

Individual Tree LiDAR:

Tom Adams, David Pont, Jonathan Harrington
6th October 2010



Different knowledge applies at different scales – but it is all useful!

- This stand was planted in 1982, it should be ready in 2010



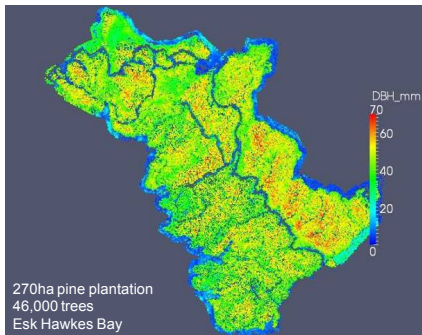
- These trees are on a shady aspect, and will be smaller than average for this stand



- This tree is next to a gap, has a lopsided canopy and may have poor wood quality



Tree diameter by individual tree



Problems

- Aerial LiDAR will not reliably hit the stem at any density (except in leaf-off conditions)
- Very high density aerial LiDAR is prohibitively expensive
- Some physical constraints (e.g. speed of light) are hard to get around



Solutions

- Terrestrial LiDAR



www.bu.edu/tech/files/2009/12/mean_AT.jpg

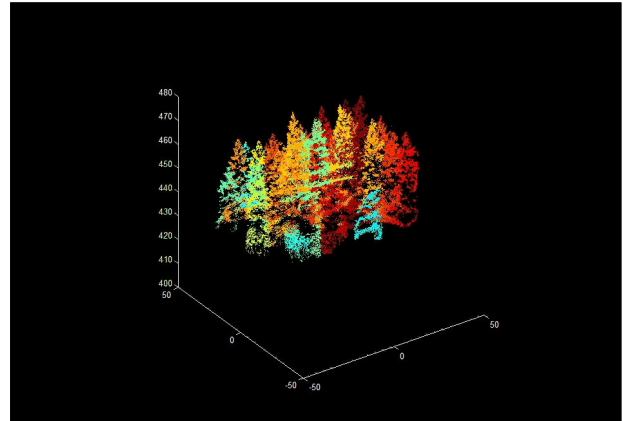
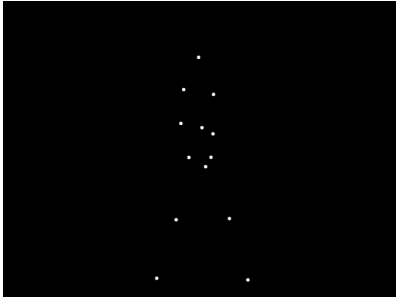


Solutions

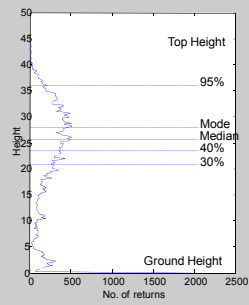
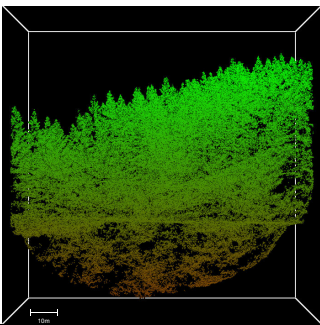
- We just get smarter with aerial LiDAR



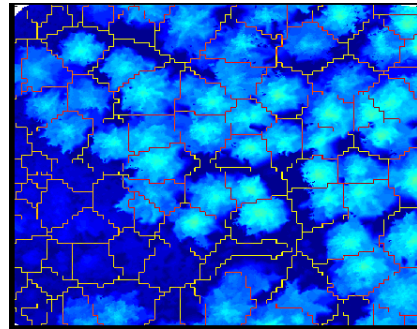
13 spots of light...



