Analysing, Modelling & Reconstructing Spatial Forest Structure

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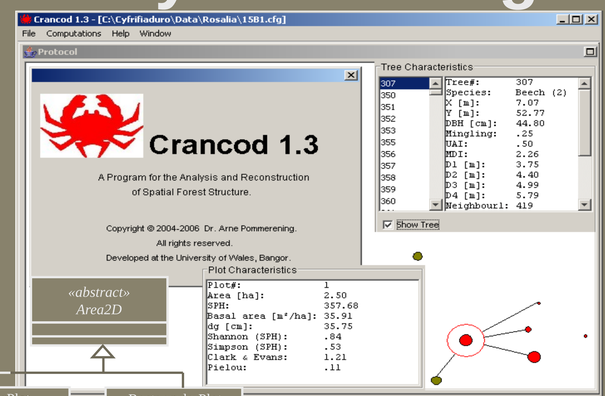
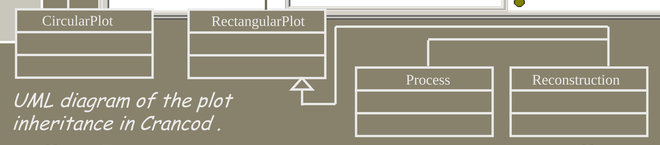
1. Introduction

- Woodland structures as part of the landscape determine to a large extent the occurrence and population dynamics of a range of species.
- Nearest neighbour summary characteristics (NNSS) can
- be employed as surrogate measures of biodiversity to monitor the difference between values ideal for a specific habitat function and currently observed values.
- In order to employ spatial statistics for research into the significance of spatial forest and landscape structure a flexible approach in bioinformatics is required.

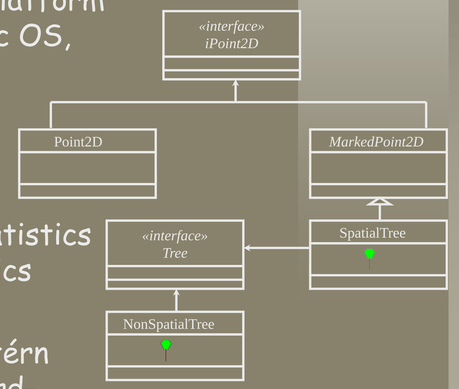
2. System design





UML diagram of the plot inheritance in Crancod .

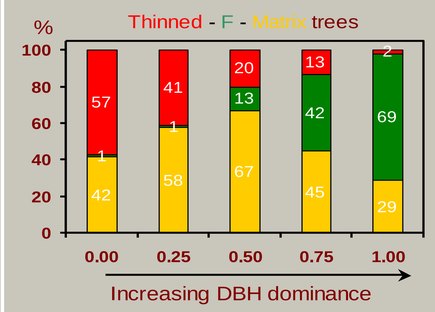
- Virtual lab for the analysis and reconstruction of spatial forest structure.
- Implemented as JAVA package, object-oriented programming (OOP), platform independent (MS Windows, Mac OS, Unix/Linux).
- Using modern design patterns (gang of four).
- Computing a wide variety of nearest neighbour summary statistics and second-order characteristics (Pommerening, 2002, 2006).
- Modelling point processes (Matérn cluster, Poisson and Matérn hard-core).



UML diagram of the point and tree hierarchy in Crancod.

3. Research applications of the CRANCOD software

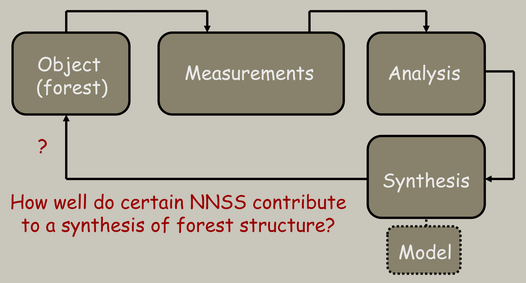
Analysis



Pommerening (2002)

Quantifying spatial woodland structure with a wide range of indices and functions. Developing and testing of new indices and functions. Can be based on full enumerations of populations as well as samples.

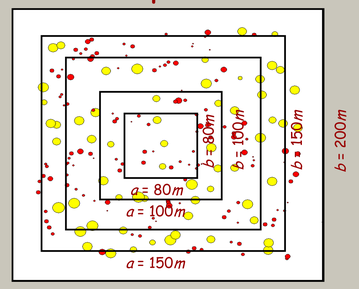
Evaluation of NNSS



Pommerening (2006)

How well do NNSS contribute to synthesising spatial woodland structure at the computer? A variant of cellular automata was used as a model driving the synthesis in this study.

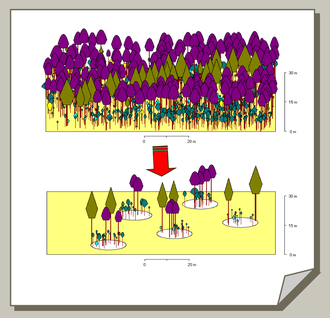
Research into Edge-Bias Compensation



Pommerening and Stoyan (2006a)

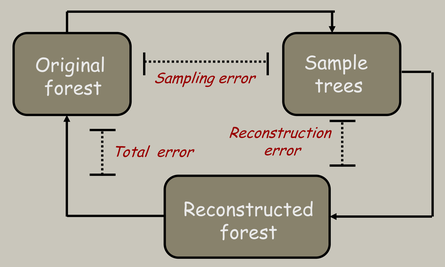
The treatment of edge trees can affect the estimation of NNSS since they can involve off-plot neighbours. The study investigated whether and in what circumstances edge-correction methods are necessary, and evaluated the performance of six different approaches.

Sampling Simulation



Sampling simulation is a method to identify the optimal sampling design and sample size for estimators of spatial woodland structure. Circular, rectangular and relascope (Bitterlich) sample plots can be simulated.

(Re)construction



Pommerening and Stoyan (2006b)

(Re)construction is the process of synthesising spatial forest structure or even the spatial structure of a landscape by means of a stochastic optimisation technique. This paves the way to habitat generators which can become an important aspect of conservation planning.

4. References

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The core package of the CRANCOD software can be downloaded free of charge from the website http://www.crancod.org.