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Project 4.12 | Estimating trunk diameter at breast height for scattered eucalyptus trees: a comparison of remote sensing system and analysis techniques

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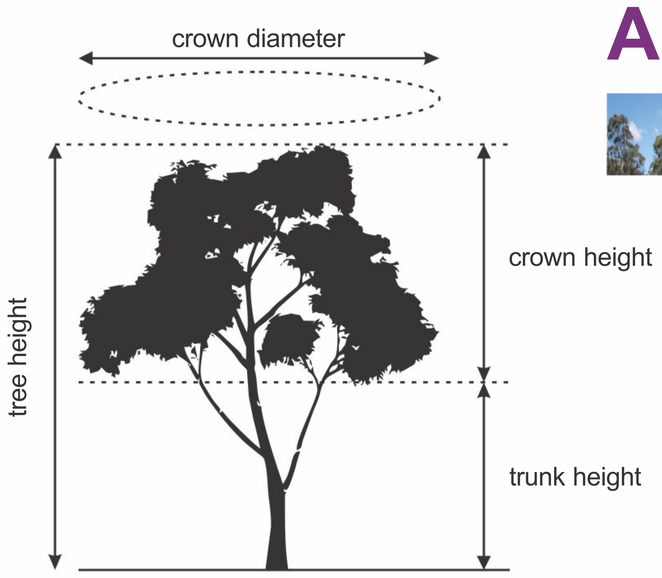
Project Participants University of New England, Queensland University of Technology
Land and Property Information (NSW)

Objectives To develop allometric relationships between diameter at breast height (DBH) and tree dimensions (canopy size and height) for scattered eucalyptus trees in an Australian farmscape

- To investigate optical remote sensing for inferring DBH from these measurables
- Investigate use of remote sensing for inferring stem density (tree clusters), canopy volume and species

Outcomes For using tree canopy parameters to estimate DBH, image-based remote sensing (multispectral) performs as well, if not better, than LiDAR-derived data



A Typical Farmscape

Methodology

Allometric equations created for five species of eucalyptus in the North western region of New South Wales based on field based measurements, and using regression methods

Estimation of tree characteristics like canopy area, tree height, stem density (Tree clusters) using multi sensor remote sensing datasets of submetre resolution

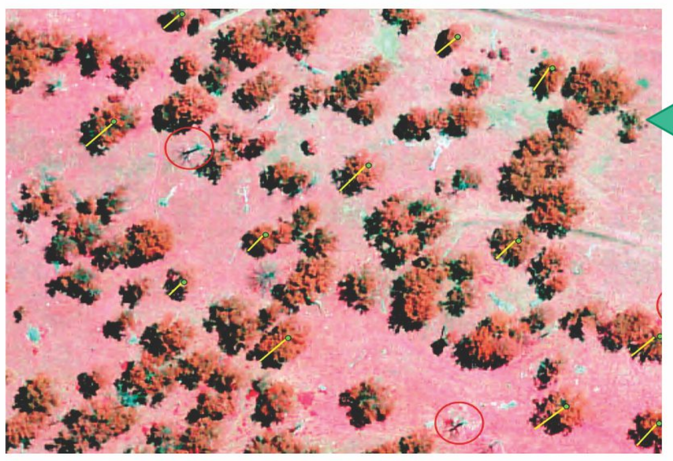
An allomteric model to estimate canopy volume using optical remote sensing and regression methods

Comparison of performance of multispectral image and LiDAR data, and data fusion for species classification

1) Project Achievement #1:
Allomteric equations developed to estimate DBH for single and clustered Eucalyptus trees

Equation	R^2	F-stat	p	MPE (m)
ln(DBH) = 2.10229 + 0.61742 ln(Ht)	0.31	37.4	<0.0001	0.16
ln(DBH) = 2.40568 + 0.42616 ln(CA)	0.68	181.6	<0.0001	0.16
ln(DBH) = 2.64742 + 0.15142 ln(Ht) + 0.38002 ln(CA)	0.59	60.1	<0.0001	0.14

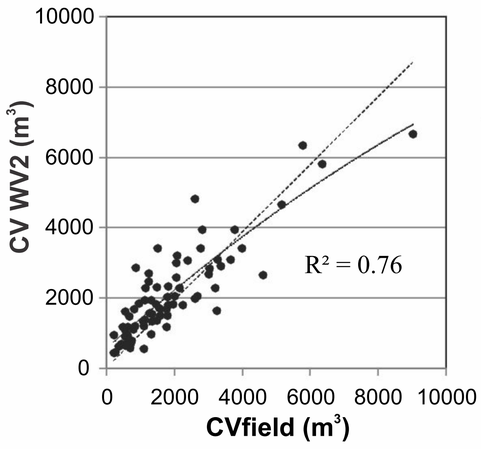
2) Project Achievement: #2 : Information on tree characteristics like tree height and crown area can be extracted from remote sensing data sets.

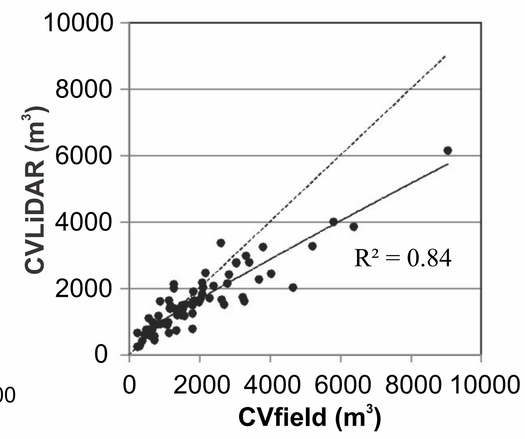


Tree height by shadow length measurements and applying corrections for sun angle and solar azimuth

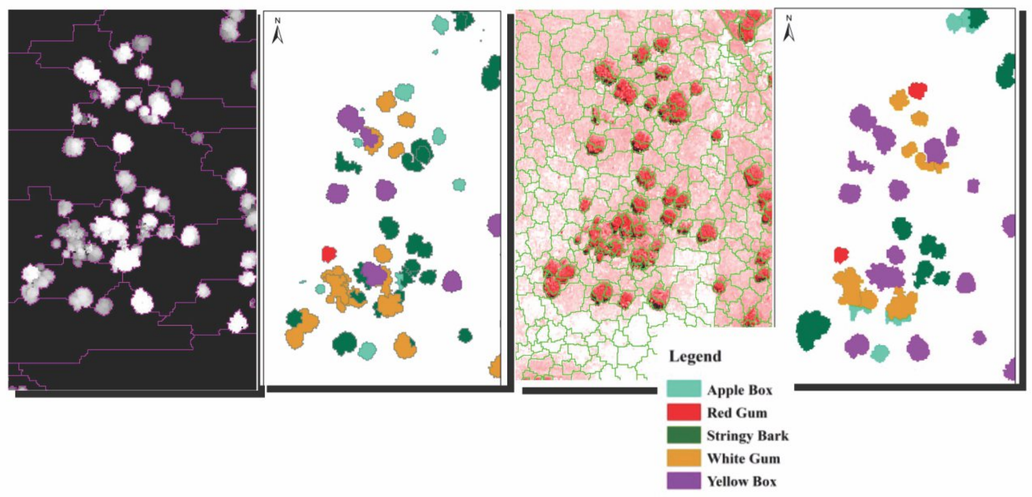
Crown area by segmentation and classification

3) Project Achievement #3 : Canopy volume a three dimensional attribute can be estimated using multispectral data





4) Project Achievement: #4 : Species can be classified at better accuracy by fusing multispectral and LiDAR data



Future Work

- The developed model should now be validated in other areas.

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