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3D-Simulation of wood stacks to analyze the influence of log properties on stack volume

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Introduction

- Roundwood measurement
  - Stack volume
  - Solid wood content
  - Conversion factors
- Quantification of the solid wood content
  - Water displacement method
  - Individually measurement of the logs
- Influencing parameters on the stack volume
  - Log properties
  - Stack properties

Material & methods

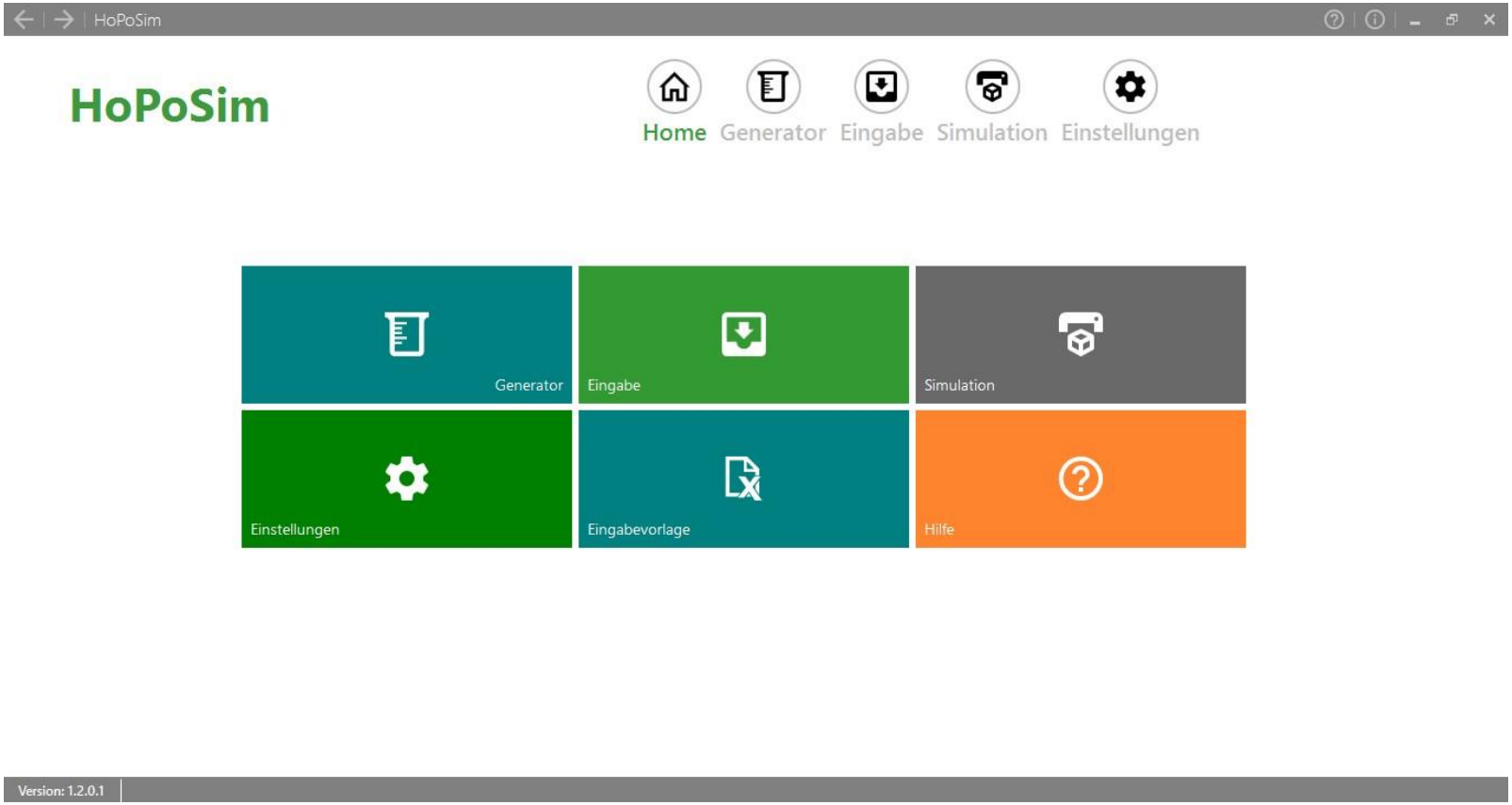
- Database:
  - 1000 logs Scots pine
  - Parameters measured: length, small, midpoint and large diameter, bark thickness and crookedness.
  - Parameters calculated: taper and ovality

