Robots for Fruit & Vegetables: what's next?

Salah Sukkarieh

THE UNIVERSITY OF SYDNEY
Australian Centre for Field Robotics


Beijing
北京
North Korea
Sea of Japan
Seoul
서울
South Korea
Nagoya
名古屋
Japan
Yellow Sea
Tokyo
東京
Osaka
大阪
China
Shanghai
上海
East China Sea
epal
Bhutan
Taipei
台北
Bangladesh
Taiwan
Myanmar
(Burma)
Hong Kong
香港
Laos
Philippine Sea
Thailand
Luzon
Vietnam
Bangkok
กรุงเทพมหานคร
Bay of Bengal
Cambodia
Philippines
Andaman Sea
Ho Chi
Minh City
Gulf of
Thailand
Palawan
Negros
Malaysia
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From Autonomous Robots to Autonomous Operations

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Tree Crop Intelligence

Automated data analytic solutions for the tree crop industry

2012 to present: Tree Crops

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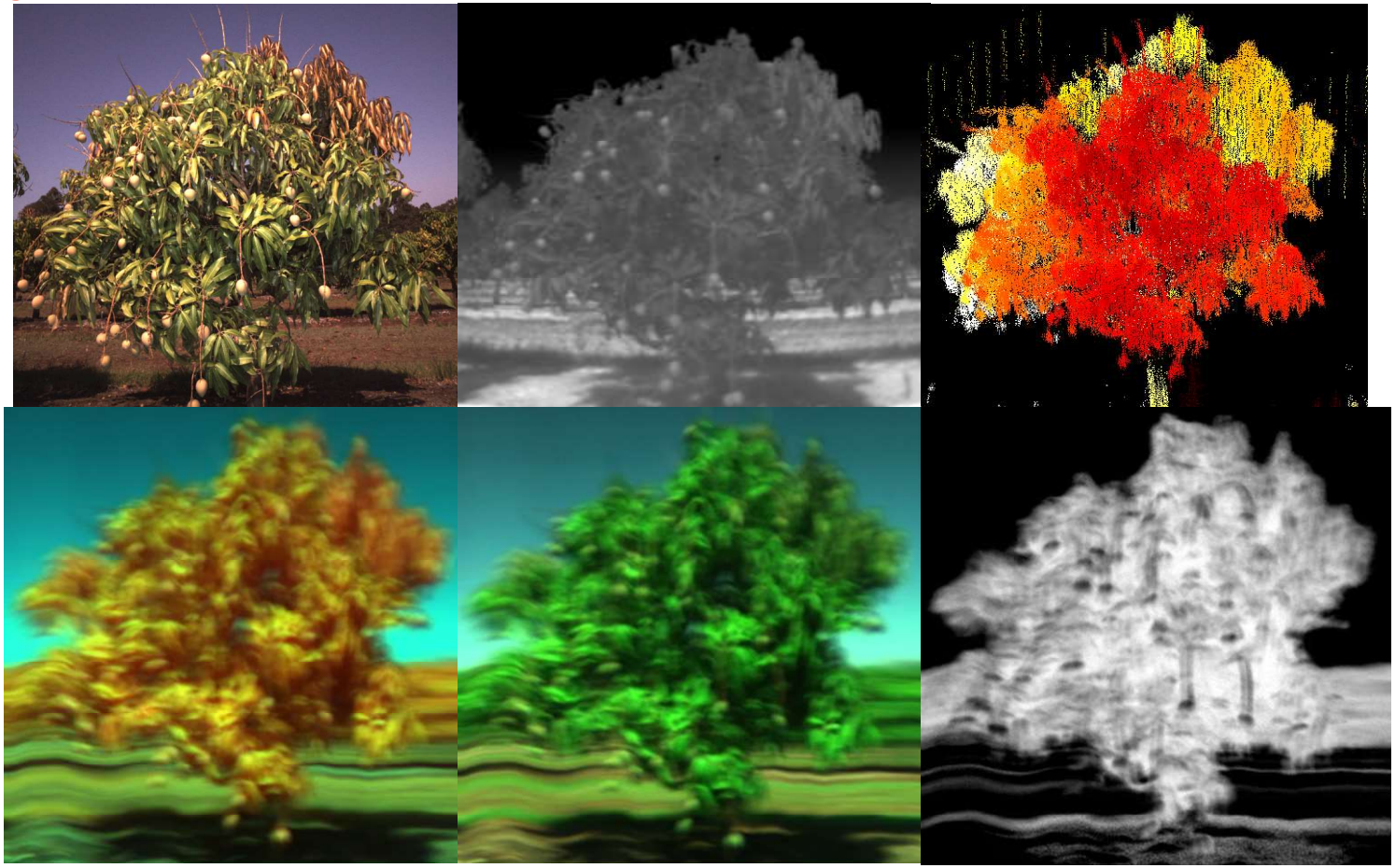
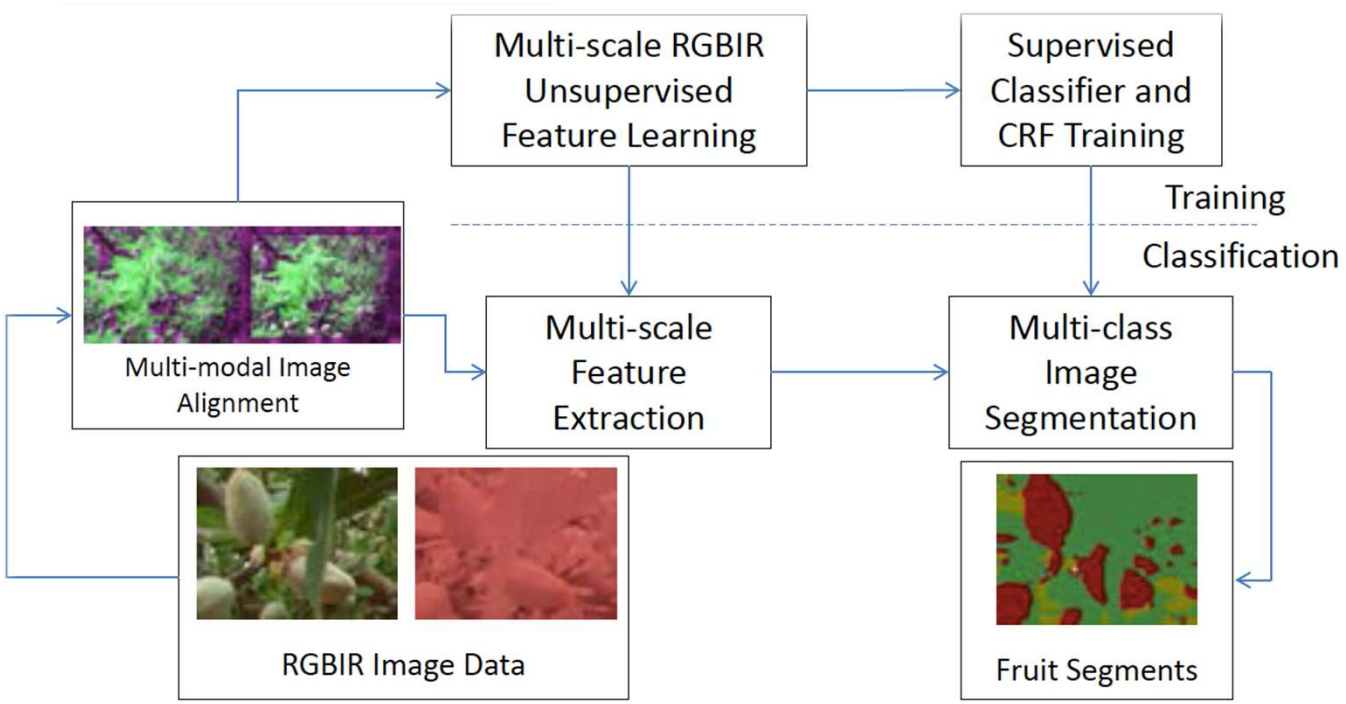
The Idea

