

---

# Available Honours research project for Bachelor Engineering (Honours) (Electrical, Avionics) Students

---

## PhD in Bio-Inspired Perception and Guidance for Unmanned Aircraft Systems

### Supervisors:

- Dr. Luis Mejias, Queensland University of Technology (QUT) and ARCAA.
- Dr. Farid Kendoul, Research Scientist at CSIRO Autonomous Systems Lab and ARCAA.

Australian Research Centre for Aerospace Automation (ARCAA) is a Joint Venture between CSIRO and QUT.

ARCAA invites applications for a PhD position with start **January 2012** or as soon as possible hereafter and for a period of three years. The Australian Research Centre for Aerospace Automation (ARCAA) aims to develop technologies that will allow the safe, reliable, and cost-effective operation of unmanned aircraft systems (UAS, also known as UAV) for scientific and civilian applications. ARCAA is engaged in different research areas including aerospace automation, flight control, static and dynamic sense and avoid, 3D perception and guidance for small UAS, etc. More than 30 researchers and engineers are working on different projects and in multidisciplinary areas. ARCAA possesses advanced facilities including small UAS, autonomous helicopters, fixed-wing UAS of different sizes, a manned Cessna aircraft, and many other infrastructures for deployment and field testing. ARCAA is a world-leading research centre based in Brisbane and has an excellent national and international reputation for high-quality theoretical and experimental research funded by aerospace industry, government and other organizations. The details of the research activities and projects within ARCAA can be found at

<http://www.arcaa.aero/>

and

<http://research.ict.csiro.au/research/labs/autonomous-systems/field-robotics/field-robotics>

**Project Description:** The goal of this exciting project is to investigate the challenging problem of vision-based 3D perception and guidance for autonomous aerial robots using a bio-inspired approach. The aim is to develop and demonstrate autonomous technologies that will allow small UAS flying at low altitudes to negotiate obstacles and to accomplish their missions in highly cluttered and dynamic environments. There are three main areas for study:

1. *Real-Time 3D perception:* development of a novel and new framework for robotics-oriented image processing and computer vision using a new generation of bio-inspired vision sensors such as artificial compound eyes and dynamic event-based cameras. The focus will be on the design of unconventional efficient and robust algorithms based on the ecological perception paradigm.

2. *Guidance System:* this is mainly concerned with the development of guidance strategies for obstacle avoidance and path planning. Two bio-inspired approaches will be investigated and compared. The first one is the insect-inspired method using optic flow, and the second one is based on the *Tau-theory* which is originated from research on ecological psychology.
3. *Implementation and Flight Testing:* the PhD project will also involve the implementation of the proposed algorithms on aerial vehicles and evaluation of their performance through indoor and outdoor flight experiments.

In addition to these main research activities, the PhD student will be also involved in other projects and collaborative activities with other international universities and leading aerospace companies such as Boeing.

The PhD student will be **based at ARCAA or/and at CSIRO**.

**Qualifications:** Successful candidates must have a **Bachelor's degree with honours** (4-years degree) or a Master's degree in engineering or computer science. Moreover, they should:

- Demonstrate knowledge within one of the following subjects: mechatronics, robotics, aerospace or computer vision.
- Be interested in and capable of conducting high-quality research in the field of autonomous aerial vehicles.
- Have **good grades**.

**Funding:** The successful student will be **eligible for the Australian Postgraduate Awards (\$22,500 per annum for 3 years, tax exempt)**. He/she may also be eligible for the CSIRO top-up, which provides a tax-free stipend of about \$10,000 a year for three years of PhD study, additionally QUT BEE top-up are available for honour students up to a maximum of \$40,005. per annum, tax exempt.

### How to apply for this position:

Applicants should send **a CV, obtained grades and a cover letter** detailing their suitability to Dr. Kendoul and/or Dr. Mejias via email to [farid.kendoul@csiro.au](mailto:farid.kendoul@csiro.au) and/or [luis.mejias@qut.edu.au](mailto:luis.mejias@qut.edu.au)

For further information on the project or for an informal discussion, please contact:

Dr. Farid Kendoul, Tel: (+61) (0)7 3327 4050, Email: [Farid.Kendoul@csiro.au](mailto:Farid.Kendoul@csiro.au)

or

Dr. Luis Mejias, Tel: (+61) 0435 009 192, Email: [luis.mejias@qut.edu.au](mailto:luis.mejias@qut.edu.au)