRIS members are advancing research into intelligent computational systems. With research strengths including optimisation, knowledge discovery, robotics and natural language processing, their work has application across science, commerce and industry, government and daily life.

Centre for Research in Intelligent Systems

Advancing research in intelligent computational systems

Research in CRIS is organised into seven specialist laboratories:



Adaptive Diagrams & Documents

Online documents require intelligence to automatically adapt content and layout to different display devices and reader contexts. The Adaptive Diagrams and Documents lab is researching techniques based on constrained optimisation to achieve this goal. Layout algorithms and interaction techniques developed in the laboratory are used in the open-source graphics authoring tool *Inkscape* and Austthink's argument mapping tool *Rational* and decision mapping tool *bCisive*.



CTI-Monash Centre for Optimisation

The CTI-Monash Centre for Optimisation seeks to increase the accuracy, scalability, and flexibility of optimisation software for solving problems in industry and government organisations. The Centre's approach is to combine techniques from research areas that have previously been kept separate, including constraint programming, mathematical programming and population-based techniques. The methodology is to isolate problem modelling from problem solving, transforming the model into a form that can be efficiently solved by hybrid algorithms.

Knowledge Discovery

KDlab undertakes research in knowledge discovery, with specific strengths in Bayesian modelling and reasoning, machine learning and data mining. Machine learning and data mining involve the analysis of data to discover new knowledge. Bayesian modelling and reasoning support the elicitation, representation and utilisation of knowledge that can encode and handle the uncertainties inherent in many domains. These technologies have a broad range of applications across science, commerce and public administration.

Natural Computation

The Natural Computation Lab studies natural phenomena as computational processes with the aim of understanding the mechanisms that sustain and perpetuate biological and social systems. Insights gained are used to develop new solutions to a broad range of technical problems. Many ways of solving complex problems have evolved within nature, and nature-inspired self-organising methods provide a promising framework for managing the increasing complexity of man-made systems and organisations. Research areas include swarm intelligence, social networks, collective behaviour, evolutionary computing, evolutionary theory, neural networks and artificial life.

Robotics & Computer Vision

The Robotics and Computer Vision Lab is involved in a number of related research projects concerning sensor, computational and mechatronic support for controlling robotic manipulators and automated guided vehicles (mobile robots). This research combines machine learning and perception, optimisation, artificial reasoning and robotic actuation. The range of operational environments and scales employed include computer vision and object recognition, artificial neural networks and touch sensing, navigation and swarm robots. Applications have included a semi-autonomous wheelchair, surf-lifesaving robots and the partial tele-operation of fire tankers.

CRIS Sunway Node

Researchers within the CRIS Sunway (Malaysia) node are working to make the way humans access information and technology systems seamless and more natural. Key areas of research strength are smart device ecologies (including robotics), distributed and multimedia computing and data mining/knowledge representation. Applications for this research include enterprise systems, image and video processing, smart devices and sensor systems.

User Modelling & Natural Language Processing

The User Modelling and Natural Language Lab focuses on applying statistical and machine learning techniques to solve problems in human-computer interaction. The lab collaborates with business and government, applying research findings to solve practical problems. User modelling enables a system to adapt its behaviour to the needs of users by inferring their beliefs, preferences, skills or objectives. Online help and information filtering systems are good examples of this. Natural language processing involves both the understanding and generation of human language by computer systems. Applications include human-computer dialogue, explanation generation and document summarisation.

www.infotech.monash.edu.au/cris