Many ways to see a tree



The Idea



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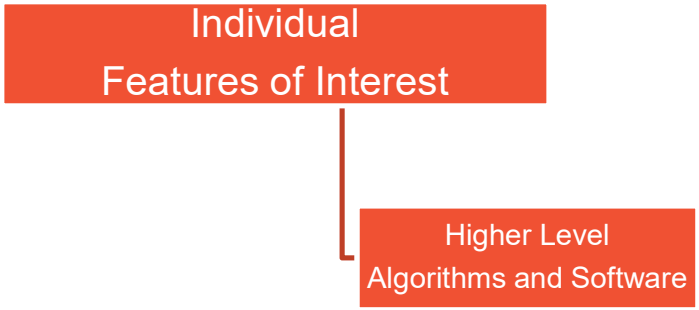
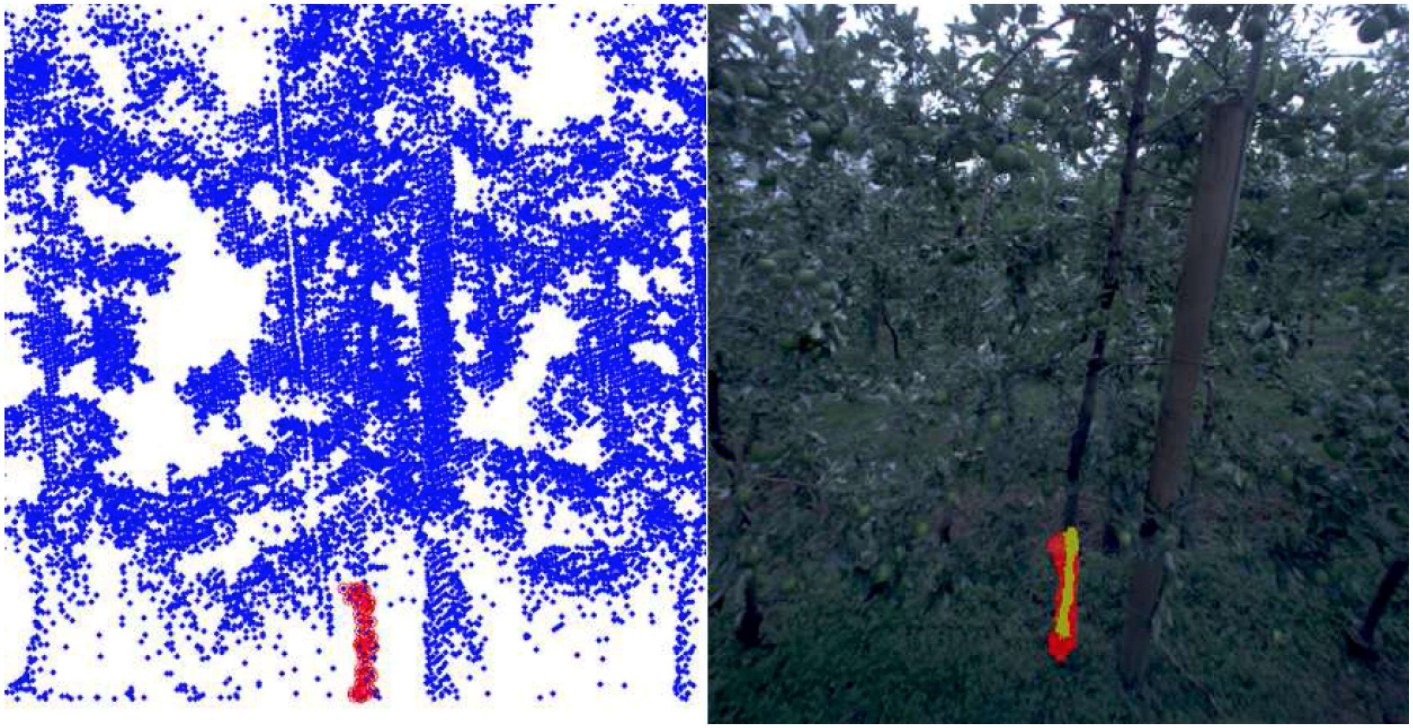
The Idea

