Robotics & Agri-Intelligence

Prof Tristan Perez
Leader Qld DAF - Strategic Investment in Farm Robotics (SIFR)
Queensland University of Technology - QUT

2015 - Future of Work

Food Security

Will we be able to feed 9 billion people in 2050?

Australia faces a real challenge to ensure its participation in food production is both competitive and sustainable

ROBOTICS IN
AGRICULTURE

Robotics in Agriculture

Robot-enabled sensing

- Weed detection & classification
- Crop yield estimation
- Soil characteristics
- Flower & fruit detection and localisation
- Pest and disease detection & monitoring
- Harvesting of big data
- Animal health and quality monitoring

Robot-enabled Acting

- Herbicide application
- Alternative weed destruction
- Pest control agent application
- Pollination
- Harvesting
- Irrigation
- Animal intervention

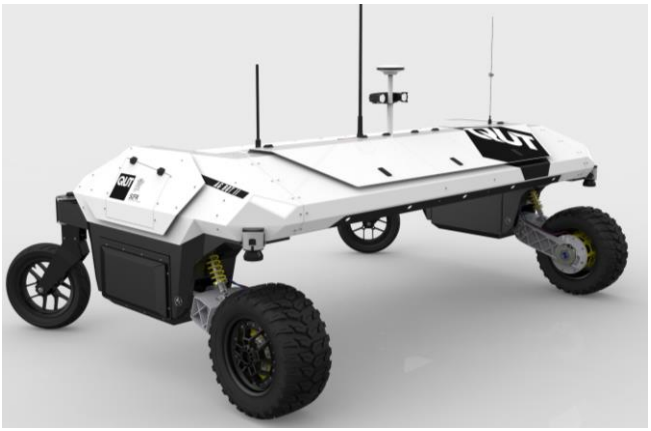
Agri-intelligent systems

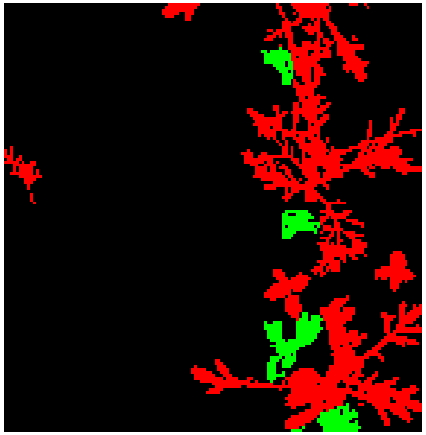
- Making sense of data - data analytics
- Risk-informed decision support - from data to decisions
- Improved strategies for spacio-temporal application of inputs
- Improved strategies for weed and pest management
- Harvest scheduling optimisation
- Improved business decisions

Enabling factors

- Trusted autonomy
- Regulation/ Certification
- Economics & business
- Legal
- Sociology
- Human-robot interactions

AgBots





- Lower soil compaction
- Optimised operation and multimode weed management
- Fault tolerance through physical redundancy
- Distributed sensing enabling new tools for Precision Agriculture (AgBot+UAV)
- Distributed action (Variable rate application of inputs for SSCM)
- Multi-purpose platform: weed, fertiliser, harvesting (horticulture)
- Long endurance and safe operation (day/night)
- Avoidance of casual workforce

AUDAX AT FIDELIS

Queensland Government

robot 0
robot 1
robot 2
robot 3
refuel station
robot 4
robot 5
Image © 2014 DigitalGlobe
Image © 2014 CNES / Astrium
©2010 Google
1294 m
Imagery Date: 9/19/2013
2001
lat 23.808167° lon 148.344288° elev 180 m
Eye alt 5.79 km

The Bigger Picture

Today

Optimise: inputs, yield, quality, responsiveness
Robust against yield/quality volatility, climate, incomplete information, weeds, pests

