

Bounds for Global and Semi-global Solutions to Functional Differential Equations

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This work considers systems of nonlinear advance-delay functional differential equations, a significant class of differential equations that exhibit both forward-looking and past-dependent behaviors. We focus on deriving the criteria for the existence of semi-global and global solutions for these systems, which are often encountered in complex dynamic models in control theory, biology, economics, and other fields.

To prove the results, we employ the monotone iterative technique and the Schauder-Tychonov fixed-point theorem. In addition to establishing the existence of solutions, we derive estimates of their coordinates, offering insights into the potential range and behavior of the solutions over time. To illustrate the theoretical results, we present a series of examples showcasing various scenarios where advance-delay dynamics play a key role.

References

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