Stochastic spatio-temporal modeling of forest dynamics

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Faced with contemporary environmental concerns, modeling of the dynamics of natural forests is one of the major issues of computational forestry. We propose a spatially explicit and individual-based modeling of the dynamics of a natural forest. Individual-based models (IBM) are often implemented through multi-agent systems, without an underlying model. This may obstruct the deep understanding of the dynamics considered, as well as its quantitative assessment. In addition, the model-based approach for forest dynamics is usually limited to aggregated (i.e. non spatialized) temporal models. In this work we propose an individual-based model, which is explicitly spatialized in terms of spatio-temporal Markovian processes. In addition to the position of an individual, the state variable may include its size and other characteristics. This type of model takes into account the competition among individuals for access to resources. We explicitly describe the Markovian dynamic and propose an efficient Monte Carlo simulation procedure. This Monte Carlo procedure will allow for a Bayesian approach which permits the model to fit data. Our aim is to calibrate this model to the database of the Paracou (French Guiana) permanent plot.

References

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