

Pseudospectral methods for the stability of periodic solutions of delay equations

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Realistic models of structured populations are often based on delay equations. Due to the complexity of such models, their dynamics cannot usually be studied analytically and must be approximated numerically. A method based on pseudospectral collocation for approximating the eigenvalues of evolution operators of linear delay differential equations has been recently developed in [1, 2]. The method can be applied in particular to the monodromy operator of linearized problems to study the local asymptotic stability of periodic solutions. We present an extension of that method to coupled renewal equations and delay differential equations, along with examples and a sketch of the proof of convergence.

- [1] Breda D., Maset S., Vermiglio R., Approximation of eigenvalues of evolution operators for linear retarded functional differential equations, *SIAM Journal on Numerical Analysis* **50**:1456-1483, 2012.
- [2] Breda D., Maset S., Vermiglio R., *Stability of Linear Delay Differential Equations: A Numerical Approach with MATLAB*, SpringerBriefs in Control, Automation and Robotics, Springer, New York, 2015.