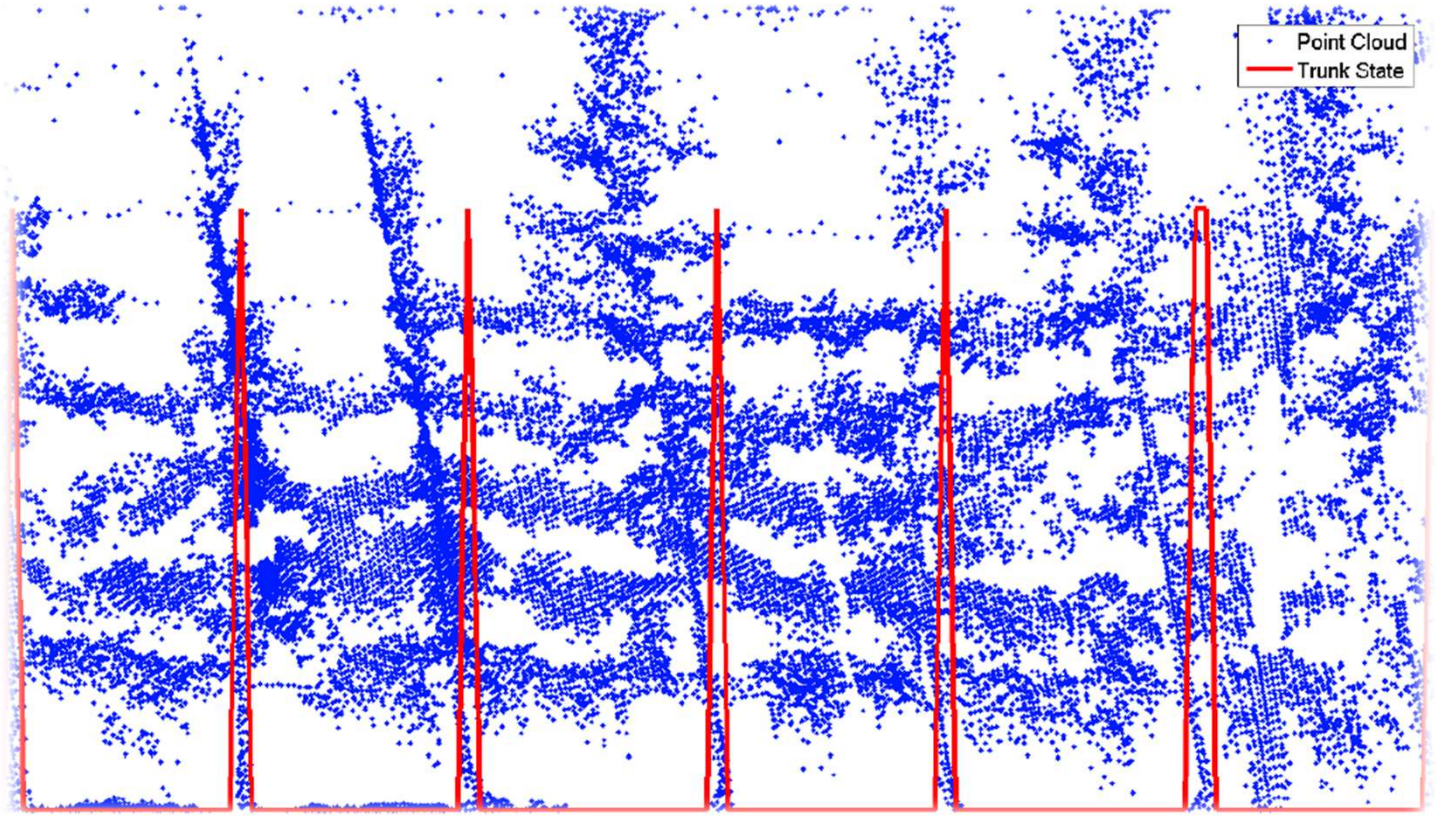

Individual
Features of Interest
Higher Level
Algorithms and Software

In the field

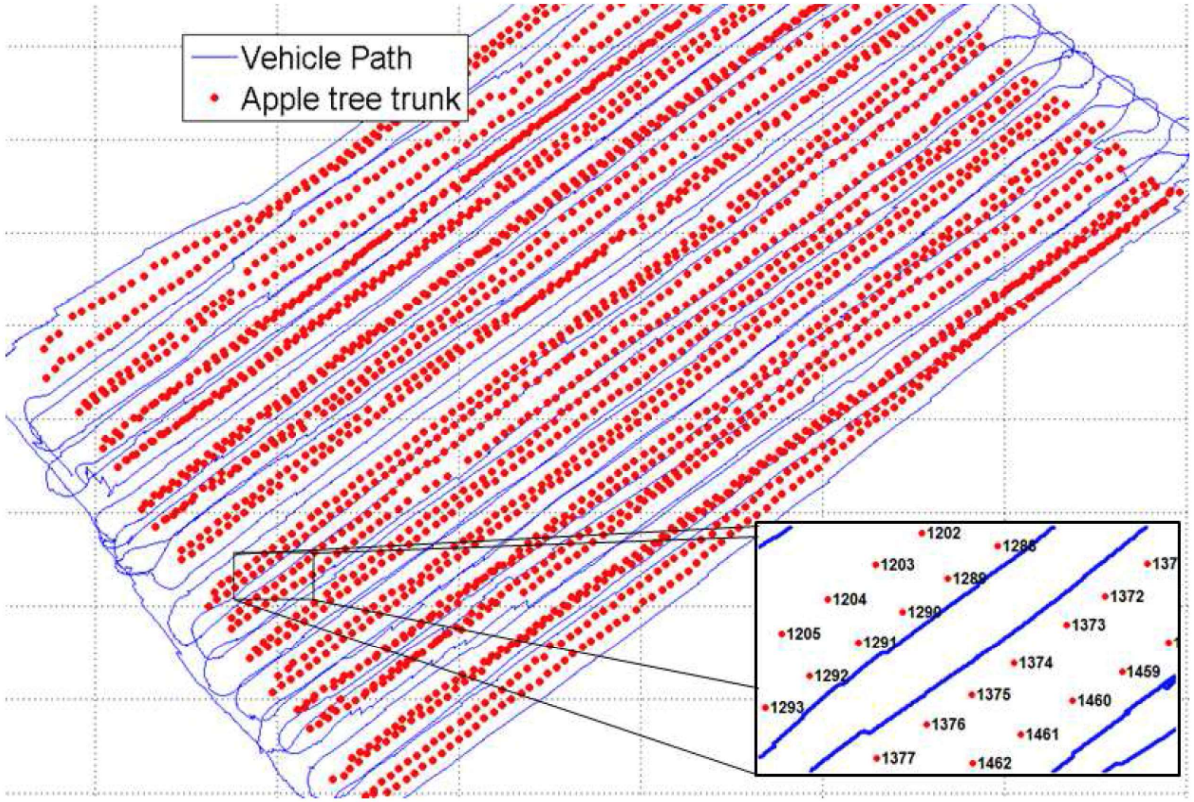
Picking out the tree trunk



