

Explicit Runge-Kutta methods for some classes of stiff problems

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SUMMARY

Numerical methods for the solution of differential systems of stiff type must possess good absolute stability properties and this implies that, in general, explicit methods are not adequate and implicit methods have to be used. However, for particular classes of stiff problems, there exist families of explicit Runge-Kutta methods that are able to integrate them, which is very convenient because they require less computational work than implicit methods. In this talk, a review of such classes of problems and methods is presented. Then, it is shown that the use of exponential fitting techniques can be useful for certain types of problems, such as those that possess an eigenvalue spectrum with gaps [1]. These techniques allow us to develop new explicit Runge-Kutta methods whose stability regions include the eigenvalue spectrum of the system and can integrate it with reasonable time step sizes.

Keywords: Stiff systems, exponential fitting, explicit Runge-Kutta methods

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References

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