28th February - 01st March 2025

Species Specific Stochastic Simulation of Tree Mortality Processes

Petras Rupšys

Faculty of Informatics, Vytautas Magnus University, Kaunas, Lithuania

Abstract:

Self-thinning is an important process in forest stand dynamics, and knowledge of it is essential for the implementation of modern management strategies. Tree mortality in a forest stand depends on many factors and influences the spatial distribution of remaining living trees in stands. Tree mortality in young forests is mainly driven by competition, but in old forests, it is mostly influenced by random disturbances in the environment. In this study, we will discuss the dynamics of the number of trees that are dead or dying over time in forests of central Lithuania. The results are obtained using diffusion processes combined with the normal copula function and stochastic differential equations. The examination of each tree's size variable individually (height and diameter) showed that the mean values of the variables of dead or dying tree size had significantly lower trajectories, which is particularly pronounced in mature stands. The Maple symbolic algebra system was used to implement all of the results.

Keywords:

Instantaneous growth rate, mortality, number of trees per hectare, probability density function, stochastic differential equation.