



Machine strength grading techniques and modeling to enlarge the yields of strength graded softwood and hardwood timber

Subject

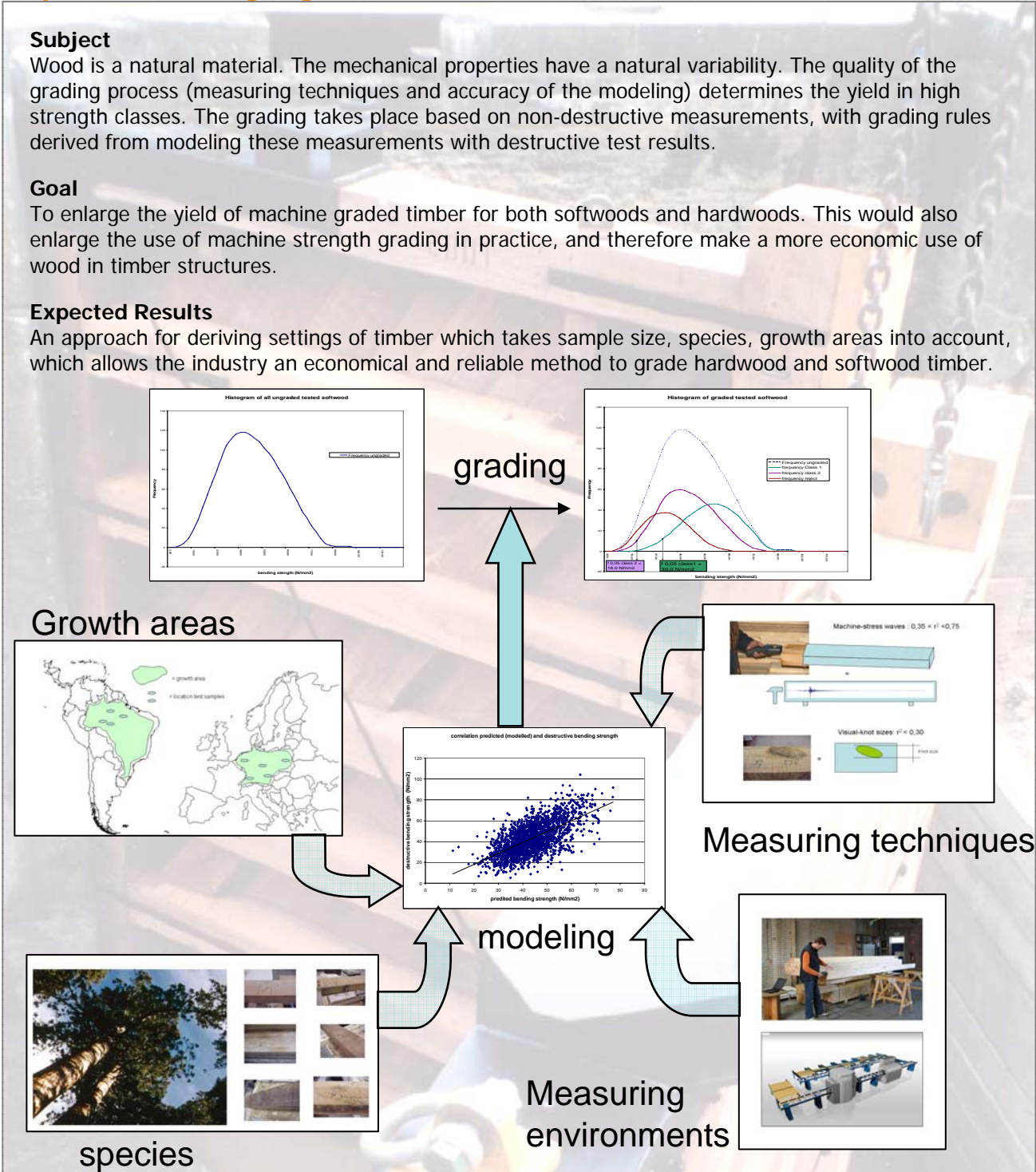
Wood is a natural material. The mechanical properties have a natural variability. The quality of the grading process (measuring techniques and accuracy of the modeling) determines the yield in high strength classes. The grading takes place based on non-destructive measurements, with grading rules derived from modeling these measurements with destructive test results.

Goal

To enlarge the yield of machine graded timber for both softwoods and hardwoods. This would also enlarge the use of machine strength grading in practice, and therefore make a more economic use of wood in timber structures.

Expected Results

An approach for deriving settings of timber which takes sample size, species, growth areas into account, which allows the industry an economical and reliable method to grade hardwood and softwood timber.



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Program/Subprogram Timber structures / Strength grading of timber
Host University Delft University of Technology / Civil Engineering and Geosciences

Machine strength grading techniques and modelling to enlarge the yields of strength graded softwood and hardwood timber.

From tree to structure.

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Nowadays the focus on strength grading of timber mainly lies on softwood that is processed in large sawmills. The possible application range for machine graded timber is much larger, however problems have to be solved to make this possible.

At this moment the effectiveness for both machine grading and visual grading differ for different species, softwood and hardwood, and growth areas. Also the fact that a large number of woods species in small amounts (as is the case for hardwoods) will enter the market for structural uses is not addressed in the present strength grading system.

Goals

The object of this PhD work is to enlarge the yield of machine graded timber for both softwoods and hardwoods. This would also enlarge the use of machine strength grading in practice, and therefore make a more economic use of wood in timber structures.

Research Question

To achieve the goals the following research questions have to be answered:

1. Is it possible to enlarge the correlation of the predicted values of the strength of timber with the tested values by more accurate Non-Destructive Measurements?
2. Is it possible to use Non-Destructive Measurements for the prediction of the timber strength in other measurement conditions like stacked timber?
3. Is it possible to enlarge the yield of hardwood and softwood to in higher strength classes by advanced modelling?
4. What is the influence of sampling (the numbers of pieces and the number of growth area) of the testing material on the derivation of the settings for machine graded timber.

Strategy

The research activities will take place on the following subjects:

- To study the improvements of the correlations of present Non-Destructive Measuring techniques with the strength. Theoretically the physical backgrounds of Non-Destructive Measurement techniques will be studied to determine the accuracy of strength-reducing defects that can be detected. These will be verified by a large number of Non-Destructive and destructive tests.
- To develop strength grading models that allows combining timber species and growth areas. These models will be based on Non-Destructive Measuring techniques and on statistical analysis of samples form different species and sources.

Expected Results

- Measuring algorithms that provide higher correlations with strength-reducing effects and also with the bending strength of both softwood and hardwood timber.
- An approach for deriving settings of timber which takes sample size, species, growth areas into account, which allows the industry an economical and reliable method to grade hardwood and softwood timber.

Preferred Partners Applications / Sponsors

Manufacturers of strength grading devices, Timber and forestry industry

Research Period : 2008 - 2013^{Research School Integral Design of Structures}