CONVERGENCE OF THE PIECEWISE ORTHOGONAL COLLOCATION FOR PERIODIC SOLUTIONS OF DELAY EQUATIONS

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This is a joint work with Dimitri Breda.

I will present an analysis of the convergence of (a variant of) the piecewise orthogonal collocation for periodic solutions of retarded functional differential equations (RFDEs) or renewal equations (REs) defined by a generic right-hand side [1]. Such analysis is highly based on [3] where a general framework for solving a certain class of boundary value problems (BVPs) is presented and accompanied by a rigorous proof of convergence of the corresponding iterative method. The novel contributions consist in the proofs of the validity of the assumptions required to apply the abstract approach of [3] in the case of periodic BVPs. Indeed, although the general BVP in [3] considers the presence of unknown parameters, it does not explicitly deal with the periodic case. In the presentation I will highlight the role of the period as the (main) unknown parameter of the problem, which leads to some effort in validating the required assumptions, being it directly linked to the course of time. It also affects the regularity that must be required from the functionals involved, as well as the choice of the relevant spaces where the solution, its derivative or the states must lie. I will conclude the presentation with some comments on the differences between the case of RFDEs and that of REs, the relevant convergence analysis of which is part of the work [2], currently under review. Despite the similarities in the structure with respect to that of the proof for RFDEs, some more work is required to complete the analysis for REs, which included recurring to some resolvent theory. The further extension to coupled systems can also be carried out by exploiting the ideas already used for RFDEs and REs separately.

References

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[2] Andò, A. and Breda, D. *Numerical computation of periodic solutions of renewal equations from population dynamics* submitted.

[3] Maset, S. *An abstract framework in the numerical solution of boundary value problems for neutral functional differential equations*, Numer. Math., 133(3):525–555, 2016.

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