

The TreeTrace Douglas database: quality assessment and traceability of Douglas fir

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ABSTRACT

The objective of the present paper is to present an experimental dataset (downloadable at <https://doi.org/10.15454/YUNEGL>) that can be of high value for the wood science community, and the first to be openly available to the best of author knowledge. The content of the database and detail about the data are presented in a datapaper [1].

The TreeTrace.Douglas database includes images and measurements at several stages of the processing of Douglas fir logs, from sawmill logyard to machine grading and destructive testing of boards, and is suitable for research on quality assessment and traceability. A total of 52 long logs, 156 short logs, 208 wood discs and 346 boards was analysed. The image data includes RGB images of log ends and board ends, RGB images and CT slices of strips, a set of images of the boards (RGB, laser and X-rays) obtained with an industrial scanner dedicated to board grading. The measurements include wood density, growth ring widths, pith and board location in the logs, heartwood and sapwood areas, mechanical properties of each board obtained by vibratory and static testing, and visual grading of the boards.

This database is suitable for working on the development of image processing algorithms to apply along the forest-wood chain: to trace the wood from the forest to the boards and to extract quality information at the different stages of the processing. A more traditional analysis of wood quality is also possible by relating the different variables (*e.g.*, wood density and ring width) to each other, to their position in the tree, and by relating the quality measured on the logs to the boards that are extracted from them. This dataset can also directly be used for the development of strength grading algorithms since it includes all the measurement made by current board scanners and vibration testing devices, plus

board traceability from the long log. Some examples of how the database can be used is described in the following part.

Pith detection algorithms has been developed [2] because they often serve as a basis for the detection of other characteristics and because pith position provides information on the severity of the eccentricity potentially related to the presence of compression wood for softwood species. The data can also be used to analyse some wood quality characteristics of Douglas fir and to estimate the amount of information that can be recovered from the analysis of log ends. For instance, a study is underway to analyse the relationship between tree growth and wood density at the ring level from the database. Indeed, an automatic detection of ring widths associated with a ring width – ring density model would provide relevant quality information. It would also be possible to link the properties of the logs (ring widths, wood density, juvenile wood area, heartwood and sapwood amounts, pith eccentricity) to the mechanical performances of the boards obtained from these logs. Another possible application is the development of strength grading algorithms such as that of [3] and [4] since the dataset includes the main measurements made by current industrial board grading machines. The location of the boards in the logs can also be used in the models like that of [5].

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