Pulling out the tree



Clean Data Map



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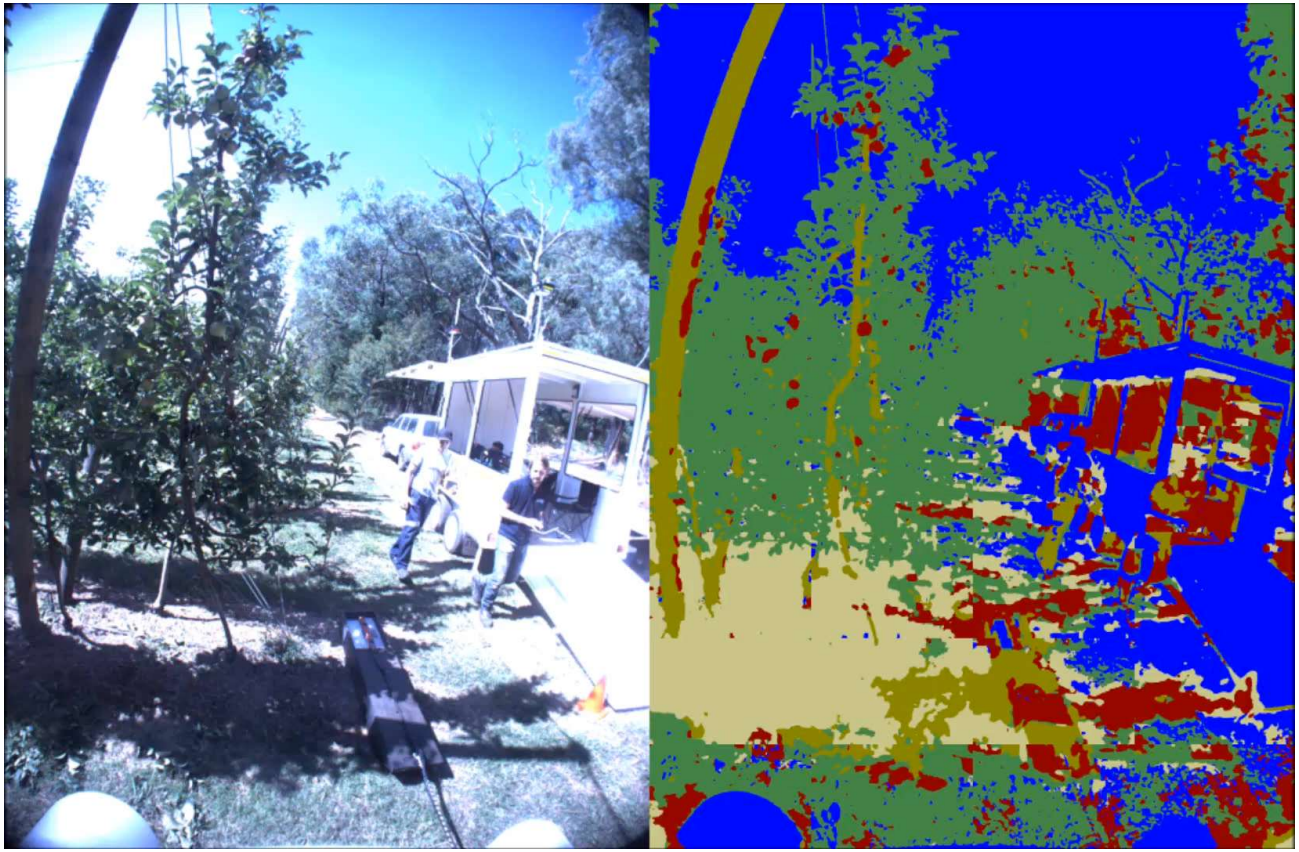
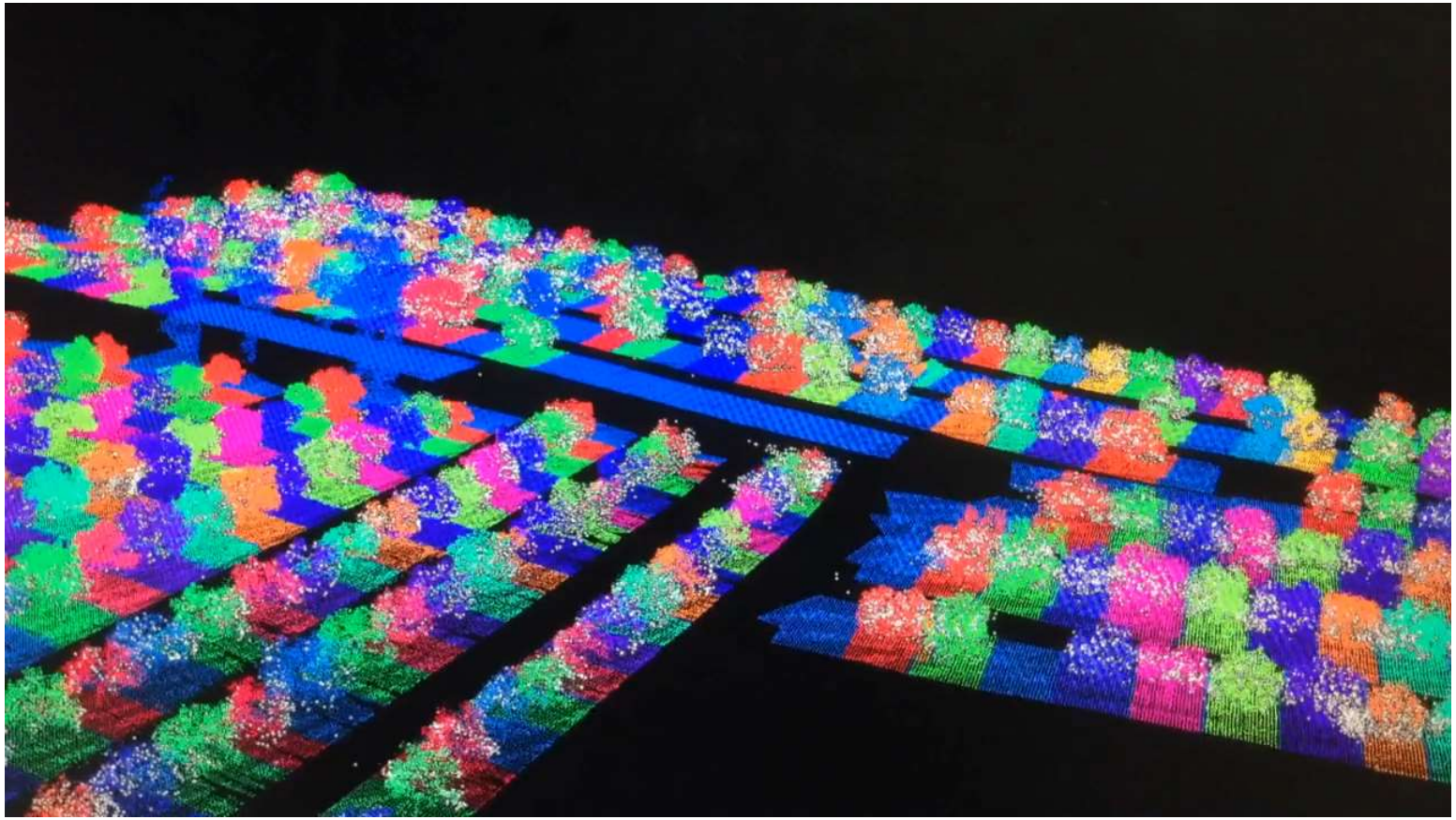
Detecting the flowers

