Computational 3-D geometry of airborne laser scanning data in modeling tree crown architecture

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Tree crown parameters obtainable from aerial inventories are of great interest in the field of several different applications; for example, knowledge on species-specific allocation of foliage biomass among tree trunk could be utilized in estimating stem dimensions through allometric relationships. It is known that airborne laser scanner (ALS) systems provide detailed 3-D data on forest canopy but certain methodology is required for extracting the information from the point cloud.

Computational geometry is a branch of computer science that deals with the study of algorithms and data structures for solving problems stated in terms of basic geometrical objects, such as points, line segments and polygons. As major attention is paid to the computational efficiency of the algorithms, the use of these could be advantageous for dealing with high-density ALS point data.

Our recent research has focused on applying computational geometry of tree-level ALS point data for quantifying parameters of crown shape and structure. The obtained results show that computational volume and complexity characteristics are useful in predicting tree species [1] and estimating stem diameter [2]. Also, the appraisal of other tree crown characteristics, such as crown base height [3], seems feasible. The purpose of this presentation is to demonstrate our approach of applying these algorithms and data structures. The presentation is based on both recently completed [1,2,3] and ongoing research.

References

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[3] J. Vauhkonen, "Estimating crown base height for Scots pine by means of the 3-D geometry of airborne laser scanning data", *International Journal of Remote Sensing*, in press.