

NUMERICAL APPROXIMATION OF THE BASIC REPRODUCTION NUMBER FOR STRUCTURED POPULATIONS

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The basic reproduction number, commonly denoted R_0 , plays a fundamental role in many ecological and epidemiological models of population dynamics, where it is defined as the spectral radius of the next generation operator [1]. In this general setting R_0 has not an explicit expression, and numerical methods are needed for its practical computation. We address the problem by reducing the relevant operators to matrices through the pseudospectral collocation and then by computing the (dominant) eigenvalues of the resulting matrices. The approach is illustrated for two classes of models, respectively from ecology and epidemiology. Some numerical tests give evidence of the convergence properties and potentialities of the approach.

References

- [1] O. Diekmann, J. A. P. Heesterbeek, and J. A. J. Metz. (1990) *On the definition and the computation of the basic reproduction number R_0 in models for infectious diseases in heterogeneous populations*. J. Math. Biol., Volume 28, 365–382