Detecting the apples

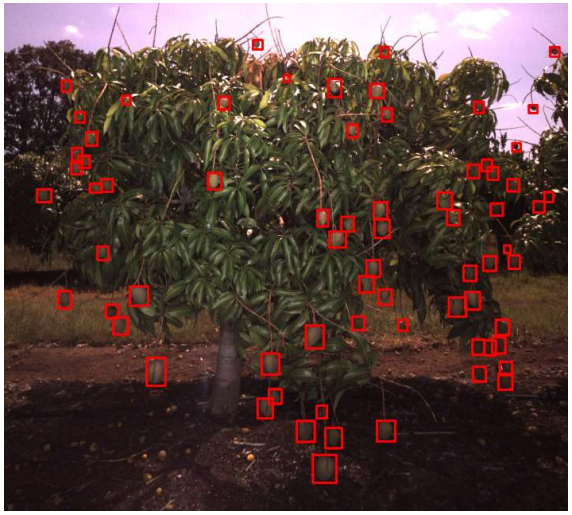


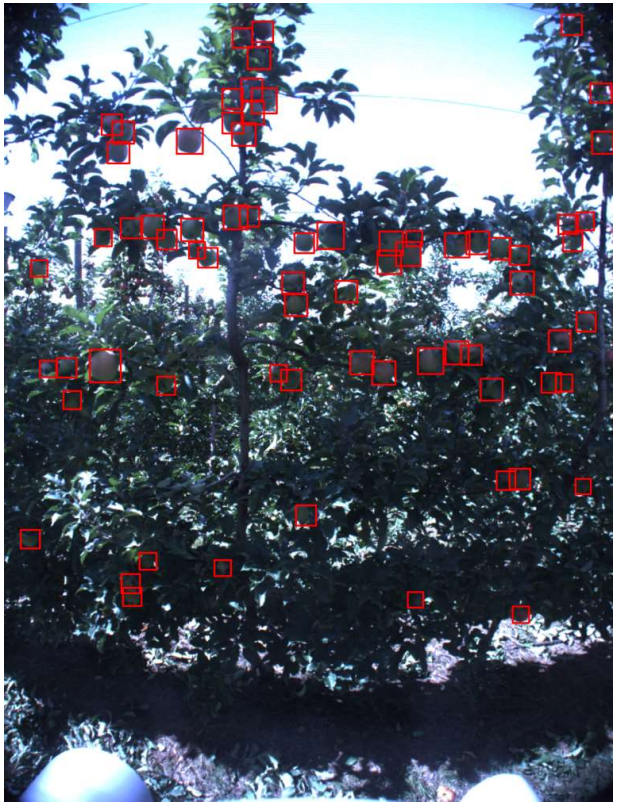
Mangoes

Mangoes



Applicable to different crops





Light Interception

Novel Robotic Systems

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Row Crops

Robotics, data analytics and decision support systems for the vegetable industry

2013 to present: Ladybird

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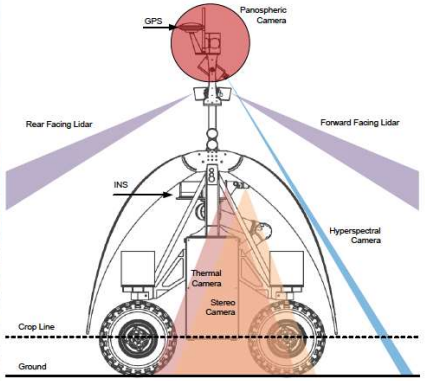
Ladybird – Science and Research Platform

(a) scanning a field



(b) sensor configuration

(c) covers lifted

(d) complete system

Data collection

RIPPA – 24/7 robot for the vegetable industry

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2015 to present: RIPPA + Subsystems for Vegetables

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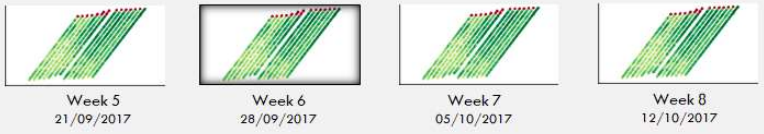
Foreign Object Removal

