Application of R for classification of main tree species using terrestrial laser scanner data

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Terrestrial laser scanning is becoming more and more popular for forest mensuration purposes. Meanwhile many groups concerned with this topic across the whole world have developed algorithms and software solutions to derive dimensional aspects of trees more or less automatically (Wezyk, 2007; Maas et al., 2008). For real forest mensurational applications, e. g. to apply terrestrial laser scanning technology for forest inventories, a lack of knowledge exists. So far no performant solution, which can distinguish the tree species automatically from point cloud data, exists.

At the chair of Forest Growth and Yield at Technische Universität München a methodology has been developed to distinguish the tree species by using terrestrial laser scanner data. This system consists of a training component, which trains classification algorithms using forest inventory data of the last inventory period. The classifying algorithms use for example tree bark metrics or color distribution metrics as variables for tree species distinction. After an evaluation of the goodness of the trained classifiers by cross-validation these classifiers are applied to the new forest inventory data. At the end of the process each automatically detected and located tree gets assigned a tree species mark (Witten and Frank, 2005).

For the application of the "lingua franca" R for this problem two reasons are responsible. The first reason is, that the scientific working group on the application of terrestrial laser scanning on forests has made good experiences with the already in R developed routines for automated derivation of dimensional measures of trees (Klemmt, 2008). The second reason is the ever growing number of R packages which provide for the mentioned problem e. g. image processing routines as well as several classification routines.

References

Klemmt (2008): *Using R as an environment for automatic extraction of forest growth parameters from terrestrial laser scanner data* , User!2008 (Dortmund, Germany), July 2008, http://www.statistik.uni-dortmund.de/useR-2008/abstracts/Klemmt.pdf

Maas, H-G., Bienert, A., Scheller, S., Keane, E. (2008): Automatic forest inventory parameter estimation from terrestrial laser scanner data. International Journal of Remote Sensing, Volume 29, Issue 5 March 2008, pp. 1579-1593.

Wezyk, P., Koziol, K., Glista, M., Pierzchalski, M. (2007): Terrestrial laser scanning versus traditional forest inventory. First results from the Polish forests. ISPRS workshop on laserscanning 2007 and SilviLaser 2007, Espoo, Sept. 12-14, 2007, Finland, pp. 424-429.

Witten, I.A., Frank, E. (2005): Data Mining – Practical Machine Learning tools and techniques. Elsevier, 524 p.