BUNCH RACHIS RECONSTRUCTION FROM A SINGLE IMAGE

DR MARK WHITTY
m.whitty@unsw.edu.au
Berry Counting and Bunch Reconstruction (Dr Scarlett Liu)

<table>
<thead>
<tr>
<th>Harvest stage</th>
<th>Berry Counting Accuracy [%] across 120 samples</th>
</tr>
</thead>
<tbody>
<tr>
<td>40A (CHA)</td>
<td>98.5</td>
</tr>
<tr>
<td>47A (SHI)</td>
<td>91</td>
</tr>
<tr>
<td>B12 (CHA)</td>
<td>98.3</td>
</tr>
</tbody>
</table>

BUNCH ARCHITECTURE (BOLAI XIN)
BUNCH ARCHITECTURE (Bolai Xin)

(a) Attenuation curve fitting for rachis internode, twig internode (b), sub-twig internode (c)

BUNCH ARCHITECTURE (BOLAI XIN)

## Bunch Architecture (Bolai Xin)

<table>
<thead>
<tr>
<th>Overall length error</th>
<th>Rachis internodes [% error]</th>
<th>Secondary internodes [% error]</th>
<th>Tertiary internodes [% error]</th>
<th>Pedicels [% error]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Schöler (2015)</td>
<td>-</td>
<td>29.6</td>
<td>-11.1</td>
<td>21.3</td>
</tr>
<tr>
<td>Proposed approach</td>
<td>3.5</td>
<td>14.6</td>
<td>-1.5</td>
<td>0.1</td>
</tr>
</tbody>
</table>

BUNCH ARCHITECTURE (BOLAI XIN)
RACHIS RECONSTRUCTION (Yiwei Han)
FLOWER COUNTING

Liu S; Li X; Wu H; Xin B; Tang J; Petrie P; Whitty M, 2018, 'A robust automated flower estimation system for grape vines', Biosystems Engineering, vol. 172, pp. 110 - 123, http://dx.doi.org/10.1016/j.biosystemseng.2018.05.009
RAPID + NON-DESTRUCTIVE MATUREITY ESTIMATION
BY MULTISPECTRAL SENSING (JULIE TANG)
Vine Water Stress

Smart Robotic Viticulture  Tools

This app is compatible with all of your devices.

\[ CWSI = \frac{T_{\text{canopy}} - T_{\text{wet}}}{T_{\text{dry}} - T_{\text{wet}}} \]

Mark Whitty
http://www.robotics.unsw.edu.au/srv/
## Remote Sensing of Non-Productive Vine Canopy

<table>
<thead>
<tr>
<th>Block</th>
<th>Ground-truth</th>
<th>Estimated</th>
</tr>
</thead>
<tbody>
<tr>
<td>40A (2015)</td>
<td>3.77%</td>
<td>3.47%</td>
</tr>
<tr>
<td>47A (2015)</td>
<td>18.48%</td>
<td>17.29%</td>
</tr>
<tr>
<td>40A (2016)</td>
<td>6.00%</td>
<td>5.52%</td>
</tr>
<tr>
<td>47A (2016)</td>
<td>6.74%</td>
<td>5.33%</td>
</tr>
</tbody>
</table>

Microscope Image Analysis (Luke Millstead)
Liu S; Whitty M. 2015, 'Automatic grape bunch detection in vineyards with an SVM classifier', *Journal of Applied Logic*, vol. 13, pp. 643 - 653, [http://dx.doi.org/10.1016/j.jal.2015.06.001](http://dx.doi.org/10.1016/j.jal.2015.06.001)
YIELD ESTIMATION AND MAP GENERATION

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http://www.robotics.unsw.edu.au/srv/
UNSUPERVISED FEATURE SELECTION AND CLASSIFICATION

Vine Structure From GoPro Video – Annie Wang
VARIABLE RATE SPRAYER FOR APPLE FLOWER THINNING

Mark Whitty
http://www.robotics.unsw.edu.au/srv/

School of Mechanical and Manufacturing Engineering
UNSW Australia
Thank you!

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Contact:
Dr Mark Whitty
m.whitty@unsw.edu.au

Smart Robotic Viticulture
Paper list

PETRIE PR; WANG Y; LIU S; LAM S; WHITTY MA; SKEWES MA, 2019, 'The accuracy and utility of a low cost thermal camera and smartphone-based system to assess grapevine water status', *Biosystems Engineering*, vol. 179, pp. 126 - 139, [HTTP://dx.doi.org/10.1016/j.biosystemseng.2019.01.002](http://dx.doi.org/10.1016/j.biosystemseng.2019.01.002)

LIU S; LI X; WU H; XIN B; TANG J; PETRIE P; WHITTY M, 2018, 'A robust automated flower estimation system for grape vines', *Biosystems Engineering*, vol. 172, pp. 110 - 123, [HTTP://dx.doi.org/10.1016/j.biosystemseng.2018.05.009](http://dx.doi.org/10.1016/j.biosystemseng.2018.05.009)


JAYAKODY H; LIU S; WHITTY M; PETRIE P, 2017, 'Microscope image based fully automated stomata detection and pore measurement method for grapevines', *Plant Methods*, vol. 13, [HTTP://dx.doi.org/10.1186/s13007-017-0244-9](http://dx.doi.org/10.1186/s13007-017-0244-9)

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Whitty M;Liu S;Cossell S;Jayakody H;Woods M;Tang J;Singh S;van Kerk Oerle P;Wiseham D;Liu S;Davidson A;Stocco T;Jarrett J;Jarrett P;Wotton C;Shepherd J;Lim S;Petrie PR;Dunn G, 2017, Improved yield prediction for the Australian wine industry, Wine Australia, Adelaide, South Australia, DPI1401, [https://www.wineaustralia.com/au/research/search/completed-projects/dpi-1401](https://www.wineaustralia.com/au/research/search/completed-projects/dpi-1401)

Cossell S;Whitty M;Liu S;Tang J, 2016, 'Spatial Map Generation from Low Cost Ground Vehicle Mounted Monocular Camera', in *IFAC PAPERSONLINE*, ELSEVIER SCIENCE BV, Seattle, WA, pp. 231 - 236, presented at 5th IFAC Conference on Sensing, Control and Automation Technologies for Agriculture (AGRICONTROL), Seattle, WA, 14 - 17 August 2016, [http://dx.doi.org/10.1016/j.ifacol.2016.10.043](http://dx.doi.org/10.1016/j.ifacol.2016.10.043)


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Liu S; Marden S; Whitty M, 2013, 'Towards automated yield estimation in viticulture', in Australasian Conference on Robotics and Automation, ACRA