- Results
  - Stack volume in st according to the German methodology (RVR_1), fotooptical methods and by measuring the surface of the front and back stack sides.
  - Solid wood content
  - Conversion factors froom stack volume into solid wood content according to the three methods.
  - Bark percentage in the stack

[1]Rahmenvereinbarung für den Rohholzhandel in Deutschland (German framework agreement for timber trade)

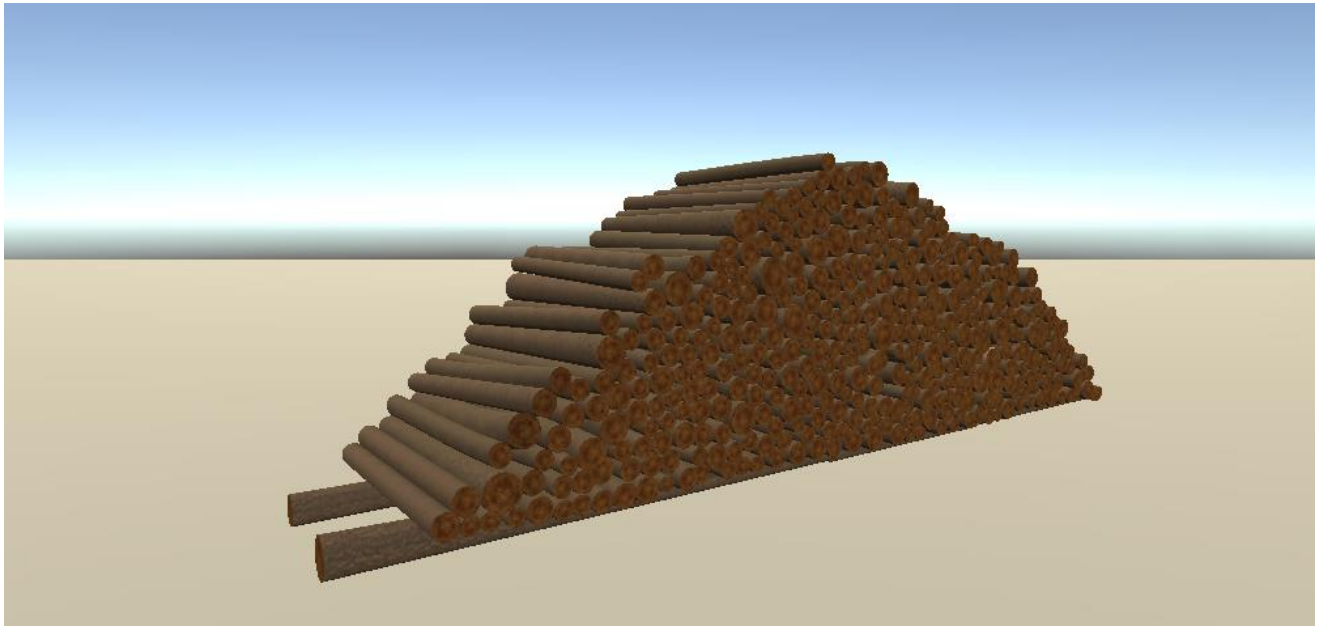
Material & methods

- Simulation model – main interface



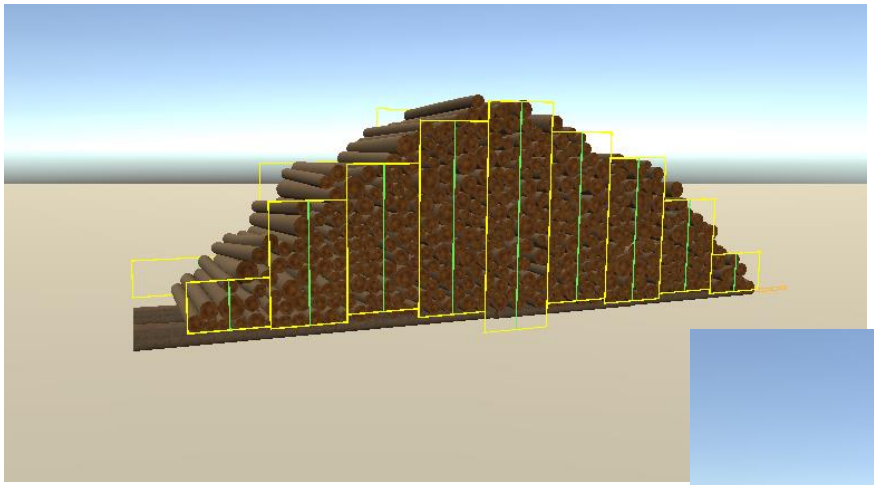
Material & methods

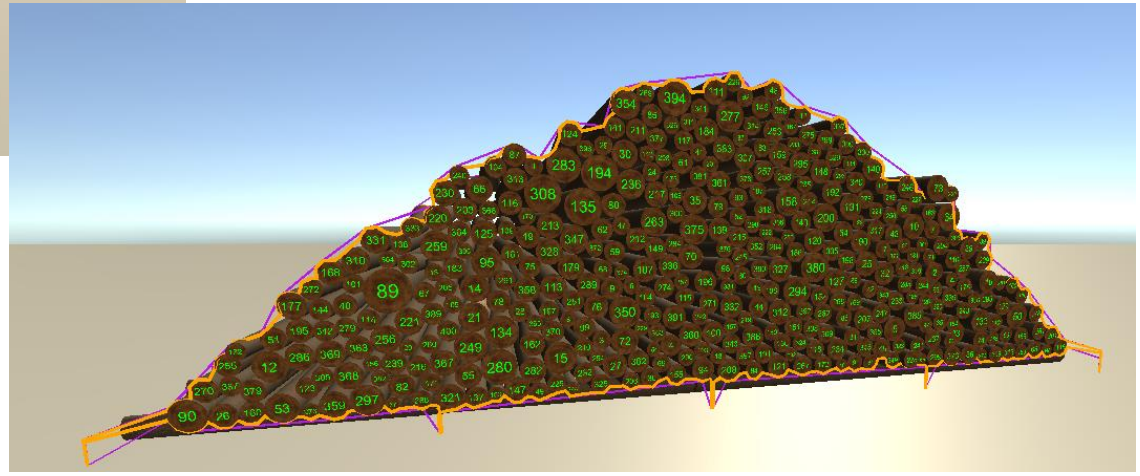
Simulation model – 3D Visualization and volume measurement



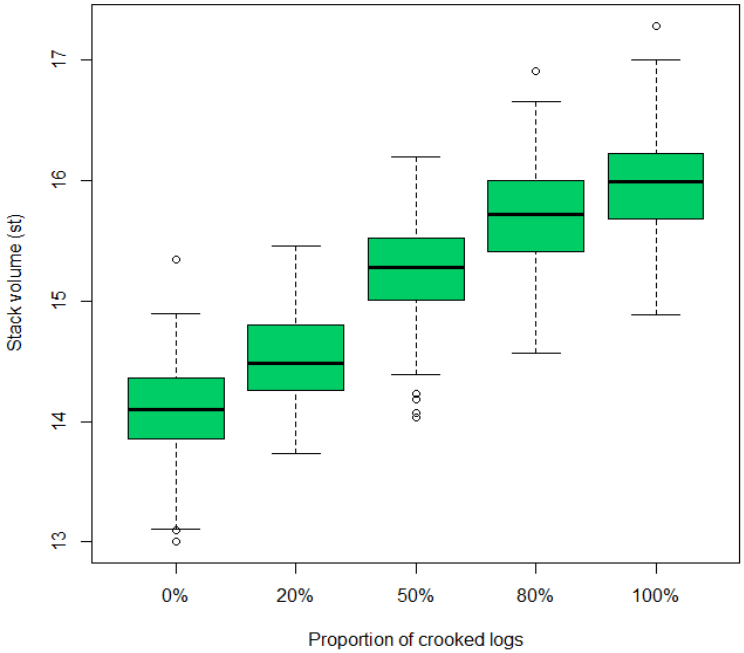
Material & methods

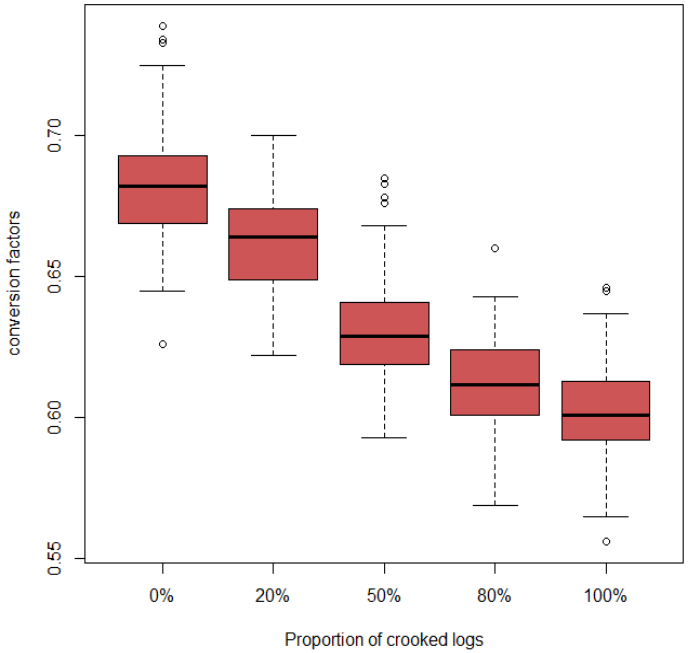
Simulation model – 3D Visualization and volume measurement





