



University of  
**Southern**  
Queensland

# Centre for Agricultural Engineering

## Robotics, Automation and Machine Vision

### Vision

To develop and deliver leading edge automation technology for agricultural and food production that will revolutionise practice.

### Overview

The team develops integrated advanced robotic sensing technologies that enhance automation in crop protection, biosecurity, livestock monitoring and the downstream processing of harvested produce.

We take pride in producing systems that add advantage and value to be adopted in practice through close collaboration with end users in the field.

Sensing, UAVs and robotics are in development within the centre to meet the demands of automatic machine operation within the natural environment and in natural mediums. Machine systems can be fully or semi-automatic and developed to deliver 'skilful' results consistently.

Machine perception is used to discriminate conditions in real-time such that robotic devices can respond within a 'skilful' context to produce outcomes with great consistency.

The work draws on the leading expertise of the team on software, electronics, mechanisms, sensing, control, machine learning and interfacing with 'big data'.

Typical on-farm autonomous systems are tractors and other machinery, spray nozzles for weed control and other plant specific therapies, drafting pens, discrimination of categories of livestock properties and processes for managing therapy efficiently. The team is also advancing new R&D in automating food and meat processing.

### Research Highlights

Through the support of our research partners, we have delivered the following:

- Commercialisation of weed sensing technology that distinguishes weeds from crop, operating at speeds of up to 20 km/h and using 80% less herbicide.
- Research Master Agreement with John Deere, recognising USQ's world-leading technological innovation and providing opportunities for researchers and their counterparts within the company to work together in the development of agricultural technologies.
- Development of new improved techniques for autonomous machine detection of crops and livestock, and provide the corresponding decision support for commercial users.



## Research Projects

- Projects cover a wide range of applications in agriculture, crop security, livestock monitoring and management, and food processing.
- Research on new fundamental technology for automation on farms of the future enhances our lead in developing enabling solutions from leading-edge techniques for users to meet their business aims in practice.
- Automated systems for agricultural land vehicles and UAV's.
- New automated sensing in crops for weed control, detection of predators, yield.
- Automated discrimination, measurement and monitoring of condition and behaviour of livestock for health, breed, control and yield.
- Automated robotic meat processing with the principal aim of consistent high quality product within the food and meat processing industry.



## Research Impact

- The team is a national leader in the agricultural application of sensor, robotic and computing technologies and now working with drone technology through several industry collaborations.
- Research impact is also evidenced through the development in 2014 of a machine vision field-ready prototype to discriminate between crops and weeds for targeted herbicide application with provisional patents lodged for this technology.
- Using machine vision to identify unhealthy crop areas will mean direct benefits for the cotton, grains, pastures and viticulture industries. Typical applications include distinguishing grass weeds and broadleaf weeds in sugarcane, horticulture and cotton.
- Research is aimed at increasing on-farm productivity by heading off crop health problems and reducing the use of unnecessary or poorly timed applications of herbicide, pesticide and fertiliser.



**Want to know more?**

07 4631 1871

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[cae.admin@usq.edu.au](mailto:cae.admin@usq.edu.au)

