A NON-STANDARD NUMERICAL METHOD PRESERVING GLOBAL PROPERTIES OF INTEGRO-DIFFERENTIAL SYSTEMS

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We propose a numerical method for a general integro-differential system of equations which includes a number of age-of-infection epidemic models in the literature [1, 2]. The numerical solution is obtained by a non-standard discretization of the nonlinear terms in the system, and agrees with the analytical solution in many important qualitative aspects. Both the behaviour at finite time and the asymptotic properties of the solution are preserved for any value of the discretization parameter. These properties, together with the fact that the method is linearly implicit, actually make it a computationally attractive tool and, at the same time, a stand-alone discrete model describing the evolution of an epidemic [3, 4].

References

[1] F. Brauer. *Age of infection in epidemiology models*, Electronic Journal of Differential Equations, 2005.

[2] D. Breda, O. Diekmann, W. F. de Graaf, A. Pugliese and R. Vermiglio, *On the formulation of epidemic models (an appraisal of Kermack and McKendrick)*, J. of Biological Dynamics, 6:sup2, 103–117, 2012.

[3] E. Messina, M. Pezzella and A. Vecchio, *A non-standard numerical scheme for an age-of-infection epidemic model*, J. Comput. Dyn., 9 (2), 239–252, 2022.

[4] E. Messina, C. Panico and A. Vecchio, *Global stability properties of non-standard discretization for renewal epidemic models*, in preparation.