Operational Crop and Soil Mapping

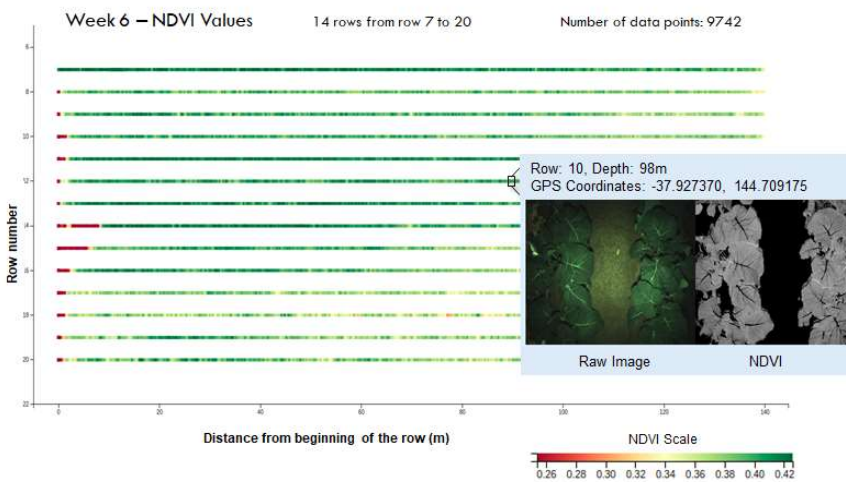
Farm: ACFR test
Mapped area: Paddock 5
Rows: 14, Length: 145m

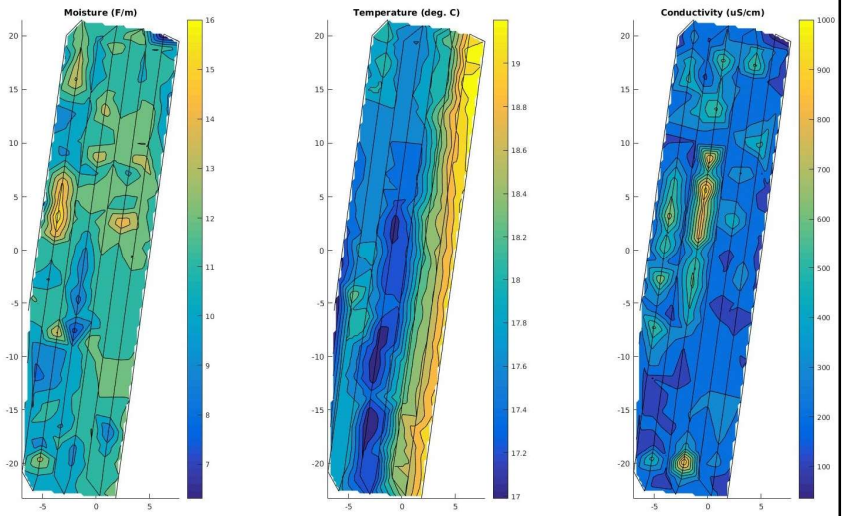


Crop metrics
Crop: Broccoli
Plants: 12154
Avg Size: 164cm²
Avg NDVI: 0.39

Weed metrics
Weeds: 253
Avg Size: 16cm²

Foreign Objects
Objects: 23





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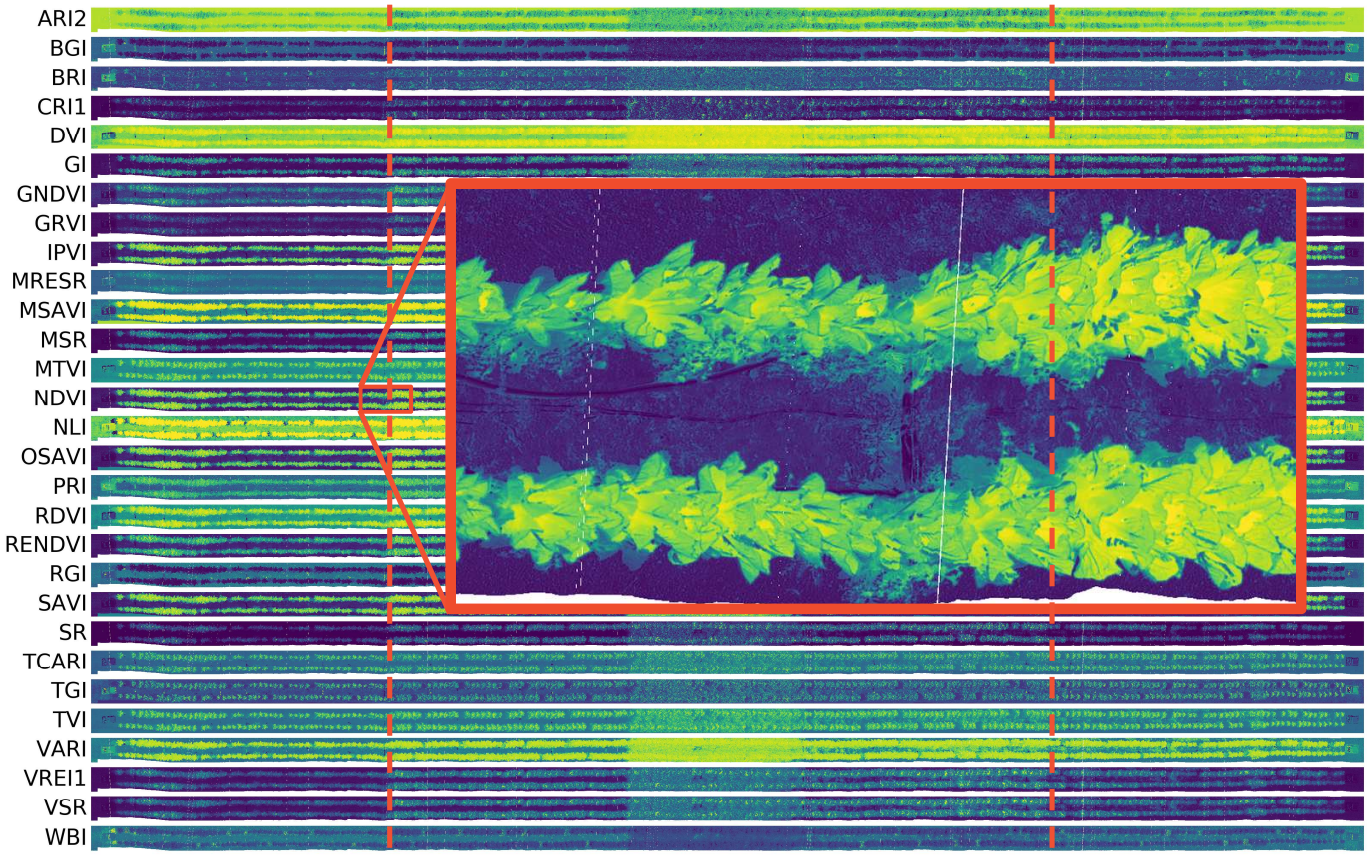
Growth Model to Fertiliser Need – Individualised



