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On the discontinuous solutions of explicit neutral delay differential equations

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Abstract

This paper considers explicit neutral delay differential equations (NDDE) with piecewise continuous initial functions. We explain how the discontinuities in the solutions arise and present a perturbing scheme, in combination with an adaptive Legendre–Gauss–Radau collocation method, to deal with this type of problems computationally. The pointwise and mean convergence of the continuous solution of the perturbed NDDE to the discontinuous solution of the original NDDE are proved. Our new method for discontinuous NDDEs and the rigorous theoretical analysis provided are particularly important since explicit NDDEs have received little attention in the literature. Numerical results are given to show that the proposed method can be implemented in an efficient and accurate manner.

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