STIFFNESS DETECTION STRATEGY
FOR EXPLICIT RUNGE KUTTA METHODS

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The notion of stiffness, which originated in several applications of different nature, has dominated the activities related to the numerical treatment of differential problems in the last fifty years.

The goal of stiffness detection methods is to allow software to automatically choose an implicit or explicit integrator, where appropriate. Making the proper choice of integrator often improve the efficiency of the software. However, the many faces of stiffness have resulted in many definitions and many methods for its detection.

In this talk, I will present a new method for detecting stiffness using the definition of stiffness presented in [1]. This method has been implemented in codes based on explicit and implicit Runge-Kutta methods.

The new technique is strictly related to the one used in codes for the numerical solution of Boundary Value Problems to compute the conditioning parameters and to define the mesh selection strategy [2].

References

[1] L. Brugnano, F. Mazzia, D. Trigiante. *Fifty Years of Stiffness.* Annals of the European Academy of Sciences, 2009 (in press) arXiv:0910.3780.

[2] J.R. Cash, F. Mazzia, *Conditioning and Hybrid Mesh Selection Algorithms for Two-Point Boundary Value Problems*, Scalable Computing: Practice and Experience,vol. 10 (4),pp. 347–361, 2009.