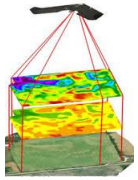
Inputs

Environment

Analyse, Decide

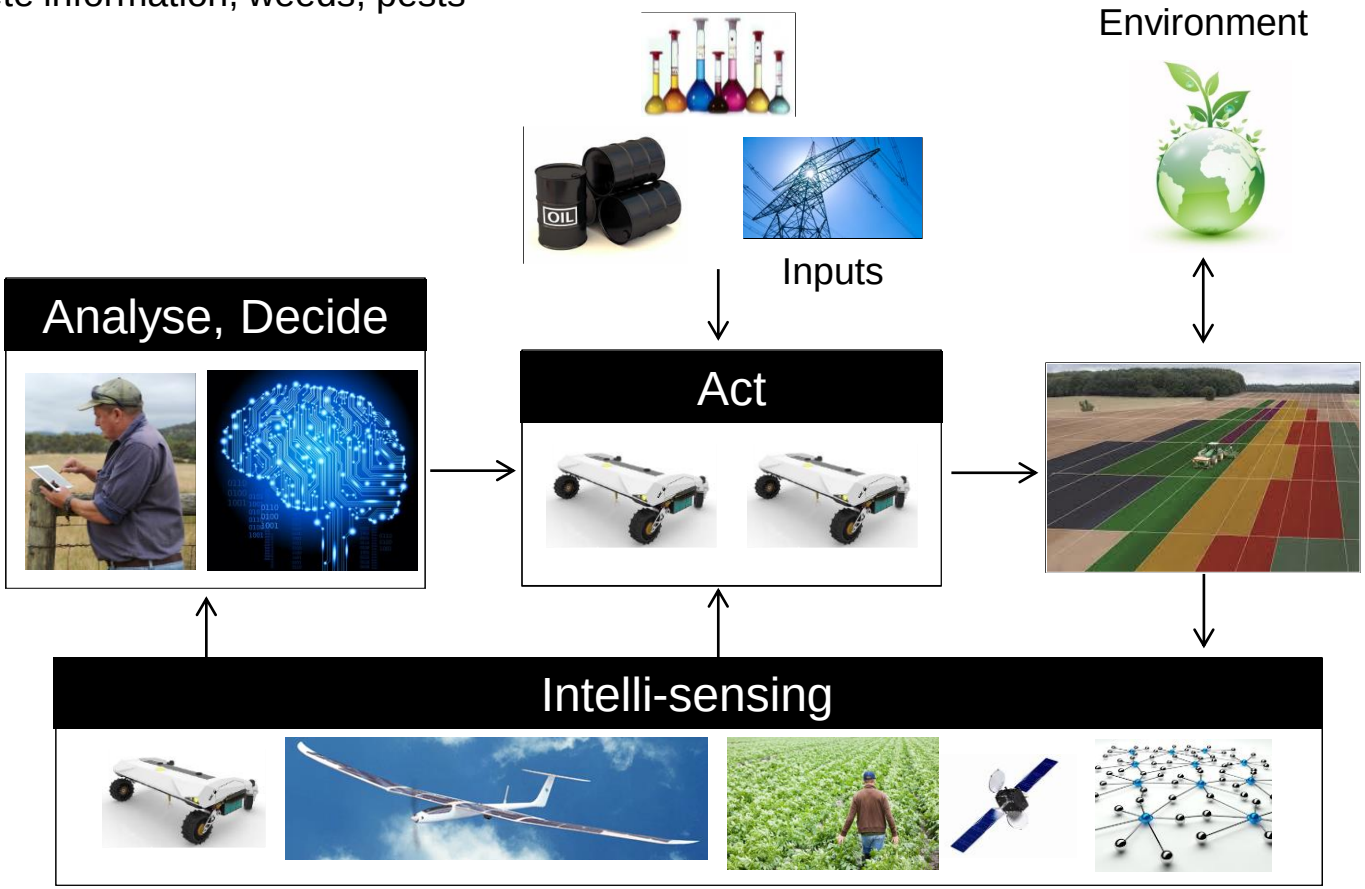
Act

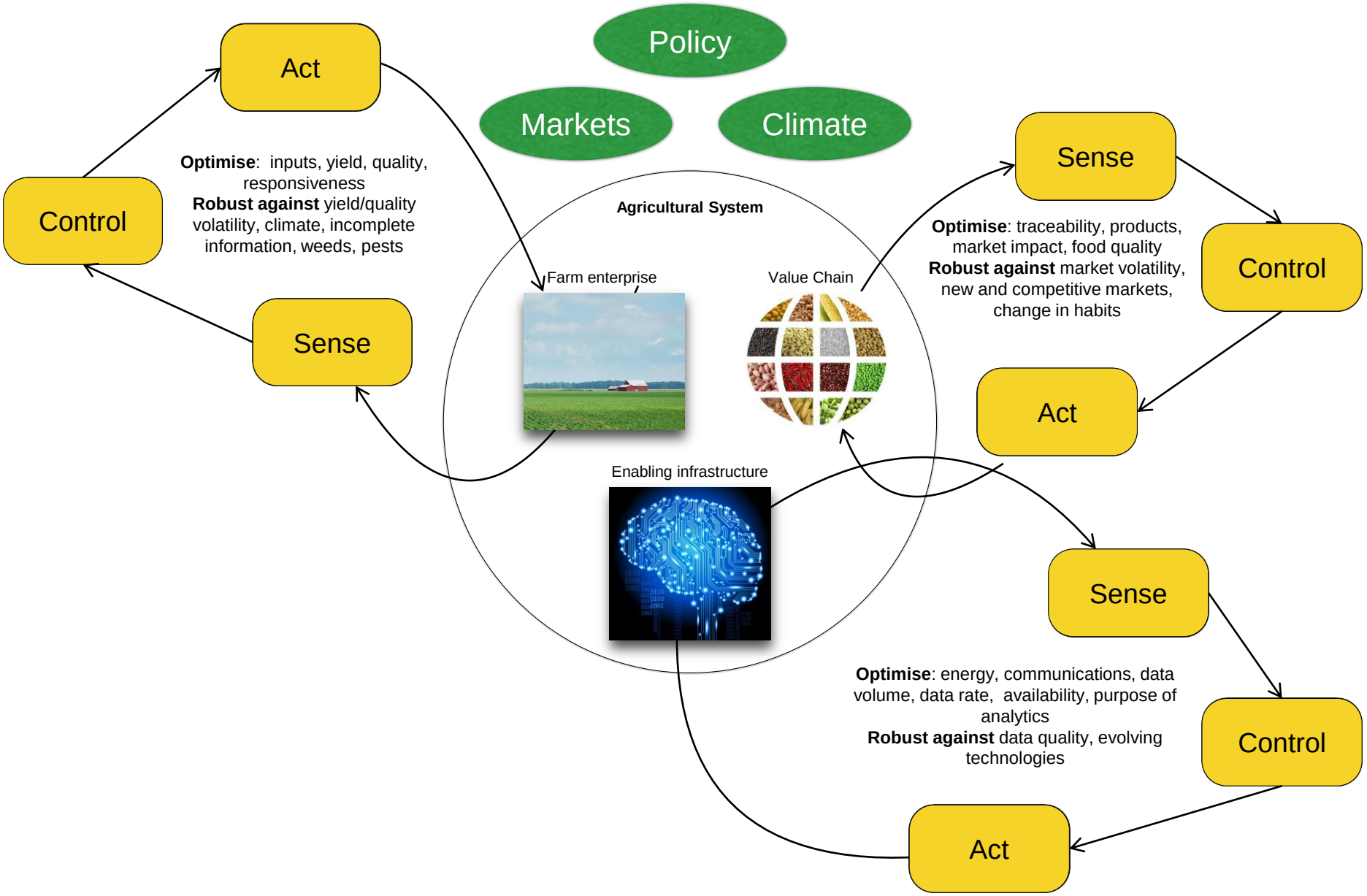
Sense



Tomorrow

Optimise: inputs, yield, quality, responsiveness
Robust against yield/quality volatility, climate, incomplete information, weeds, pests




Policy
Markets
Climate
Act
Control
Sense
Optimise: inputs, yield, quality, responsiveness
Robust against yield/quality volatility, climate, incomplete information, weeds, pests
Agricultural System
Farm enterprise
Value Chain
Enabling infrastructure
Sense
Control
Act
Optimise: traceability, products, market impact, food quality
Robust against market volatility, new and competitive markets, change in habits
Sense
Control
Act
Optimise: energy, communications, data volume, data rate, availability, purpose of analytics
Robust against data quality, evolving technologies

Future workforce