NATIONAL CONSORTIUM FOR REMOTE SENSING EDUCATION, RESEARCH, AND APPLICATIONS

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Accuracy and Precision of Digital Forest Measurements.

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Introduction

Research Question: Are forest measurements taken using camera imaging accurate enough to apply on an operational scale, and what potential problems need addressed?

Tested Hypotheses:

1) *Null:* Camera-based systems take unbiased measurements of tree diameter.
2) Any bias in the camera-based measurements is associated with tree eccentricity.

Figures

- *Figure 1* - Graphs plot ground measurements against imaging.
    - A one-to-one line is inserted to model linearity (orange). Best fit lines with intercept set at zero are included for comparison (dashed red).
- *Figure 2* – Deviance was calculated by subtracting average (a) or imaging (b) values from min and max ground measurements.

Results

- The camera-based system **underpredicted diameter**, as measured by tape, by an average of 8.3% for each cm increase in diameter (Figure 3a)
- Camera-based estimates were closest to the minimum tree diameter, but still underpredicted
    - Minimum underprediction bias: 3.9% (Figure 3b)
    - Maximum underprediction bias: 9.4% (Figure 3c)
- As trees get larger ground measurement deviance changes little (Figure 4a)
- As trees get larger image-based measurements become more accurate (Figure 4b)

Conclusion

- Based on Figure 1, we reject hypothesis 1
- Because smaller trees are more eccentric, data supports hypothesis 2

Diameter measurements derived from camera-based systems are accurate, but biased. These systems need refinement to correct for bias before widespread use.

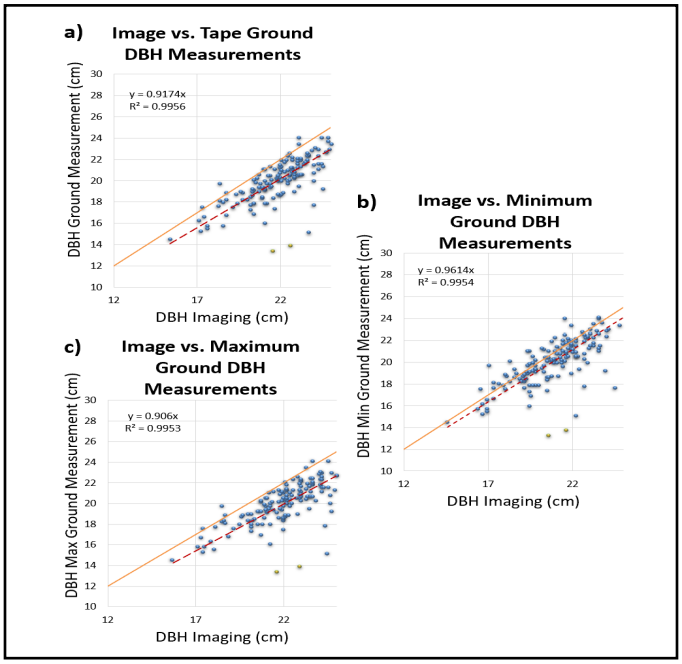

Figure 1 - Upper and Lower Bound Accuracy of Digital DBH Measurements.

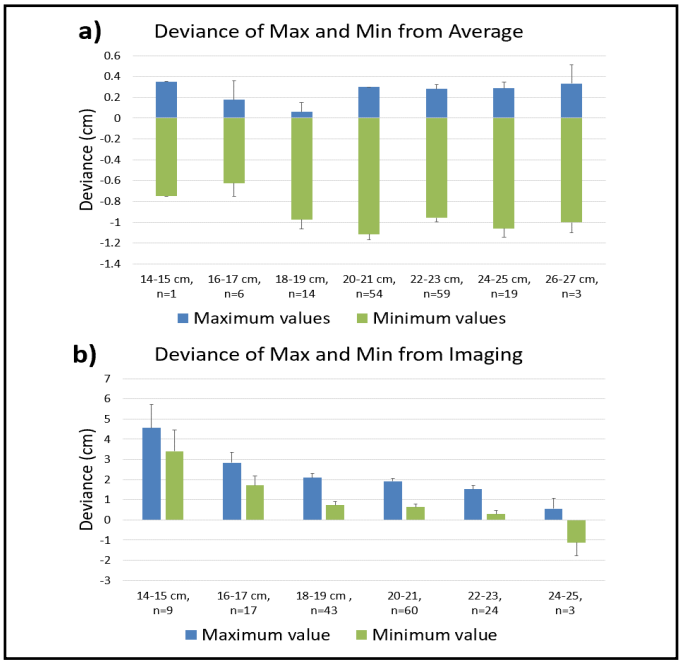

Figure 2 - Deviance of Maximum and Minimum Measurements.