

A numerical library for the solution of integro-differential problems

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Abstract

The tau method, introduced by Cornelius Lanczos, is a spectral method originally developed to compute a polynomial that approximates the solution of a linear ordinary differential problem with polynomial coefficients. The method has been used since then and extended to problems with non polynomial coefficients, to functional and to nonlinear integro-differential equations, among others. This widespread was only possible from the pioneering work of Ortiz and Samara with the introduction of an algebraic formulation of the method. The Tau Toolbox is a project to aggregate all these contributions, to enhance the use of the method by developing more stable algorithms and to offer efficient implementations of its algebraic formulation. It is able to solve various integro-differential problems, linear and nonlinear, with initial and/or boundary or others conditions, working with the most common polynomial orthogonal basis. Non expert can now profit from this spectral method and its solutions properties. On the other hand, experts can easily analyze new problems by exploring the large set of building blocks functions provided.