FINITE DIMENSIONAL STATE REPRESENTATION OF STRUCTURED POPULATION MODELS

Mats Gyllenberg

Finnish Centre of Excellence in Analysis and Dynamics Research
Department of Mathematics and Statistics
FIN-00014 University of Helsinki

mats.gyllenberg@helsinki.fi

Structured population models can be formulated as delay systems. We consider the question of when delay systems, which are intrinsically infinite dimensional, can be represented by finite dimensional systems. Specifically, we give conditions for when all the information about the solutions of the delay system can be obtained from the solutions of a finite system of ordinary differential equations. For linear autonomous systems and linear systems with time-dependent input we give necessary and sufficient conditions and in the nonlinear case we give sufficient conditions. The ideas and results are illustrated by models for infectious diseases and physiologically structured populations.