THE UNIVERSITY OF MELBOURNE

UAV-borne Infrared Thermography for Plant Water Stress

Department of Economic Development, Jobs, Transport & Resources

State Government Victoria

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Team

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- **Dr Sigfredo Fuentes** (Agriculture and Food Systems, The University of Melbourne)
- **Dr Mark O'Connell** (Agriculture Research/Horticulture Production Science, Dept of Environment and Primary Industries)
- **Mr Andrew Nolan** (Digital Falcon Pty. Ltd.)
- **Dr Richard Collmann** (Victorian Partnership for Advanced Computing/V3 Alliance)
- Kate Park (UoM), Yue Wang (UoM), Esther Hernandez, Lisa Kimmorley (Curly Flat Winery), etc.

Project Overview

- Efficient irrigation for orchards and vineyards requires timely monitoring of plant water stress

- Carefully controlled water stress can also improve wine and fruit quality

- Thermal infrared sensing can provide instantaneous measurement of plan water stress

Why UAV?

- Typical measurement support (individual canopies to trees) and extent (a few km^2 to 100's km^2) for fruit orchards and vineyards make satellite- and ground-based monitoring unideal options

- Optical/infrared imaging sensors onboard UAV can fill the large spatial gap between the satellite (coarse support) and ground measurements (small spatial extent)


[http://7-themes.com]

ISF Themes

- Boosting productivity and competitiveness by innovation: Proposed low-cost sensing system can boost productivity by enabling timely provision of water.

- Research and innovation for high quality produce: Innovative control of water stress for enhanced quality requires accurate and real-time monitoring of water status over large region.

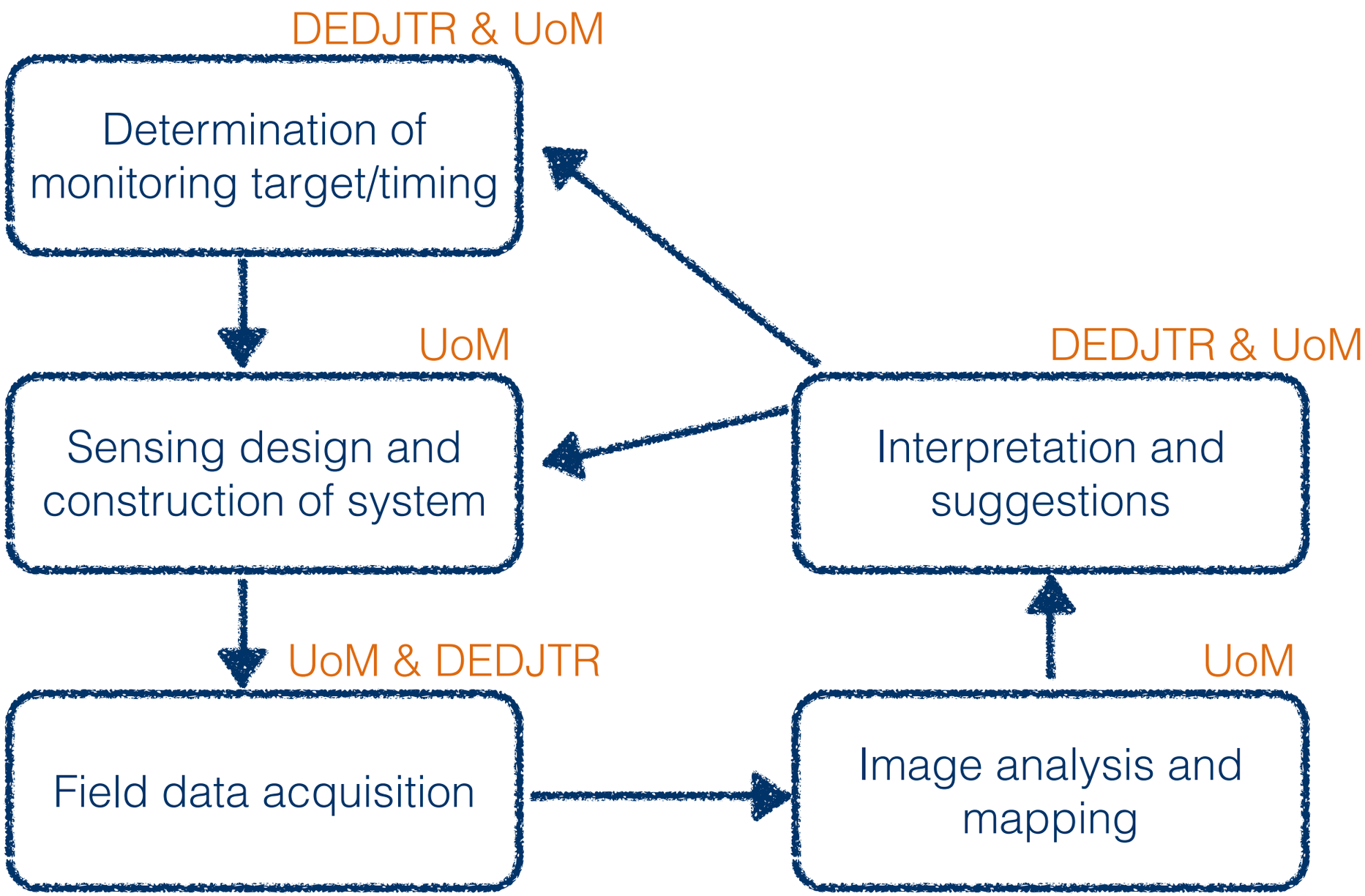
- Rapid detection, response and management of pests and disease: An important by-product of this work is early detection of non-waterborne plant stresses, such as insect infestation or plant diseases.

- Agricultural Drones at the top of 10 Breakthrough Technologies by 2014 MIT Tech Review

- Many existing works for 'proof of concept' but still with large skill gap in 1) quantitative mapping; 2) real-time application; 3) full automation of mapping water stress over large regions

http://www.technologyreview.com/lists/technologies/2014/

Collaboration



Expected Outcomes

- Innovative methods to detect early symptoms of water stress in fruit orchards and vineyards

- Demonstrated capability of the UAV-borne sensing for mapping plant water stress (and other stresses) at high-resolution

- Strengthened collaboration between DEPI and UoM to advance practical applications of fast developing UAV-borne sensing technology and to enable more widespread adoption of the innovation

- Exploration of new research revenues stemmed from the main research topic proposed in this work

Progress So Far…

- UAV-borne field campaigns have been conducted in stone fruit orchard (Tatura) and vineyard (Lancefield) sites in February 2015.








Progress So Far…

- Thermal images over the peach orchard site (Tatura) showed 3~5 K difference between the ‘Water Deficit’ and ‘Control’ groups