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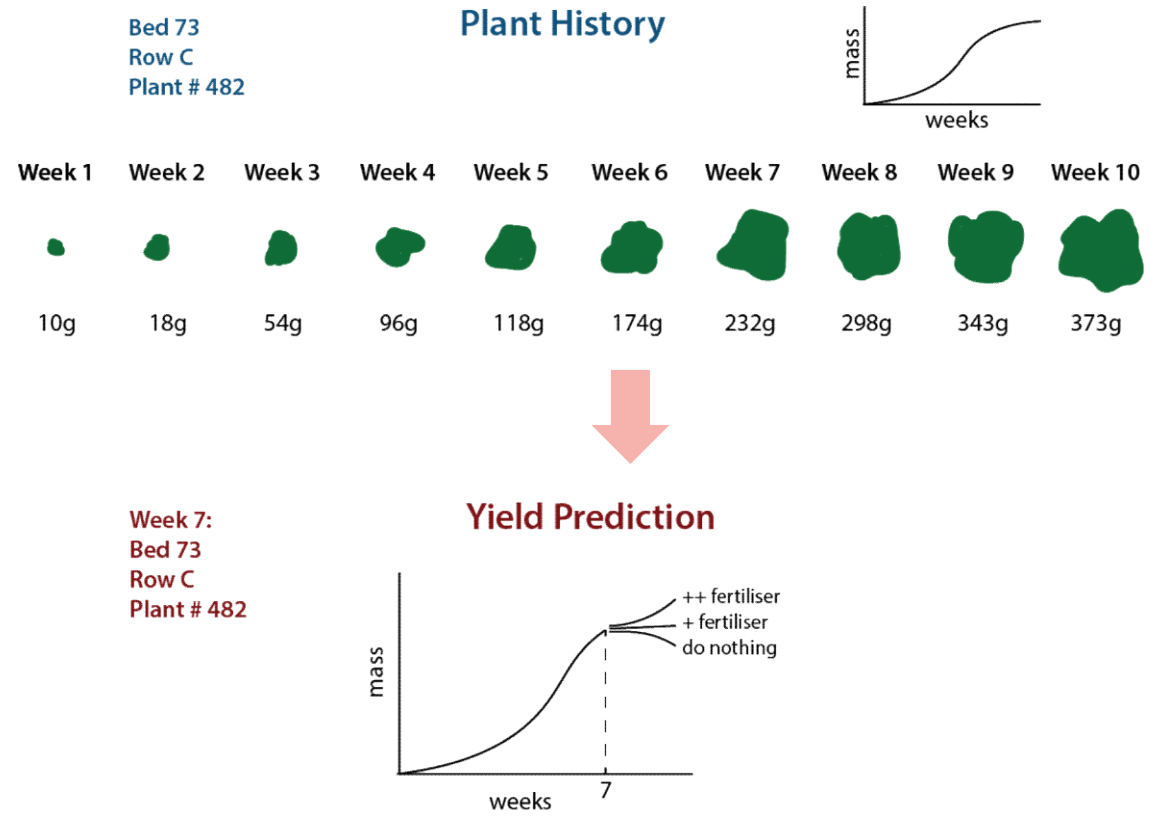
Next Steps – Yield Prediction and Variability Reduction

Growth models

Fertiliser needs



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2017: RIPPA + Subsystems for Tree Crops

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Small Holder Farmers

Off-the-shelf components to build low cost agriculture robots for small-holder farmers

