

General Linear Methods for Ordinary Differential Equations

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The well-known Runge-Kutta and linear multistep methods have served the scientific computation community very well: today, efficient algorithms based on these traditional methods are available for solving a range of evolutionary problems. However, it is interesting to see what else might be possible by combining the multivalued aspects of linear multistep methods with the multistage aspects of Runge-Kutta methods. The members of the large family of methods, resulting from this amalgamation of existing computational schemes, are known as general linear methods. It will be shown how some of the limitations inherent in the traditional methods can be overcome within the larger family. In addition to this, progress will be reported on the development and implementation of a novel approach using methods which exhibit Runge-Kutta stability. That is, these new methods are genuine multivalued methods but their stability properties are exactly the same as for Runge-Kutta methods.