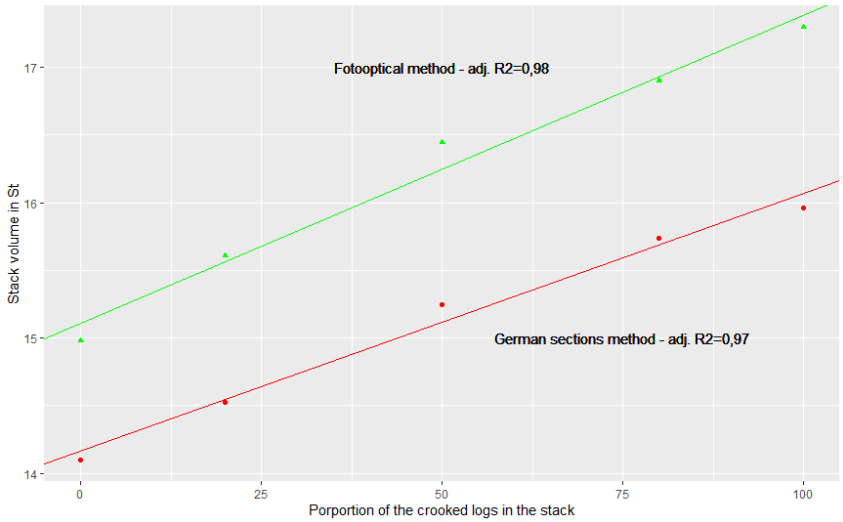
Results

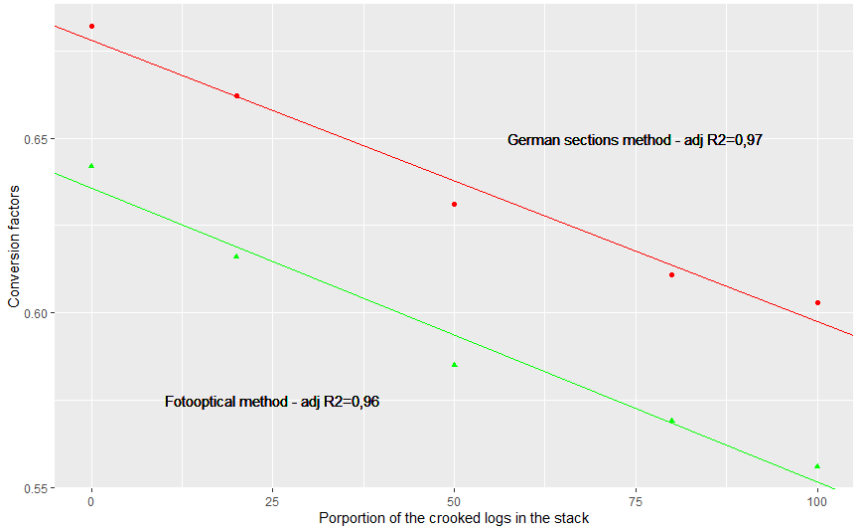




The bigger the portion of crooked logs in the stack, the larger is the stack and inversely, the smaller is the conversion factor.

Results





This variations show a linear relation between the stack volume, conversion factors and the proportion of crooked logs in the stack

Conclusion

- Hypothesis confirmed:
  - crooked logs occupy a larger volume in the pile than do the straight ones and produce air spaces between them such.
- This corresponds to the mentioned measurement guidelines of some countries and other publications:
  - Standard Procedures for the Measurement of Round Timber for Sale Purposes in Ireland
  - the Swedish SDC´s instructions for timber measurement
  - Zon (1903)
  - Parde&Bouchon (1988)
  - Rondeux (1993)

Conclusion

- The results demonstrate the capacity of the simulation model to obtain large databases for statistical analyses and a therefore higher reliability.
- The parameter crookedness exerts a considerable influence on the stack volume.
- Therefore, provenience regions, where the raw material is more crooked because of genetics patterns or site conditions, should be considered when purchasing round wood

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Many thanks for your attention