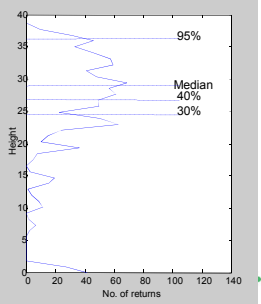
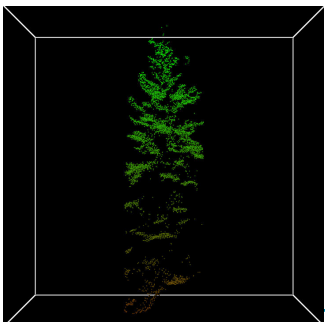
200,000 spots of light...



Individual Tree Segmentation



Individual tree LiDAR window



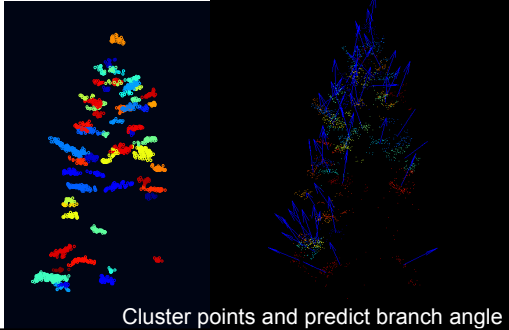
Individual canopy lidar

- Aerial LiDAR gives a rich (but not complete) description of the canopy
- The canopy is the 'engine of the tree'
- Can we infer things about the stem from the canopy?
 - Species
 - Health (defoliation, broken tops, lean)
 - Log grades (internodal distances, branch sizes)
 - Wood properties (stiffness, compression wood, microfibril angle)

■ To be resolved...

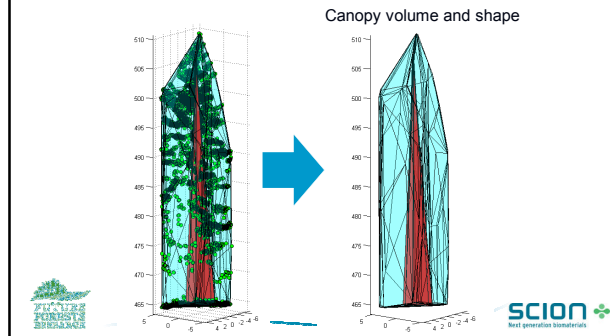


Canopy characteristics



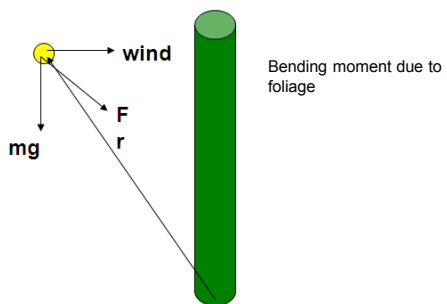
Cluster points and predict branch angle

Canopy characteristics



Canopy volume and shape

Canopy characteristics

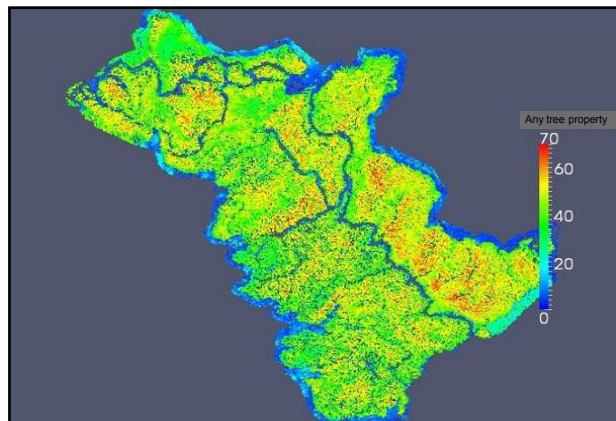


Bending moment due to foliage

Problems

- Distinguishing stem, foliage, understory and ground returns
- Shadowing
- Segmentation
- Computational cost
- Physical data collection

Why persevere?





Acknowledgements

- FFR, Scion capability Fund
- David Pont, Jonathan Harrington, Lucy Manning, Peter Beets, Thomas Paul