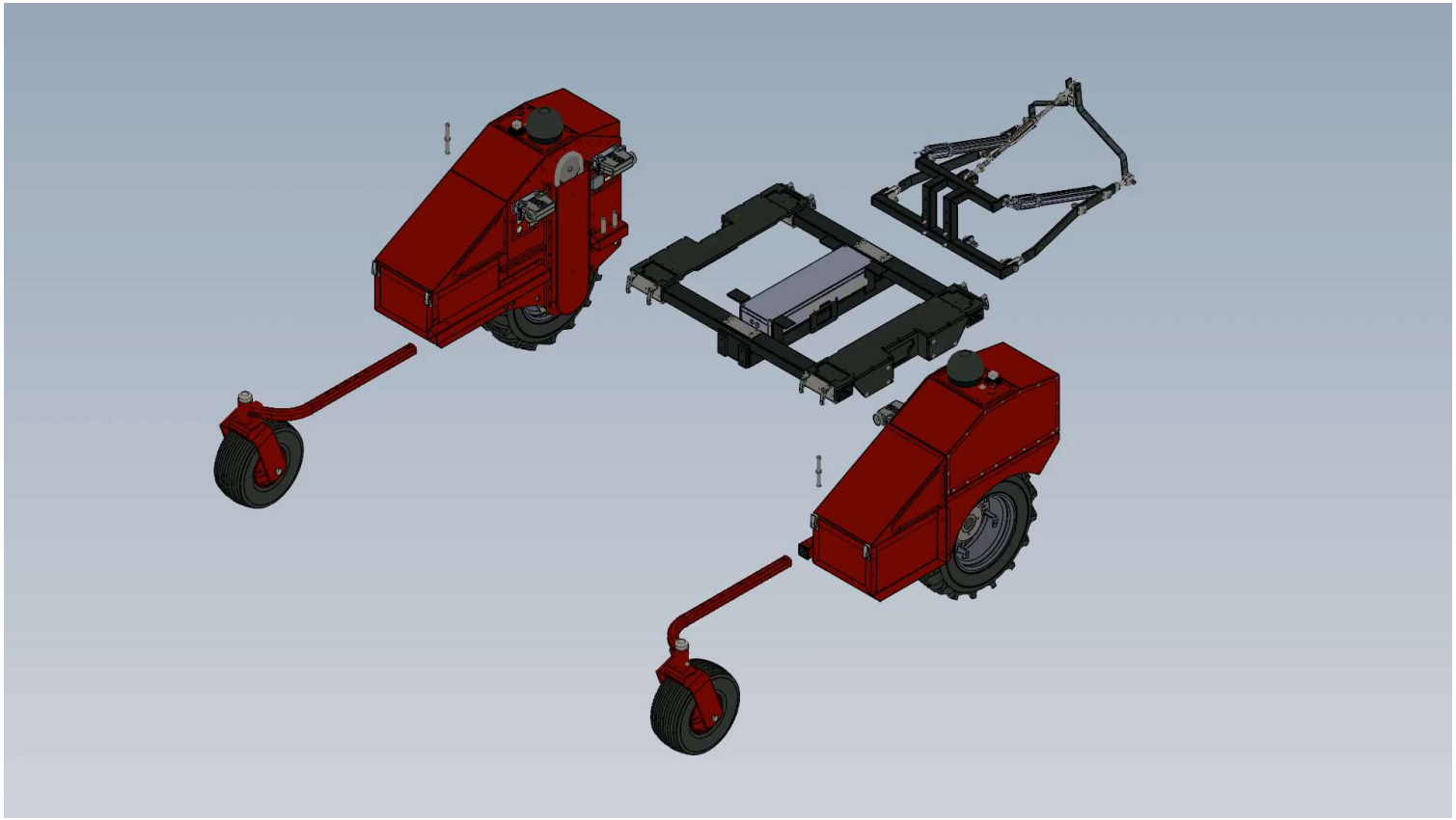
2016: Low cost and easy to assemble

2017: Mum and Dad farm trial

Commercial Small Holder Farmers

Indonesia Trial

Modularity



Fiji and Samoa

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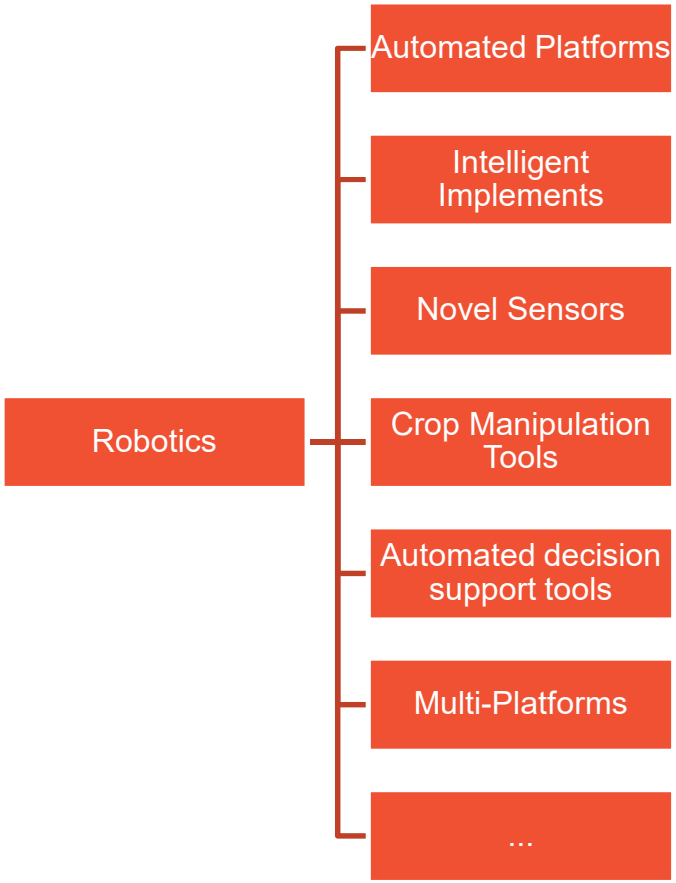
Where to from here?

Spin-in and Spin-out technologies…



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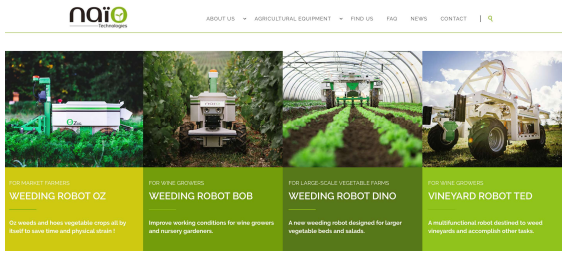
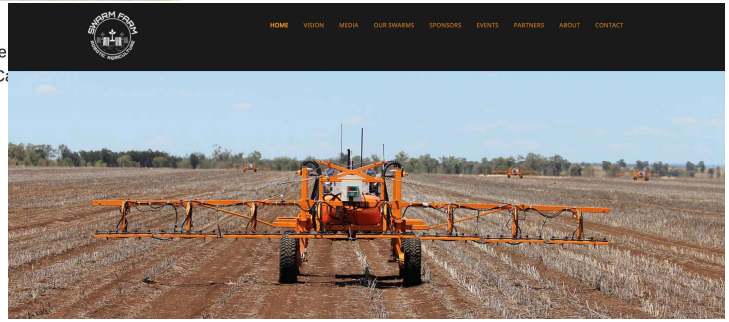
Commercial Ground Robotics for Ag - examples

Autonomous tractor unveiled



Autonomous Tractor Corporation Aims to be the Tesla for Tractors

Case IH unveiled an autonomous concept vehicle
Boone, Iowa. The concept vehicle is a cab-less C



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From Autonomous Robots to Autonomous Operations

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Things to consider…

- Ultimate prize is not the robot itself – (except if you're a tech company)
  - (the drive for reducing labour cost is a side-show)
- Naturally heading down the path of semi/automated operations
  - Increasing information/knowledge => better decision making
  - Undertaking actions in an semi/automated and predictable/responsive manner
  - Supply Chain
    - Increasing yield/quality/efficiencies and reducing variability, chemicals etc
    - Information passed beyond the farm gate
    - Decentralised? Agile?

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