Comparison of individual tree height measurements: LiDAR Point Cloud vs. Manual Measurements

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The aim of this research is to investigate whether tree measurements can be made and to compare tree level measurements obtained from the LiDAR image with preexisting field measurements.

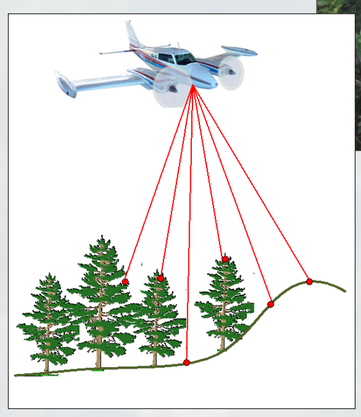
Aerial Light Detection and Ranging (LiDAR) scanning of a forest resource provides significant benefits to forest managers. There are several well documented examples of forest companies using aerial LiDAR scanning to derive stand level statistics (volume, basal area etc.)

LiDAR data of a reasonable resolution produces a point cloud which can be viewed using specialist software as a three dimensional image. This image contains a large amount of detail on tree features and it may be possible for technicians to manually make tree level measurements from the LiDAR image in a similar manner to the measurements made by field teams measuring plots in the forest.

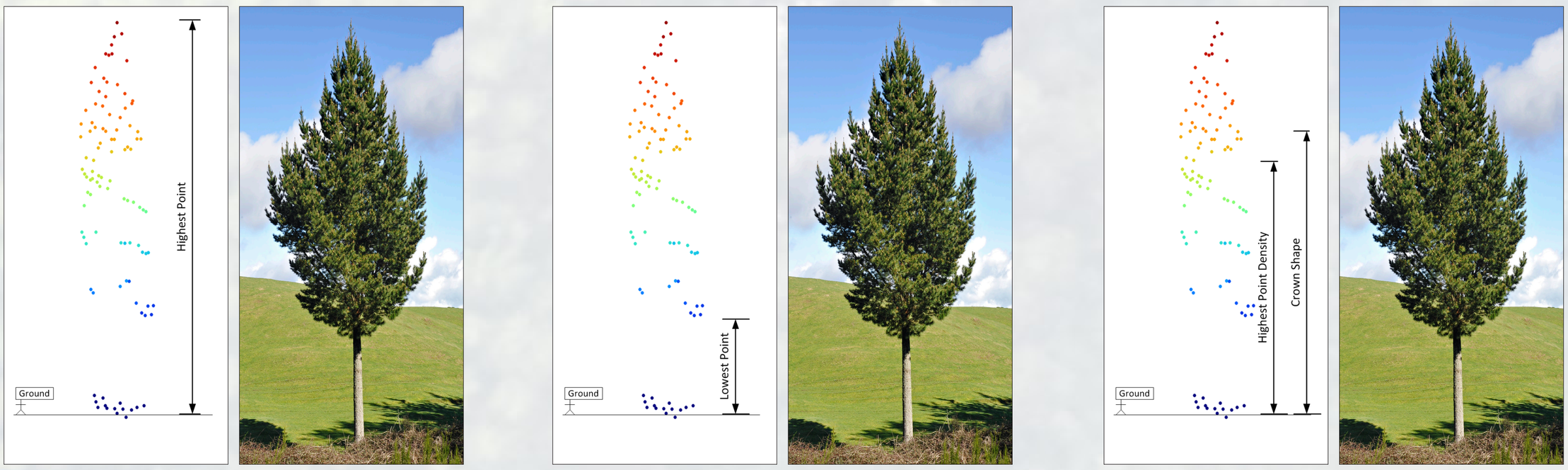
Importance for the Industry

Should the techniques piloted in this study be the successful the following benefits may be realised:

- There may be an increase in accuracy because the less difficult measurement conditions may result in reduced human error.
- If costs are reduced it may be possible to measure more regularly resulting in more up to date resource information.
- The size of the measurement team can be reduced there are significant benefits in terms of health and safety and social disruption for field workers.



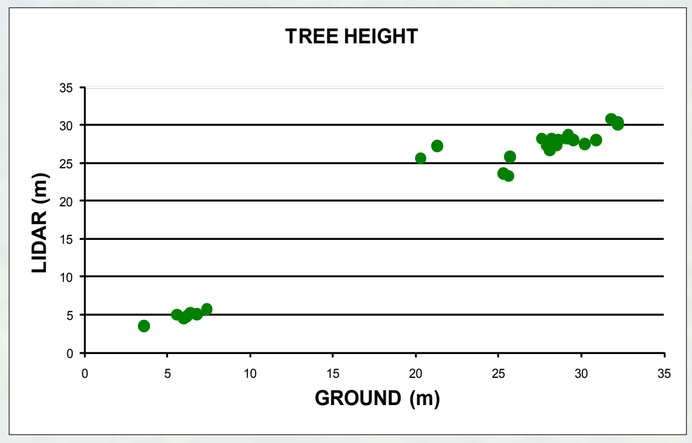
Method



Results

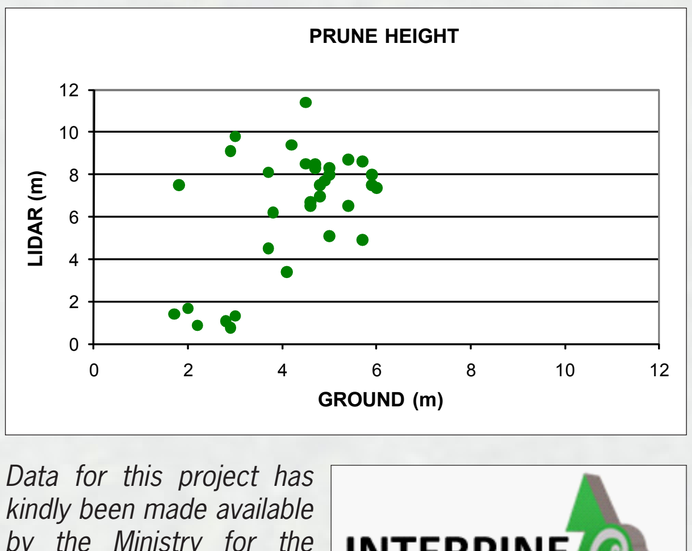
<u>Tree height</u>

There was found to be a strong correlation (R2 =0.96) between tree heights measured using the LIDAR image and the field measurement when a linear regression was fitted to the data. This result indicates that tree height can be effectively measured from the LiDAR image.



<u>Pruned height</u>

A weak correlation was found between pruned heights measured using from the LiDAR image and those measured on the ground when a linear regression was fitted to the data (R2 = 0.29). This result indicates that it may be difficult to measure pruned height from the LiDAR image. The weak relationship may be due to the difficulty in identifying the branches belonging to a specific tree in some instances.



<u>Green crown</u>

The green crown measurements made from the LiDAR image were considerably higher than those recorded in the field. This indicates that it may not be possible to measure green crown accurately from the LiDAR image.

Conclusion

The results of the analysis indicate that it is probable that tree features can be measured in the manner outlined in this research but that some features, such as green crown length may be difficult to measure. The results show sufficient promise to suggest that a larger scale research project aimed at better understanding of the measurement procedures would be beneficial.

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